FLORIDA ATLANTIC UNIVERSITY

NEW/CHANGE PROGRAM REQUEST
Graduate Programs

Department Computer and Electrical Eng. and Comp. Science

College Engineering and Computer Science

UGPC Approval _____
UFS Approval _____
Banner Posted _____
Catalog _____

Program Name
Master of Science in Artificial Intelligence

☑ **New Program**
☐ **Change Program**

Effective Date
(TERM & YEAR)
FALL 2019

Please explain the requested change(s) and offer rationale below or on an attachment

The Department of Computer and Electrical Engineering and Computer Science is proposing a new Master Science in Artificial Intelligence program. The program requires 30 credits. Both thesis and non-thesis options are available. The admission requirements and the curriculum specifications are attached.

Faculty Contact/Email/Phone

Hanqi Zhuang/Zhuang@fau.edu/561-297-3413

Consult and list departments that may be affected by the change(s) and attach documentation
NA

Approved by		***Date***
Department Chair		3/5/19
College Curriculum Chair		3/11/19
College Dean		3/11/2019
UGPC Chair		3/27/2019
UGC Chair		3/27/19
Graduate College Dean	Khaled Sohlan	3/27/2019
UFS President		
Provost		

Email this form and attachments to UGPC@fau.edu one week before the UGPC meeting so that materials may be viewed on the UGPC website prior to the meeting.

GRADUATE COLLEGE
MAR 12 2019
Received

Master of Science with Major in Artificial Intelligence

The Master of Science with Major in Artificial Intelligence provides a comprehensive curriculum, consisting of foundation and theory of artificial intelligence and elements of machine learning, data analytics, computer vision, knowledge management and reasoning, and applications. Both thesis and non-thesis options of the Master of Science with major in Artificial Intelligence require a minimum of 30 credits. The thesis option consists of a minimum of 24 coursework credits and 6 thesis credits.

With approval of the advisor, substitution can sometimes be made among similar courses. See the Department of Computer & Electrical and Computer Science website for updates.

Admission Requirements
Applicants for admission to the master's program are approved by the University upon the recommendation of the department. All applicants must submit with their applications the official transcripts from previous institutions attended and have official GRE scores forwarded to the University. Applications for admission are evaluated on an individual basis. As a minimum, applicants are expected to meet the following requirements. Students with non-engineering bachelor's degrees, click here for additional requirements.

1. A baccalaureate degree in Computer Science or a related field (Students without a computer science background will be expected to take additional courses);

2. At least a 3.0 (of a 4.0 maximum) GPA in the last 60 credits attempted prior to graduation;

3. Submission of the Graduate Record Examination (GRE) scores. GRE scores more than five years old are normally not acceptable. The GRE requirement is waived for any student who has a baccalaureate degree from FAU's Department of Computer & Electrical Engineering and Computer Science with a GPA of at least 3.25 (out of a possible 4.0) in the last 60 credits attempted prior to graduation; and

4. International students from non-English-speaking countries must be proficient in written and spoken English as evidenced by a score of at least 500 (paper-based test) or 213 (computer-based test) or 79 (Internet-based test) on the Test of English as a Foreign Language (TOEFL) or a score of at least 6.0 on the International English Language Testing System (IELTS).

Applicants are expected to have taken the following prerequisite courses (or equivalents) before pursuing a master's degree. In some cases, prerequisite courses may be taken after admission to the graduate program.

Data Structures and Algorithm Analysis	COP 3530
Design and Analysis of Algorithms	COT 4400
Stochastic Models for Computer Science	STA 4821
Calculus with Analytic Geometry 1	MAC 2311
Calculus with Analytic Geometry 2	MAC 2312

Submission of Plan of Study
Students are required to submit a Plan of Study when they have completed between 9 and 15 credits of coursework with a minimum cumulative GPA of 3.0. All courses must be approved by the student's advisor. A student may not register for thesis credits prior to submitting a Plan of Study.

Degree Requirements
The Master of Science with Major in Artificial Intelligence program offers both thesis and non-thesis options. Both options require a minimum of 30 credits, as specified in Table 1.

Students must satisfy all of the University graduate requirements. In addition, the following requirements must be met:

1. The coursework credits must satisfy the following constraints:

a. No more than 3 credits of directed independent study may be taken.

b. No course can be counted toward the degree that is more than 10 years old at the time the degree is awarded

c. No 4000-level course is allowed toward the degree. Courses taken to make up for the deficiencies will not be counted toward the degree.

2. At least one-half of the credits must be at the 6000 level or above

3. Must have a GPA of 3.0 (out of 4.0) or better.

4. All courses in the degree program must be completed with a grade of "C" or better.

Transfer Credits
Any transfer credits toward the requirements for a master's degree in Artificial Intelligence must be approved by the department, the College and the University. The transfer credits must correspond to equivalent requirements and performance levels expected for the degree. Normally no more than 6 credits of coursework (that have not been applied to a degree) can be transferred from another institution.

Table 1

Students are required to take 3 core course:	
Computational Foundations of Artificial Intelligence	CAP 5625
Artificial Intelligence	CAP 6635
Data Mining and Machine Learning	CAP 6673
In addition, students pursuing the non-thesis option are required to take 7 elective courses from the groups below. Students pursuing the thesis option are required take 5 elective courses from the groups below and 6 thesis credits. Both non-thesis and thesis options allow up to 3 elective courses to be substituted with any course in the College of Engineering and Computer Science, with prior approval from the advisor.	
Vision	
Foundations of Vision	CAP 6411
Computer Vision	CAP 6415
Machine Learning for Computer Vision	CAP 6618
Visual Information Retrieval	COP 6728
Data Analytics and Algorithms	
Big Data Analytics with Hadoop	CAP 6780
Social Networks and Big Data Analytics	CAP 6315
Introduction to Data Science	CAP 5768
Data Mining for Bioinformatics	CAP 6546
Analysis of Algorithms	COT 6405
Knowledge Management and Reasoning	
Information Retrieval	CAP 6776
Web Mining	CAP 6777
Natural Language Processing	CAP 6640
Semantic Web Programming	COP5859
Machine Learning	

Introduction to Neural Networks	CAP 5615
Evolutionary Computing	CAP 6512
Deep Learning	CAP 6619
Advanced Data Mining and Machine Learning	CAP 6778
Sparse Learning	CAP 6617
Applications	
Robotic Applications	EEL 5661
Computational Advertising and Real-time Data Analytics	CAP 6807
Artificial Intelligence in Medicine and Healthcare	CAP 6683

FAU
FLORIDA ATLANTIC UNIVERSITY

Division of Academic Affairs
New Degree Program Approval
Routing and Signature Form

Proposed Program Title: MS in Artificial Intelligence **CIP:** 11.0102

Degree Level: Graduate

Department: Computer and Electrical Eng and CS _____ 3/5/19
Chair/Director's Signature Date

College: Engineerig and Computer Science _____ 3/11/2019
Dean's Signature Date

Academic Affairs: _____ 3/13/19
Associate Provost for Programs and Assessment's Signature Date

_____ 3/13/19
Associate Provost for Planning and Budget's Signature Date

Team for Assurance of Student Learning (TASL): _____ 3/13/19
Committee Chair's Signature Date

Undergraduate Studies: _____ _____
Dean's Signature (For Undergraduate Degree) Date

Graduate College: _____ 3/27/2019
Dean's Signature (For Graduate Degree) Date

UFS – GPC or UPC [circle one]: _____ 3/27/19
Chair's Signature Date

UFS – Academic Planning and Budget: _____ _____
Chair's Signature Date

University Faculty Senate: _____ _____
UFS President's Signature Date

Provost: _____ _____
Provost's Signature Date

GRADUATE COLLEGE

MAR 18 2019

Received

Board of Governors, State University System of Florida

Request to Offer a New Degree Program

(Please do not revise this proposal format without prior approval from Board staff)

Florida Atlantic University University Submitting Proposal	Fall 2019 Proposed Implementation Term
College of Engineering and Computer Science Name of College(s) or School(s)	Computer and Electrical Engineering and Computer Science Name of Department(s)/ Division(s)
Artificial Intelligence Academic Specialty or Field	MS with Major in Artificial Intelligence Complete Name of Degree
11.0102 Proposed CIP Code	

The submission of this proposal constitutes a commitment by the university that, if the proposal is approved, the necessary financial resources and the criteria for establishing new programs have been met prior to the initiation of the program.

Date Approved by the University Board of Trustees		President	Date
Signature of Chair, Board of Trustees	Date	Vice President for Academic Affairs	Date

Provide headcount (HC) and full-time equivalent (FTE) student estimates of majors for Years 1 through 5. HC and FTE estimates should be identical to those in Table 1 in Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2 in Appendix A. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 (Total E&G divided by FTE).

Implementation Timeframe	Projected Enrollment (From Table 1)		Projected Program Costs (From Table 2)				
	HC	FTE	E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary Funds	Total Cost
Year 1	20	16	16,322	261,144			261,144
Year 2	25	21					
Year 3	30	25					
Year 4	35	27					
Year 5	40	30	13,165	394,950			394,950

Note: This outline and the questions pertaining to each section must be reproduced within the body of the proposal to ensure that all sections have been satisfactorily addressed. Tables 1 through 4 are to be included as Appendix A and not reproduced within the body of the proposals because this often causes errors in the automatic calculations.

INTRODUCTION

I. Program Description and Relationship to System-Level Goals

A. Briefly describe within a few paragraphs the degree program under consideration, including (a) level; (b) emphases, including majors, concentrations, tracks, or specializations; (c) total number of credit hours; and (d) overall purpose, including examples of employment or education opportunities that may be available to program graduates.

1. The proposed program is a Master of Science with Major in Artificial Intelligence (MSAI). The program will be administered by the Department of Computer and Electrical Engineering and Computer Science (CEECS) in the College of Engineering and Computer Science (COECS) at Florida Atlantic University (FAU).
2. The program offers both thesis and non-thesis options. There are no other concentrations, tracks, or specializations.
3. Both thesis and non-thesis options require a minimum of 30 credits.
4. Artificial Intelligence (AI) has become more and more important in our daily life. Locally and nationally the demand for AI professionals increases exponentially in recent years. The graduates of the MSAI program will fill in the needs both in the local and national level.

B. Please provide the date when the pre-proposal was presented to CAVP (Council of Academic Vice Presidents) Academic Program Coordination review group. Identify any concerns that the CAVP review group raised with the pre-proposed program and provide a brief narrative explaining how each of these concerns has been or is being addressed.

The pre-proposal was presented to the CAVP on February 22, 2019. There were no concerns regarding the proposed degree of MS with Major in Artificial Intelligence. We received several positive comments about the importance of this degree and the high level of demand that would exist. In addition, there were comments about FAU being well-positioned and well-suited to provide this degree.

C. If this is a doctoral level program please include the external consultant's report at the end of the proposal as Appendix D. Please provide a few highlights from the report and describe ways in which the report affected the approval process at the university.

N/A

D. Describe how the proposed program is consistent with the current State University System (SUS) Strategic Planning Goals. Identify which specific goals the program will directly support and which goals the program will indirectly support (see link to the SUS Strategic Plan on the resource page for new program proposal).

The proposed MS with Major in Artificial Intelligence program supports and aligns with the current SUS Strategic Planning Goals. The Strategic Plan 2012 - 2025 emphasizes teaching, research, and public service, with the following priorities: Excellence, Productivity, and Strategic Priorities for a Knowledge Economy.

Excellence
The proposed MS with Major in Artificial Intelligence is a high-quality program where experts in the field will train students in a transformative discipline that will change the way

the society works. This program will contribute to a workforce with the skills needed to harness the potential benefits of AI. The high quality of the program consists of (1) a strong curriculum, consisting in a foundation of AI that includes theory, methods and technologies, combined with major subfields of vision, data analytics and algorithms, knowledge management and reasoning, machine learning, and applications; (2)high quality research (i.e. thesis option) supervised by experts in the field; and (3) facilities, such as the Artificial Intelligence and Deep Learning Laboratory, which will serve as a training platform to support graduate student teaching and research.

Productivity
One of the main priorities of SUS Strategic Planning Goals is to award more degrees in the high demand programs in STEM disciplines. The newly proposed MS in Artificial Intelligence programs aligns very well with this priority. FAU will produce graduates which possess the skills and knowledge needed to be competitive in the AI field.

Strategic Priorities for a Knowledge Economy
The objective of this priority is to promote STEM programs with critical and/or development needs or emerging technologies that address both the workforce and student demand. Over the past ten years, there has been a dramatic progress in the rise of artificial intelligence and in its use in the development of systems that can reason and respond to increasingly complex situations. AI is everywhere and the change brought about by these technologies has just begun. AI is transforming every segment of American industry. It is making agriculture more precise and efficient, new medical technologies, and the prospect of autonomous transportation and advanced manufacturing close to reality. The effects of AI are expected to be profound. To become competitive, the companies will have to embrace AI to some extent. MSAI program will contribute in creating an educated workforce, one of the most diverse student bodies in the SUS system.

FAU Strategic Plan for Race to Excellence 2015 - 2025
The MS with Major in Artificial Intelligence program aligns with the vision of FAU which includes an excellent graduate education and high quality programs in areas of strategic emphasis (STEM areas). The programs will support focal areas, known as Pillars and Platforms. All pillars (Healthy Aging; Neuroscience; Ocean Science and Engineering/Environmental Sciences; Sensing and Smart Systems) are expected to adopt AI methods and technologies to stay competitive. Among the platforms, the Big Data Analytics is one of the major subfields of AI. The MSAI program will also support platforms such as Community Engagement and Economic Development, Global Perspectives and Participations, and Innovation and Entrepreneurship.

College of Engineering and Computer Science (COECS) Strategic Plan
The College of Engineering and Computer Science (COECS) is committed to provide high quality programs of education and research, along a stimulating and productive environment of work, study, and scholarly inquiry for students, faculty, and staff. The College's goals are results-oriented, and can be summarized as follows: (1) encourage students to consider careers in engineering and computer science, (2) prepare graduates with a basis for lifelong personal and professional development that enables them to make lasting contributions in their disciplines, (3) engage students in research and discoveries in emerging disciplines and in related interdisciplinary areas, (4) provide top education preparation that working professionals need to keep pace with developments in their field, and (5) build mutually beneficial linkages with business, industry, schools, and other constituencies.

E. If the program is to be included in a category within the Programs of Strategic Emphasis as described in the SUS Strategic Plan, please indicate the category and the justification for inclusion.

The Programs of Strategic Emphasis Categories:

1. Critical Workforce:
    - Education
    - Health
    - Gap Analysis
2. Economic Development:
    - Global Competitiveness
3. Science, Technology, Engineering, and Math (STEM)

Please see the Programs of Strategic Emphasis (PSE) methodology for additional explanations on program inclusion criteria at the resource page for new program proposal.

Critical Workforce

Students after completing the MSAI program will become skillful AI professionals, meeting the critical workforce needs of the South Florida Region, Florida State and beyond.

Global Competitiveness

Florida Atlantic University offers a number of Ph.D. programs, and participating faculty are active in research and teaching. Faculty are world class leaders in Artificial Intelligence, Machine Learning, Data Mining, Autonomous Vehicles, among other things. The university supports a combination of academic research and collaboration with for-profit partners, with the goal of developing products which are competitive in global markets. In addition,
South Florida in general is a highly populated, highly developed area with small businesses and innovative and technologically advanced companies. FAU has received multiple competitive research grants from National Science Foundation, the Defense Advanced Research Projects Agency and other Federal funding agencies in the area of AI and Machine Learning. FAU is home to the NSF Big Data Training and Research Laboratory and a NSF AI and Deep Learning Training and Research Laboratory. In short, research related to AI at FAU is prominent locally and globally.

Science, Technology, Humanities, Engineering, and Math (STHEM)

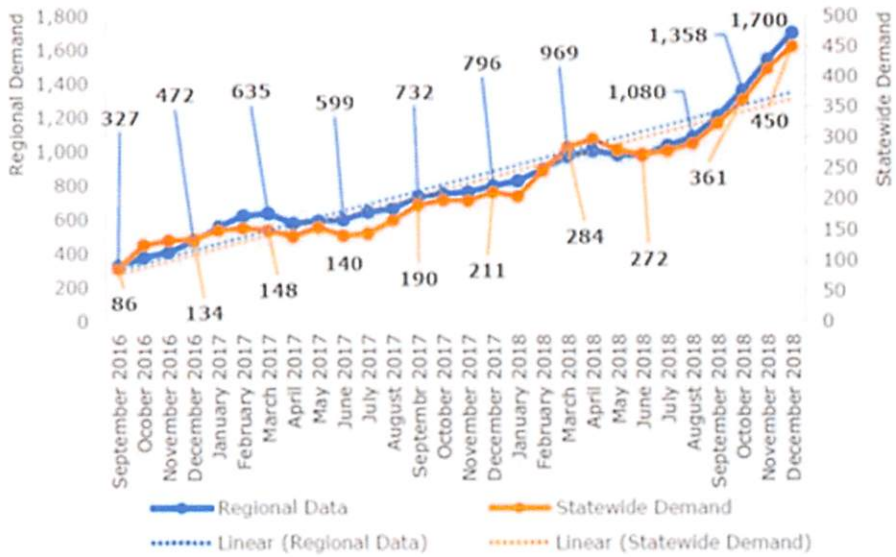
The MSAI program offers coursework and laboratory training at the graduate level will enable its graduates to enter Florida's workforce with the capabilities to fill emerging needs. This addresses more than STEM development in "Sciences and Technology" as identified in the Programs of Strategic Emphasis.

Figure below partially shows historical employer demand for MSAI professionals (EAB Market Research Brief, 2018).

Linear trend lines represent the average monthly change in statewide and regional employer demand for master's-level artificial intelligence professionals.

Historical Employer Demand for Master's-Level Artificial Intelligence Professionals

September 2016-October 2018, Statewide and Regional Data[3]



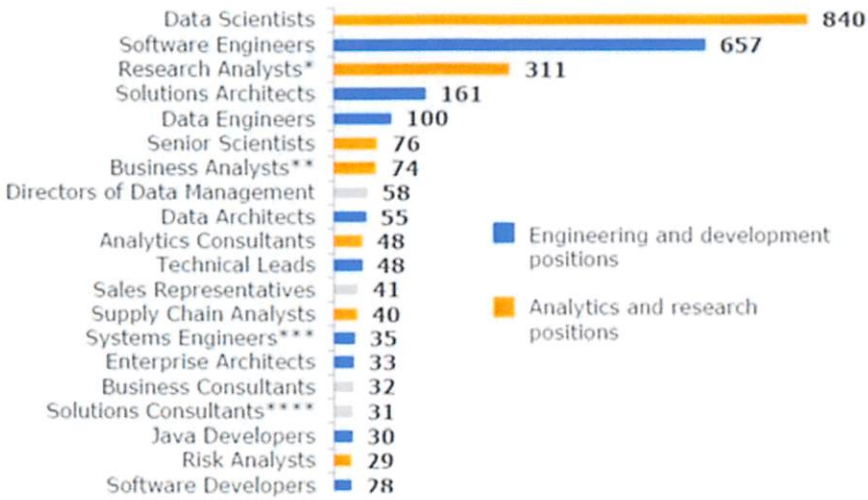
2) Bureau of Labor Statistics
3) Emsi Analyst™

This degree will prepare students for careers in various education, government and industry positions that require AI skills. Potential jobs include political data scientists, survey statistician, research analyst, intelligence data analyst, quantitative social scientist, software engineers, research analysts and solution architects (see the figure below (EAB Market Research Brief, 2018).

Top Regional Titles for Master's-Level Artificial Intelligence Professionals

January 2018-December 2018, Regional Data[4]

n = 4,697 job postings



* Research Analysts (Life, Physical, and Social Science)
** Business Analysts (Business and Financial Operations)
*** Systems Engineers (Computer and Mathematical)
****Solutions Consultants (Business and Financial Operations)

F. Identify any established or planned educational sites at which the program is expected to be offered and indicate whether it will be offered only at sites other than the main campus.

The program will be offered at the main campus in Boca Raton, Florida. The courses are expected to be offered both in-person and using the distance learning option. Therefore, students will be able to complete the program by attending the courses in person or remotely through distance learning.

INSTITUTIONAL AND STATE LEVEL ACCOUNTABILITY

II. Need and Demand

A. Need: Describe national, state, and/or local data that support the need for more people to be prepared in this program at this level. Reference national, state, and/or local plans or reports that support the need for this program and requests for the proposed program which have emanated from a perceived need by agencies or industries in your service area. Cite any specific need for research and service that the program would fulfill.

Locally, startups and established companies have difficulties to recruit AI professionals. Nationally, not just the economical side but also the security side, the US needs invest heavily in AI to be competitive. Other countries spend billions of dollars in AI research and education. Increased employer demand for master's-level AI professionals indicates an opportunity for the program development. Data collected by EAB Global indicates that the state-wide demand for such professionals increased 423 percent (from 86 to 450 postings (EAB Market Research Brief, 2018). Reported high earnings in relevant occupations will attract prospective students to the program. AI-related professionals earn a median hourly income of $46 state-wide, which is way higher than a median income of $16 per hour across all professionals in the state.

South Florida is home to many startups and large companies with demands of developing smart devices and products. Recently, a number of local companies such as Magic Leap, Cendyn, and Florida Power and Light Company came to FAU to seek AI professionals. The program will produce AI professionals serving not only South Florida and the State, but also the US. The graduates of the MS program will be able to contribute to meet the needs of these employers. This will have a positive impact to the local economy.

Federal funding agencies such as NSF, NIH, DARPA and ONR have provided numerous opportunities in AI and its related areas. These funding opportunities have helped the US capitalize on the full potential of AI to strengthen our economy, better our society, and improve our national security (NSF, 2018). The proposed master's program will attract like-minded faculty and students who are passionate about AI and its applications. It is anticipated that more competitive proposals will be written by the AI faculty with the help of the student body.

B. Demand: Describe data that support the assumption that students will enroll in the proposed program. Include descriptions of surveys or other communications with prospective students.

We conducted a survey among both undergraduate and graduate students in the Department of Computer and Electrical Engineering and Computer Science at FAU. 96.7% of surveyed students agree that a Master of Science in Artificial Intelligence

program will be beneficial to society in general and the FAU community in particular. Other key elements indicating that students will be interested in the proposed program are:

1. Increased employer demand for master's-level AI professionals indicates an opportunity for the program development. Data collected by EAB Global indicates that the state-wide demand for such professionals increased 423 percent (from 86 to 450 postings).
2. Reported high earnings in relevant occupations will attract prospective students to the program. AI-related professionals earn a median hourly income of $46 state-wide, which is way higher than a median income of $16 per hour across all professionals in the state.
3. Nationally, less than 10% of students in the field closely related to AI are black, and similarly for woman and Hispanic population. By encouraging minority and women students to pursue the MS study, FAU will produce more AI professionals who are minority and women.

C. If substantially similar programs (generally at the four-digit CIP Code or 60 percent similar in core courses), either private or public exist in the state, identify the institution(s) and geographic location(s). Summarize the outcome(s) of communication with such programs with regard to the potential impact on their enrollment and opportunities for possible collaboration (instruction and research). In Appendix C, provide data that support the need for an additional program.

There is no similar program in the SUS.

D. Use Table 1 in Appendix A (1-A for undergraduate and 1-B for graduate) to categorize projected student headcount (HC) and Full Time Equivalents (FTE) according to primary sources. Generally undergraduate FTE will be calculated as 30 credit hours per year and graduate FTE will be calculated as 24 credit hours per year. Describe the rationale underlying enrollment projections. If students within the institution are expected to change majors to enroll in the proposed program at its inception, describe the shifts from disciplines that will likely occur.

We projected student headcount is 20 in the first year, with an increment of 5 students over the next 4 years. Students enrolled in other programs are expected to change program only during the first 2 years of offering this program. Most of the students expected to enroll in this program are students that graduated with a bachelor's degree in the College of Engineering and Computer Science at FAU, and students with bachelor's degree in other disciplines at FAU and at other SUS institutions. A number of working professionals are expected to enroll in this MS program to advance their professional career. Some other populations of students are public and private local institutions, as well as national and international institutions.

E. Indicate what steps will be taken to achieve a diverse student body in this program. If the proposed program substantially duplicates a program at FAMU or FIU, provide, (in consultation with the affected university), an analysis of how the program might have an impact upon that university's ability to attract students of races different from that which is predominant on their campus in the subject program. <u>The university's Equal Opportunity Officer shall review this section of the proposal and then sign and date Appendix B to indicate that the analysis required by this subsection has been completed</u>.

Graduate students are drawn from local, statewide, out-of-state and international populations. Under-represented minorities (URM) will be well represented as FAU is the

most ethnically diverse institution in the State of Florida (29th nationwide). Minorities currently make up 44.83% of the FAU enrollment, and FAU is designated by the DOE Office of Postsecondary Education as a minority serving institution. Indeed, of the 29,606 students enrolled at FAU (all colleges) in Fall 2018 whose ethnicity was known, 12,574 were white and 13,376 were URM. Over the last five years, black and Hispanic enrollments have increased more than that of any other groups; FAU's student body will soon be a "majority minority" mirroring the predicted demographic composition of the USA in the near future. Thus there is already a large and diverse pool of students from which this program can recruit. Approximately 33.22% of graduate students in related programs belong to underrepresented minority groups. This number continues to grow each year and we assume that it will eventually reach numbers similar to the undergraduate distribution of 46.88% URM. This information was provided by FAU IEA office and approved.

III. Budget

A. Use Table 2 in Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 in Appendix A to show how existing Education & General funds will be shifted to support the new program in Year 1. In narrative form, summarize the contents of both tables, identifying the source of both current and new resources to be devoted to the proposed program. (Data for Year 1 and Year 5 reflect snapshots in time rather than cumulative costs.)

The faculty staffing in the department is sufficient to initiate the program. The faculty salary and benefits needed to support this program will come entirely from reallocated base E&G funds. For Year 1, the budget includes $224,045 in funds reallocated from the department to fund faculty salaries and benefits for the current faculty members in the program. The reallocated salaries and benefits extend into the fifth year and include any increases in percent effort for current faculty for a total of $326,387 for Year 5. See Table 4 for a complete listing of faculty involved with the program.

Reallocated base funding is also being used to cover one AMP Budget Coordinator position at 5% effort ($4,404) to support the overall administrative functions of the program; and one USPS Graduate Programs coordinator position at 15% effort in Year 1 ($9,695) and 25% effort by Year 5 ($16,159) based on the anticipated growth in student enrollment.

The Department currently receives 35 graduate teaching assistantships for full-time students. Funding for one position would be reallocated in Year 1 to support this program ($18,000). By Year 5, we anticipate the number of GTAs to increase to two based on the projected full-time enrollment ($36,000).

Expenses in Table 2 ($5,000 in year 1; $12,000 in year 5) include computers/printers, copier, phones, postage, printing, travel, office supplies, information technology supplies, and specialized software. An allocation for recruiting (brochures, travel, etc.) is also requested to be able to attract new students from outside universities as well as agencies and industry in our service areas. This proposed program is a priority for the College such that funding will be reallocated to match the university/College priorities.

B. Please explain whether the university intends to operate the program through continuing education, seek approval for market tuition rate, or establish a differentiated graduate-level tuition. Provide a rationale for doing so and a timeline for seeking Board of Governors' approval, if appropriate. Please include the expected rate of tuition that the university plans to charge for this program and use this amount when calculating cost entries in Table 2.

N/A

C. **If other programs will be impacted by a reallocation of resources for the proposed program, identify the impacted programs and provide a justification for reallocating resources. Specifically address the potential negative impacts that implementation of the proposed program will have on related undergraduate programs (i.e., shift in faculty effort, reallocation of instructional resources, reduced enrollment rates, greater use of adjunct faculty and teaching assistants). Explain what steps will be taken to mitigate any such impacts. Also, discuss the potential positive impacts that the proposed program might have on related undergraduate programs (i.e., increased undergraduate research opportunities, improved quality of instruction associated with cutting-edge research, improved labs and library resources).**

None of the programs will be impacted by a reallocation of resources for the MS with Major in Artificial Intelligence program. The undergraduate programs will not be affected at all. All graduate courses are taught by graduate faculty in the College of Engineering and Computer Science, mainly from the CEECS department. Only 2 new graduate courses have been added as part of this proposal, a core course and an elective course. Both courses will attract other graduate students in the college and can be taken as electives in other programs. The courses already existent will benefit from the new program MS with Major in Artificial Intelligence, as they are expected to increase their enrollment. These courses are offered both live and distance learning. The 3 core courses will be offered at least once every year. The proposed curriculum has a rich variety of courses listed as electives (i.e. 21 elective courses), thus the enrolment increase per course is not expected to be high. The MS with Major in Artificial Intelligence program provides a great opportunity for students obtaining their bachelor's degree in Computer Science or related areas to continue their academic preparation and specialize into a field with great potential to transform every segment of industry.

D. **Describe other potential impacts on related programs or departments (e.g., increased need for general education or common prerequisite courses, or increased need for required or elective courses outside of the proposed major).**

There is no impact on related programs or departments. There is only one new core course added as part of this proposal (CAP 5625 Computational Foundations of Artificial Intelligence), and this course does not have any additional prerequisites. One new elective course has been added as an elective to an already rich variety of courses. No additional prerequisites are needed for this elective as well.

E. **Describe what steps have been taken to obtain information regarding resources (financial and in-kind) available outside the institution (businesses, industrial organizations, governmental entities, etc.). Describe the external resources that appear to be available to support the proposed program.**

NSF invests currently over $100 million annually to support AI research (https://www.nsf.gov/news/news_summ.jsp?cntn_id=245418). NSF is supporting fundamental research to bring AI technologies to maturity and to provide new opportunities for the American workers. DARPA is funding research in AI. For example the Explainable Artificial Intelligence (XAI) program (https://www.darpa.mil/program/explainable-artificial-intelligence) are expected to enable AI systems where machines understand the context and environment in which they operate, and build models that allow them to characterize real world phenomena. Local industry (i.e. Modernizing Medicine, Magic Leap) will provide great opportunities for

internships for the students in MSAI program.

IV. Projected Benefit of the Program to the University, Local Community, and State

Use information from Tables 1 and 2 in Appendix A, and the supporting narrative for "Need and Demand" to prepare a concise statement that describes the projected benefit to the university, local community, and the state if the program is implemented. The projected benefits can be both quantitative and qualitative in nature, but there needs to be a clear distinction made between the two in the narrative.

It is evident from the recent development that AI is one of the foundations of many cutting-edge technologies such as data science, robotics, Internet of Things, clouding computing, cyber security and cyber-physical systems. These cutting-edge technologies in term fuel job growth in many high-tech areas. A study released by the World Economic Forum shows that Data Analysis, AI and machine learning-related jobs will be the most in demand within the next four to five years. National Academies of Science, Engineering and Medicine released a report stating advancement of AI and machine learning is crucial for the wellbeing of the nation. Many federal research funding agencies, such as National Science Foundation, National Institute of Health, and Defense Advanced Research Projects Agency, launched requests for applications in the areas of AI , Deep Learning, and their applications. These activities provide challenges and opportunities for us to produce AI professionals that meet the needs and demand of the call. The proposed program, with the available resource in the College of Engineering and Computer Science, Florida Atlantic University, will produce up 40 MSAI graduates annually after five years. These graduates will contribute their talent to generate broader economic impact on the regional and state economic development.

V. Access and Articulation – Bachelor's Degrees Only

A. If the total number of credit hours to earn a degree exceeds 120, provide a justification for an exception to the policy of a 120 maximum and submit a separate request to the Board of Governors for an exception along with notification of the program's approval. (See criteria in Board of Governors Regulation 6C-8.014)

N/A

B. List program prerequisites and provide assurance that they are the same as the approved common prerequisites for other such degree programs within the SUS (see link to the Common Prerequisite Manual on the resource page for new program proposal). The courses in the Common Prerequisite Counseling Manual are intended to be those that are required of both native and transfer students prior to entrance to the major program, not simply lower-level courses that are required prior to graduation. The common prerequisites and substitute courses are mandatory for all institution programs listed, and must be approved by the Articulation Coordinating Committee (ACC). This requirement includes those programs designated as "limited access."

If the proposed prerequisites are not listed in the Manual, provide a rationale for a request for exception to the policy of common prerequisites. NOTE: Typically, all lower-division courses required for admission into the major will be considered prerequisites. The curriculum can require lower-division courses that are not prerequisites for admission into the major, as long as those courses are built into the curriculum for the upper-level 60 credit hours. If there are already common prerequisites for other degree programs with the same proposed CIP, every effort must be made to utilize the previously approved prerequisites instead of recommending an additional "track" of prerequisites for that CIP. Additional tracks may not be approved by the ACC, thereby holding up the full approval of the degree program. Programs will not be entered into the State University System Inventory until any

exceptions to the approved common prerequisites are approved by the ACC.

N/A

C. **If the university intends to seek formal Limited Access status for the proposed program, provide a rationale that includes an analysis of diversity issues with respect to such a designation. Explain how the university will ensure that Florida College System transfer students are not disadvantaged by the Limited Access status. NOTE: The policy and criteria for Limited Access are identified in Board of Governors Regulation 6C-8.013. Submit the Limited Access Program Request form along with this document.**

N/A

D. **If the proposed program is an AS-to-BS capstone, ensure that it adheres to the guidelines approved by the Articulation Coordinating Committee for such programs, as set forth in Rule 6A-10.024 (see link to the Statewide Articulation Manual on the resource page for new program proposal). List the prerequisites, if any, including the specific AS degrees which may transfer into the program.**

N/A

INSTITUTIONAL READINESS

VI. Related Institutional Mission and Strength

A. **Describe how the goals of the proposed program relate to the institutional mission statement as contained in the SUS Strategic Plan and the University Strategic Plan (see link to the SUS Strategic Plan on the resource page for new program proposal).**

The mission of the State University System of Florida is to provide undergraduate, graduate and professional education, research, and public service of the highest quality through a coordinated system of institutions of higher learning, each with its own mission and collectively dedicated to serving the needs of a diverse state and global society. The proposed MSAI program will produce AI professionals who are equipped with fundamentals of AI, data mining and analysis, and machine learning, as well as domain knowledge autonomous systems, robotics, computer vision, human machine interfacing, natural language processing, among other things. They will also gain the research and inquiry skills necessary to independently conduct research and answer questions within their area of choice. They will be well prepared with rich hands-on AI and machine learning skills to enter the high demand workforce in the era of big data and AI. The new program will thus enhance both graduate education and public service in fields important not only to South Florida but also the United States by producing graduates well situated to enter the workforce, ready to apply their skills to research, management and administrative questions related to data science and analytics. Graduates are expected to enter into higher education, government, private sector consulting positions and non-profit organizations.

The MSAI Program will also seek to provide public service through student internships with federal, state and local agencies and organizations. The internships would offer opportunities for FAU students to participate in research and monitoring efforts, learn new skills, obtain experience, and provide various types of support to local partners on research projects related AI and machine learning. Thus, the MSAI Program, its faculty and students will become a resource for local communities, government agencies, and local businesses in their efforts to find innovative solutions to problems facing coastal Florida.

B. Describe how the proposed program specifically relates to existing institutional strengths, such as programs of emphasis, other academic programs, and/or institutes and centers.

The newly proposed program MS with Major in Artificial Intelligence integrates well with the existing programs in the COECS, and provides a pathway of specialization for the students getting a bachelor's degree in engineering or science. CEECS department has a number of faculty conducting funded research in the AI - related areas (vision; data analytics and algorithms; knowledge management and reasoning; machine learning; and AI applications), and this represents great research opportunities for the students enrolled in the MSAI program, as well as great opportunities for advising MS theses. CEECS department has a Big Data Analytics certificate program. MSAI students that specialize in Data Analytics and Machine Learning (as result of selecting corresponding elective courses) will be eligible to receive this certificate. CEECS department has few laboratories that can be used for teaching and research in AI related areas: Artificial Intelligence and Deep Learning (AIDL) Training and Research Laboratory in Florida (Director: Dr. Hill Zhu); Big Data Training and Research Laboratory (Director: Dr. Taghi Koshgoftaar); and Bidtellect Laboratory (Director: Dr. Hill Zhu).

C. Provide a narrative of the planning process leading up to submission of this proposal. Include a chronology in table format of the activities, listing both university personnel directly involved and external individuals who participated in planning. Provide a timetable of events necessary for the implementation of the proposed program.

Planning Process

Date	Participants	Planning Activity
October 2018	COECS Dean , COECS Associate Dean and CEECS chair	Initial plan for a new MSAI program
October 2018	Associate Dean and Assistant Provost for eLearning	Meeting to discuss the process and request the Market Analysis
January 2019	EAB contacted FAU	EAB Market Analysis - interim report received
February 2019	EAB contacted FAU	EAB Market Analysis - final report received
February 2019	COECS Associate Dean, CEECS Chair, Senior Associate Provost for Academic Affairs	Pre-proposal submitted
February 2019	Senior Associate Provost for Academic Affairs	Pre-proposal approved by CAVP
February 2019	CEECS Faculty, CEECS Associate chair, COECS Associate Dean	Meeting to discuss curriculum
March 2019	CEECS Associate Chair, COECS Associate Dean	Develop the proposal
March 2019	CEECS GPC, College GPC, University GPC	Approval
April 2019	FAU Senate	Approval

Events Leading to Implementation

Date	Implementation Activity
February 2019	CAVP approves the pre-proposal

March 2019	Proposal preparation, syllabi for new courses developed, catalog entry developed
March 2019	Approval by the CEECS GPC, COECS GPC, and UGPC

VII. Program Quality Indicators - Reviews and Accreditation

Identify program reviews, accreditation visits, or internal reviews for any university degree programs related to the proposed program, especially any within the same academic unit. List all recommendations and summarize the institution's progress in implementing the recommendations.

The program will be hosted in the Department of Computer and Electrical Engineering and Computer Science (CEECS). The CEECS department aims to find a balance of adhering to the mathematical and scientific fundamentals of our disciplines while also following their evolution and reflecting them in our offered curriculum and student training. We emphasize critical thinking, problem solving and teamwork, and stress the significance of lifelong learning. The goals of the College of Engineering and Computer Science are to encourage young people to consider careers in engineering and computer science by introducing them to these fields while in middle and high school; to prepare graduates in ways that provide them a basis for lifelong personal and professional development and that enable them to exercise leadership and make lasting contributions in their disciplines; to continue on new roads of research and discovery in its existing areas of expertise, in emerging disciplines and in related interdisciplinary areas; to provide the educational resources that working professionals need to keep pace with developments in their field; and to magnify its positive impact in serving regional, state, national and global needs by building mutually beneficial linkages with business, industry, state colleges, K-12 programs and schools and other constituencies. The CEECS department offers two programs related to the proposed MSAI program: Master of Science in Computer Science (MSCS), and Master of Science in Computer Engineering (MSCE). Both programs are accredited by the Southern Association of Colleges and Schools (SACS) Commission on Colleges. The programs are also reviewed regularly by the Board of Governors. No serious concerns were raised during the last visit. Recommendations include reducing teaching loads of untenured faculty and improving the output of faculty research and scholarly work. Since then, the teaching loads of untenured faculty members have been drastically cut (from 2 plus 2 to 1 plus 1) and new departmental and college research initiatives have been launched.

VIII. Curriculum

A. Describe the specific expected student learning outcomes associated with the proposed program. If a bachelor's degree program, include a web link to the Academic Learning Compact or include the document itself as an appendix.

AI is transforming every segment of industry, thus enhancing the lives of all people. Students in the MSAI program will understand how artificial intelligence works, by combining data with fast, iterative processing and intelligent algorithms, allowing the software to learn from patterns or features of the data. Students will have a broad understanding of the theories, methods and technologies which lay the foundation of artificial intelligence, and will get the opportunity to take courses in major AI areas of specialty: vision, data analytics and algorithms, knowledge management and reasoning, machine learning, and AI applications.

Student Learning Outcomes (SLO) - Master of Science in Artificial Intelligence
SLO1: Students master advanced knowledge in Artificial Intelligence

Students in the MSAI program will master advanced knowledge in AI through courses, term projects, algorithms, software assignments, and oral presentations of the class projects. The core courses provide the foundation for AI techniques. Students will then take classes from specialty groups: vision, data analytics and algorithms, knowledge management and reasoning, machine learning, and AI applications.

Implementation Strategy
Instructors design lectures and assignments aiming at improving students' mastery of advanced knowledge in their fields of study.

Assessment Method
Document and analyze students' work in terms of their understanding and mastery of knowledge in the fundamentals of AI and machine learning as well as applications. Instructors of the courses in the program offered in each academic year will document and assess students performance quantitatively and qualitatively through homework, tests, and class projects (among other things) in terms of students theoretical, analytical, and design skills.

SLO2: Students conduct independent research and or scholarly work in the areas related to the Artificial Intelligence discipline
Students enrolled in the thesis option will conduct original research, write and defend a thesis. The thesis students will demonstrate (1) the ability to survey the scientific literature; (2) the ability to develop a hypothesis, design algorithms, implement them, conduct scientific experiments and simulations, and draw conclusions; (3) the ability to analyze the complexity of the algorithms; (4) the ability to write a scientific thesis; and (5) the ability to communicate effectively during the thesis presentation.
Students interested in getting engaged in research can enroll in a research-oriented Directed Independent Study (DIS), for the duration of a semester. This represents an opportunity to get involved in research in AI related areas under the supervision of a professor working in this field.

Implementation Strategy
The evaluation of the thesis will be conducted by the thesis committee members, following the guidelines of the CEECS department. A digital copy of the thesis will be made available to the whole department at least 1 week before the defense. The committee members will carefully review the manuscript and provide feedback. The committee members will attend the defense presentation, which is opened to the university at large and to the public. The DIS will be evaluated by the professor supervising the DIS.

Assessment Method
Each member of the MS supervisory committee will complete an evaluation form, where they evaluate the thesis and the quality of the research conducted by the student, using a scale 1 through 5 (1=unsatisfactory; 3 = satisfactory; 5=excellent) for established criteria such as:

1. The ability to perform research
2. The development of an appropriate solution for the thesis based on fundamentals and advanced topics.

The professor supervising the research-oriented DIS will complete an evaluation form, where he/she will evaluate on a scale of 1 to 5 (1=unsatisfactory; 3 = satisfactory; 5=excellent) the following criteria:

1. The ability to perform research
2. The student has demonstrated an advanced level of knowledge in the selected topic

SLO3: Students possess effective oral and written communication skills
The thesis students will write a thesis and will present orally their research findings to the MS supervisory committee and other people attending the defense.

Implementation Strategy
The evaluation of the written thesis and the oral presentation will be conducted by the MS supervisory committee following the guidelines in the CEECS department. The research-oriented DIS is supervised by a professor working in AI - related areas.

Assessment Method
Each member of the MS supervisory committee will complete an evaluation form, where they evaluate the written thesis and the oral presentation by using a scale of 1 through 5 (1=unsatisfactory; 3 = satisfactory; 5=excellent) for established criteria such as:

:

1. Submission of a satisfactory written thesis.
2. Oral presentation of the thesis in a satisfactory manner.

The professor supervising the DIS will complete an evaluation form at the completion of the DIS, where they evaluate on a scale 1 to 5 (1=unsatisfactory; 3 = satisfactory; 5=excellent) the following criteria:

1. Submission of a satisfactory written report
2. Oral presentation of the DIS report in a satisfactory manner.

B. Describe the admission standards and graduation requirements for the program.

Admission Requirements
Each applicant to the MSAI program must meet the following requirements:

1. A baccalaureate degree in Computer Science or a related field (Students without a computer science background will be expected to take additional courses);
2. At least a 3.0 (of a 4.0 minimum) GPA in the last 60 credits attempted prior to graduation;
3. Submission of the Graduate Record Examination (GRE) scores. GRE scores more than five years old are normally not acceptable. The GRE requirement is waived for any student who has a baccalaureate degree from FAU's Department of Computer & Electrical Engineering and Computer Science (CEECS) with a GPA of at least 3.25 (out of a possible 4.0) in the last 60 credits attempted prior to graduation; and
4. International students from non-English-speaking countries must be proficient in written and spoken English as evidenced by a score of at least 500 (paper-based test) or 213 (computer-based test) or 79 (Internet-based test) on the Test of English as a Foreign Language (TOEFL) or a score of at least 6.0 on the International English Language Testing System (IELTS).

Applicants are expected to have taken the following prerequisite courses (or equivalents) before pursuing a master's degree. In some cases, prerequisite courses may be taken after admission to the graduate program.

Data Structures and Algorithm Analysis	COP 3530
Design and Analysis of Algorithms	COT 4400
Stochastic Models for Computer Science	STA 4821
Calculus with Analytic Geometry 1	MAC 2311
Calculus with Analytic Geometry 2	MAC 2312

Graduation Requirements
Both thesis and non-thesis options are available and require a minimum of 30 credits. Non-thesis students will take 3 core courses and 7 elective courses from the following AI-related groups: vision, data analytics and algorithms, knowledge management and reasoning, machine learning, and applications. The thesis students will take 3 core courses, 6 thesis credits and 5 elective courses from the areas indicated previously. Both non-thesis and thesis options allow up to 3 elective courses to be substituted with any course in the College of Engineering and Computer Science, with prior approval from the advisor.

C. **Describe the curricular framework for the proposed program, including number of credit hours and composition of required core courses, restricted electives, unrestricted electives, thesis requirements, and dissertation requirements. Identify the total numbers of semester credit hours for the degree.**

Both the thesis and non-thesis options of the MSAI program require a minimum of 30 credits in total.

Required Core Courses
The students are required to take 3 required core courses (9 credits):
CAP 5625 Computation Foundation of Artificial Intelligence
CAP 6635 Artificial Intelligence
CAP 6673 Data Mining and Machine Learning

Restricted Electives
Non-thesis students must take at least 7 elective courses (21 credits) from the following AI-related groups: vision, data analytics and algorithms, knowledge management and reasoning, machine learning, and applications. The thesis students will take at least 5 elective courses (15 credits) from the specified AI-related groups.

Unrestricted Electives
Both non-thesis and thesis options allow up to 3 elective courses to be substituted with any course in the College of Engineering and Computer Science, with prior approval from the advisor.

Thesis Requirements
Thesis option requires a minimum of 6 thesis credits.

D. **Provide a sequenced course of study for all majors, concentrations, or areas of emphasis within the proposed program.**

The MSAI program requires a minimum of 30 credits for both thesis and non-thesis options.

Required core courses (9 credits)

Computational Foundations of Artificial Intelligence	CAP 5625
Artificial Intelligence	CAP 6635
Data Mining and Machine Learning	CAP 6673

In addition, students pursuing the non-thesis option are required to take 7 elective courses from the groups: Vision, Data Analytics and Algorithms, Knowledge Management and Reasoning, Machine Learning, and Applications. Students pursuing the thesis option are required take 5 elective courses from the groups below and 6 thesis credits. Both non-thesis and thesis options allow up to 3 elective courses to be substituted with any course in the College of Engineering and Computer Science, with prior approval from the advisor.

Vision	
Foundations of Vision	CAP 6411
Computer Vision	CAP 6415
Machine Learning for Computer Vision	CAP 6618
Visual Information Retrieval	COP 6728
Data Analytics and Algorithms	
Big Data Analytics with Hadoop	CAP 6780
Social Networks and Big Data Analytics	CAP 6315
Introduction to Data Science	CAP 5768
Data Mining for Bioinformatics	CAP 6771
Analysis of Algorithms	COT 6405
Knowledge Management and Reasoning	
Information Retrieval	CAP 6776
Web Mining	CAP 6777
Natural Language Processing	CAP 6640
Semantic Web Programming	COP 5859
Machine Learning	
Introduction to Neural Networks	CAP 5615
Evolutionary Computing	CAP 6512
Deep Learning	CAP 6619
Advanced Data Mining and Machine Learning	CAP 6778
Sparse Learning	CAP 6617
Applications	
Robotic Applications	EEL 5661
Computational Advertising and Real-time Data Analytics	CAP 6807
Artificial Intelligence in Medicine and Healthcare	CAP 6683

E. Provide a one- or two-sentence description of each required or elective course.

<u>Required Core Courses</u>

CAP 5625 Computational Foundations of Artificial Intelligence
This course covers the mathematical and programming foundations of artificial intelligence (AI) and machine learning (ML) using contemporary programming languages and tools. As a result, students will develop familiarity with mathematical methods (and associated notation, software packages and libraries) that are widely used in AI and ML projects and literature.

CAP 6635 Artificial Intelligence

The basic concepts, techniques, and applications of artificial intelligence: representations, search strategies, control, communication, deduction, agents, evolutionary computation and machine learning.

CAP 6673 Data Mining and Machine Learning

Course deals with the principles of data mining and machine learning. Topics to be covered include machine learning methods, knowledge discovery and representation, classification and prediction models.

Elective courses per group

- **Vision**

CAP6411 Foundations of Vision

Study of the interdisciplinary science of vision combining the psychological, neurophysiological, and computational aspects of vision research. Research paper and project topics will be chosen from a list of latest developments in the field.

CAP6415 Computer Vision

Course covers fundamentals of computer vision and their applications in various areas such as medicine, homeland security, entertainment, and manufacturing.

CAP6618 Machine Learning for Computer Vision

Introduction to machine learning techniques and their application in computer vision problems. Discusses image processing principles, techniques and algorithms. Use of MATLAB for lab assignments and projects.

COP6728 Vision Information Retrieval

Studies the interdisciplinary research area of visual information retrieval. Research paper and project topics are chosen from a list of latest developments and open challenges and opportunities in the field.

- **Data Analytics and Algorithms**

CAP6780 Big Data Analytics with Hadoop

Course covers data mining and machine learning in relation to Big Data. Big Data challenges such as high dimensionality, class imbalance and quality of data are examined. Offers hands-on experience with Big Data analysis in Hadoop using a high performance computing cluster.

CAP6315 Social Networks and Big Data Analytics

This course teaches students basic concepts of Big Data Analytics with focus on social network analysis and modeling. The class covers three major topics: graphs and social network models, Big Data Analytics platform and MapReduce (Hadoop) programming, and social network analytics and mining algorithms.

CAP5768 Introduction to Data Science

This course will survey foundational topics in data science and reinforce practical programming skills in the context of data analytics. Students will learn fundamentals of computational data analysis using statistics and machine learning and gain experience working with data sets from a variety of domains.

CAP6546 Data Mining for Bioinformatics

Course focuses on the principles of data mining as it relates to bioinformatics. Topics covered include gene selection, class imbalance, classification, biomarker discovery and prediction models. No prior knowledge of biology is required.

COT6405 Analysis of Algorithms

Design and analysis of algorithms from several areas of computer science. Topics include advanced data structures, dynamic programming, greedy algorithms, approximation algorithms, and probabilistic algorithms.

- **Knowledge Management and Reasoning**

CAP6776 Information Retrieval

This course teaches concepts, techniques and popular tools and applications in information retrieval (IR), which aims to obtain relevant information from a collection of resources. The class covers efficient text indexing, text processing, web search and text mining. New applications are also introduced.

CAP6777 Web Mining

Course covers the techniques used to model, analyze, and understand the Internet and the web, especially the web graph and hypertext data.

CAP6640 Natural Language Processing

This course will provide students with both theory and applications of Natural Language Processing. It includes relevant background material in Linguistics, Mathematics, Probability, and Computer Science. Some of the topics covered in the class are Text Similarity, Part-of-Speech Tagging, Parsing, Semantics, Question Answering, Sentiment Analysis, and Text Summarization.

COP5859 Semantic Web Programming

Semantic web building blocks (standards, languages and frameworks). Open source tools. Integrated flow with our examples. Build an infrastructure to develop personal and practical Apps. Open to majors in computer science and engineering and others with consent of instructor.

- **Machine Learning**

CAP5615 Introduction to Neural Networks

Brief introduction to biological neural systems. Models of neural mechanisms of learning and memory. Neural net applications to image processing, pattern recognition, machine learning, optimization problems, and robotics. Hardware implementation issues.

CAP6512 Evolutionary Computing

Course provides understanding and exploration of biologically inspired computation. In-depth look at genetic algorithms (variables to be optimized and/or minimized), genetic programming (tree representation and parsing), classifier systems (GA variations and production rules), and evolutionary programming and strategies. Students will have a number of hands-on simulations and design assignments.

CAP6619 Deep Learning

This course teaches students basic concepts of deep learning with applications in computer science, engineering, business and other areas. The class covers major topics including math preliminaries, machine learning basics, deep forward networks, convolution networks, autoencoders, representation learning networks and their implementations and applications.

CAP6778 Advanced Data Mining and Machine Learning

The study of advanced topics in data mining and machine learning. Current research issues in data mining and its application in bioinformatics, computer network security, computer science, and software engineering.

CAP6617 Sparse Learning

This course introduces new concepts, theory, algorithms, and applications of sparse representation and modeling, and their relationship with deep learning. Topics covered include mathematical preliminaries, L1 optimization, pursuit algorithms, sparse representation classifiers, sparse dictionary learning, sparse deep learning, and applications.

- **Applications**

EEL5661 Robotic Applications

Robot classification, robot systems, economic justification; product design for robot assembly; programming, part feeding, tooling.

CAP6807 Computational Advertising and Real-Time Data Analytics

This course teaches students basic concepts of computational advertising with a focus on real-time data analytics for displaying advertisement. The class introduces different key aspects of building platforms for online advertising, the computational requirement, tools and solutions.

CAP6683 Medical Applications for Artificial Intelligence
This course introduces the underlying concepts, methods, and the potential of intelligent systems in medicine. It explores the application of artificial intelligence (AI) and machine learning methods, techniques, and tools to specific areas in medicine and healthcare. As a research and project-based course, students will have opportunities to identify and specialize in particular AI methods, clinical/healthcare applications, and relevant tools.

F. For degree programs in the science and technology disciplines, discuss how industry-driven competencies were identified and incorporated into the curriculum and indicate whether any industry advisory council exists to provide input for curriculum development and student assessment.

The aim of the MSAI program to produce AI professionals who will be able to work all sectors of employment, including industry, government and defense. The coursework and research projects to be undertaken by students will help them to meet the needs of a wide range of employers. The Industry Advisory Board of the Department of Computer and Electrical Engineering and Computer Science will meet regularly to ensure that the needs of the employers will be identified and incorporated into the curriculum.

G. For all programs, list the specialized accreditation agencies and learned societies that would be concerned with the proposed program. Will the university seek accreditation for the program if it is available? If not, why? Provide a brief timeline for seeking accreditation, if appropriate.

At this time, we are not seeking accreditation for the MS with Major in Artificial Intelligence program, since this is not a professional development program.

H. For doctoral programs, list the accreditation agencies and learned societies that would be concerned with corresponding bachelor's or master's programs associated with the proposed program. Are the programs accredited? If not, why?

N/A

I. Briefly describe the anticipated delivery system for the proposed program (e.g., traditional delivery on main campus; traditional delivery at branch campuses or centers; or nontraditional delivery such as distance or distributed learning, self-paced instruction, or external degree programs). If the proposed delivery system will require specialized services or greater than normal financial support, include projected costs in Table 2 in Appendix A. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.

The courses for the MSAI program will be delivered in traditional classroom, distance learning, and online. Most of the courses included in this program are courses already offered by the CEECS department. One new core course (CAP5625 Computational Foundations of Artificial Intelligence) and one elective course (CAP6683 Medical Applications for Artificial Intelligence) have been developed by CEECS to support the development of this program. There is not a perceived need to look outside FAU at this time for shared courses and technologies in regard to the newly proposed MSAI program.

Students enrolled into the MSAI program will be involved in research by pursuing the thesis option, by taking a research-based-DIS course, or through research assistantships. Many of the courses enclosed in this program are of interest to our industry partners. We will work with the department and college Industry Advisory Board to provide opportunities for the students enrolled in the MSAI to gain industry experience.

IX. Faculty Participation

A. Use Table 4 in Appendix A to identify existing and anticipated full-time (not visiting or adjunct) faculty who will participate in the proposed program through Year 5. Include (a) faculty code associated with the source of funding for the position; (b) name; (c) highest degree held; (d) academic discipline or specialization; (e) contract status (tenure, tenure-earning, or multi-year annual [MYA]); (f) contract length in months; and (g) percent of annual effort that will be directed toward the proposed program (instruction, advising, supervising internships and practica, and supervising thesis or dissertation hours).

Table 4 in Appendix A lists all graduate faculty associated with the program in Years 1 and 5. There is no new faculty hiring needed. The following estimates are used in computing the values in Table 4:

- If a faculty teaches a core course specifically for MSAI (CAP 5625,CAP6635), then the effort is projected to be 33%
- If a faculty teaches a core course which is included in other programs as well (i.e. CAP 6673), then the effort is estimated to be 20%
- If a faculty is the program advisor, then the effort is 15%
- If a faculty is involved in teaching an existing course for the program, thus adding few MSAI students to the class, then the effort is projected to be 6% in the first year. The effort doubles in the fifth year if thesis advising is projected.

B. Use Table 2 in Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 4 in Appendix A). Costs for visiting and adjunct faculty should be included in the category of Other Personnel Services (OPS). Provide a narrative summarizing projected costs and funding sources.

The proposed budget includes 1 graduate teaching assistant per year in years 1,2, and 3, and 2 graduate assistants per year for years 3 and 4, at the rate (stipend + rate benefits) set by the Graduate College. The graduate teaching assistants positions are reallocated within the CEECS department. Additional details are presented in Table 2 in Appendix A.

C. Provide in the appendices the abbreviated curriculum vitae (CV) for each existing faculty member (do not include information for visiting or adjunct faculty).

The abbreviated CVs have been included in the appendices. Brief research interests of the faculty is presented below.

Dr. Taghi M. Khoshgoftaar is Motorola Endowed Chair professor of the Department of Computer and Electrical Engineering and Computer Science, Florida Atlantic University and the Director of NSF Big Data Training and Research Laboratory. His research interests are in big data analytics, data mining and machine learning, health informatics and bioinformatics, social network mining, fraud detection, and software engineering. He has published more than 700 refereed journal and conference papers in these areas. He is the conference chair of the IEEE International Conference on Machine Learning and

Applications (ICMLA 2019). He is the Co-Editor-in Chief of the journal of Big Data. He has served on organizing and technical program committees of various international conferences, symposia, and workshops.

Dr. Xingquan (Hill) Zhu is a professor in the Department of Computer and Electrical Engineering and Computer Science at FAU. Dr. Zhu's research interests are data mining, machine learning, multimedia systems, and bioinformatics.

Dr. Hanqi Zhuang is Associate Chair and a professor in the CEECS department. Dr. Zhuang's research interests span signal and image processing, robotics and computer vision, dictionary learning and deep learning, and their applications.

Dr. Oge Marques is a professor in the CEECS department with research interests in intelligent processing of visual information, a combination of artificial intelligence, image processing, computer vision, human vision, and machine learning, with recent emphasis on medical applications. In addition to applying artificial intelligence to image analysis and computer vision problems, Dr. Marques' research has been inspired by the human factors associated with visual perception, object recognition, image retrieval, and other intelligent visual processing tasks. He has also devoted a significant amount of effort researching the cognitive foundations of human visual perception and building serious games and other human computation solutions (e.g., crowdsourcing) to engage users in such tasks.

Dr. Dingding Wang's primary research interest lies in data mining, information retrieval, and machine learning for improving document understanding. In particular, her research goal is to help users to better understand and utilize large real document data sets via document clustering, summarization, and storyline generation. She also works on research topics related to social network analytics, bioinformatics, music information retrieval, recommendation systems, and malware detection.

Dr. Yufei Tang is an Assistant Professor in the Department of CEECS and a Faculty Fellow of I-SENSE at Florida Atlantic University (FAU), where he is also the Director of the Intelligent and Resilient Systems (IRS) Research Group. His research interests are in the areas of Computational Intelligence (e.g., Machine Learning, Networked Big Data Mining) and Cyber-Physical Systems (e.g., Ocean Energy Systems, Smart Grid). Currently, his research foci are networked big data and system analytics (e.g., social networks and sensor networks), and predictive maintenance of marine structures/systems (e.g., marine hydrokinetic turbine monitoring, harmful algal blooms prediction).

Dr. Feng-Hao Liu is an Assistant Professor in the CEECS department with research interests in cryptography (foundations and applications), and broadly theoretical computer science. Specific topics include: how to compute on encrypted data, how to verify computation in outsourced environments, how to protect memory and computation from physical attacks, and various settings of multiparty computation.

Dr. Kwang-Soo Yang is an Assistant Professor in the CEECS department with research interests in the broadly area of Spatial Big Data (SBD). Examples of SBD include temporally detailed road maps that provide speeds every minute for every road-segment, GPS trace data from cell-phones, and engine measurements of fuel consumption, greenhouse gas emissions, etc. SBD has the potential to transform society via next-generation routing services, emergency and disaster response, and discovery of potentially useful patterns embedded in these datasets. However, SBD poses significant challenges as the size, variety, and update rate of mobile datasets exceed the capacity of commonly used spatial computing and spatial database technologies to learn, manage, and process the data with reasonable effort. My research has focused on two issues within Spatial Big Data: storage of big spatio-temporal network (STN) data and design of scalable algorithms for big spatial networks.

Dr. Dimitris Pados is a Professor in the CEECS department, ISENSE Fellow, and director of the ExtremeComms Laboratory. His research interests are in Communications Theory and Systems (Cognitive Software-defined Radios and Networks; Interference Avoiding Networking; Secure Wireless Communications; Underwater Cognitive Hi-rate/Long-distance Acoustic Communications; Autonomous/Unmanned Aerial/Ground/Underwater System Communications) and Machine Learning and Adaptive Signal Processing (L1-norm Principal-component Analysis (L1-PCA); Robust Feature Extraction from Faulty Data Sets;

Digital Data Embedding/Hiding; Compressed-sensed (Multi-view) Imaging and Video; Localization in GPS-less Environments; Ad-hoc/Dynamic Geometry Beamforming and Array Radar; Communications-Radar Coexistence).

Dr. Elias Bou-Harb is an Assistant Professor in the CEECS department. Dr. Bou-Harb is an expert in cyber threat intelligence, real-time traffic analysis and correlation, and digital/network forensics. Throughout his academic and technical career, Dr. Bou-Harb has gained the ability to represent information in various methods, the aptitude to design and conduct an observational, testing and an application experiment, and the capability to effectively communicate scientific ideas and results. Moreover, he has gained operational engineering capabilities in cyber security R&D, realtime big data analytics, cyber-attack detection and mitigation, efficient malware fingerprinting and real-time traffic analysis.

Dr. Behnaz Ghoraani is an Assistant Professor in the CEECS department and ISENSE. Dr. Ghoraani research interests span biosensor and biomedical signal analysis, non-stationary data analytics, feature extraction and classification, time-frequency signal analysis, pattern classification and recognition, dictionary learning, computer-aided clinical decision making.

Dr. Ravi Shankar is a Professor in the CEECS department. Dr. Shankar's research interests span systems and all issues pertinent so systems.Over the years, he has built up background and expertise, always with a systems perspective, in biomedical engineering, analog and mixed signal design, VLSI and chip design, engineering design automation, concurrent and distributed processing, engineering management, engineering design productivity, software automation, cyberlearning, complex systems, and App development for smart phones, robotics, and the semantic web.

Dr. Mihaela Cardei is a Professor in CEECS department and Associate Dean for Graduate Studies. Dr. Cardei's research interests are in the areas of design of efficient protocols and algorithms for managing communication and energy resources in ad hoc wireless networks:wireless communications and energy efficiency in wireless networks QoS; routing and data dissemination schemes in wireless networks; power-aware scalable topology control in wireless networks; and optimization problems in wireless networking.

D. Provide evidence that the academic unit(s) associated with this new degree have been productive in teaching, research, and service. Such evidence may include trends over time for average course load, FTE productivity, student HC in major or service courses, degrees granted, external funding attracted, as well as qualitative indicators of excellence.

The CEECS Department has over 800 undergraduate, 200 M.S. and 75 Ph.D. students. Its three programs (Electrical Engineering, Computer Engineering and Computer Science) are all accredited by the American Board of Engineering Training (ABET) and Southern Association of Colleges and Schools (SACS). The 5-year trend of degrees awarded and 6-year trend of research expenditures are shown in the tables below.

	2013-14	2014-15	2015-16	2016-17	2017-18
Bachelor's	190	171	226	225	232
Master's	71	59	41	54	85
PhD	10	16	5	7	14
Total	**271**	**246**	**272**	**286**	**331**

Total Departmental Research Expenditure

FY2012-13	FY2013-14	FY2014-15	FY2015-16	FY2016-17	FY2017-18
1,021,174	867,727	850,795	1,457,057	2,370,294	2,463,447

The CEECS Department is home to two NSF IUCRC (Industry - University Cooperative Research Centers), two named laboratories (Bidtellect and Tecore). In AY 2017-18, CEECS faculty have published 9 books, 220 peer reviewed publications, 142 conference presentations and submitted 56 grant proposals.

X. Non-Faculty Resources

A. Describe library resources currently available to implement and/or sustain the proposed program through Year 5. Provide the total number of volumes and serials available in this discipline and related fields. List major journals that are available to the university's students. Include a signed statement from the Library Director that this subsection and subsection B have been reviewed and approved.

All FAU campuses have onsite libraries, with extensive physical and electronic collections. The total number of print volumes that could be categorized as related to Artificial Intelligence is 24,740. The call number ranges and subject areas are included in the Appendix E. There are two print journals in areas related to Artificial Intelligence: Florida Scientist and Scientific American.

FAU also has access through subscriptions to a number of electronic journal titles and databases, such as JSTOR, related to Artificial Intelligence areas. The number of journal titles is 765. The journal titles and the databases are listed in the Appendix E.

B. Describe additional library resources that are needed to implement and/or sustain the program through Year 5. Include projected costs of additional library resources in Table 2 in Appendix A. Please include the signature of the Library Director in Appendix B.

No additional library resources are needed to implement and support the program.

C. Describe classroom, teaching laboratory, research laboratory, office, and other types of space that are necessary and currently available to implement the proposed program through Year 5.

The existing space is sufficient for both teaching and research activities associated with the proposed program MSAI. More specifically, the following facility and research labs are available.

Artificial Intelligence and Deep Learning (AIDL) Training and Research Laboratory in Florida (Director: Dr. Hill Zhu)
Hosted at the university, FAU's AIDL laboratory will be shared across multiple campuses and research disciplines and will significantly advance FAU's role in artificial intelligence and deep learning-based intelligent information analysis. FAU's AIDL laboratory

infrastructure features a graphics processing unit (GPU) cluster – a computer cluster that enables the performance of very fast calculations – and includes 18 GPU servers and 72 Nvidia Tesla V-100 GPU cards and a 38.4 Terabyte flash memory server. The GPU cards are among the world's best technology for artificial intelligence and deep learning. This project will nearly quadruple the number of GPU cards at FAU from 31 to 103 cards and will increase the onboard GPU memory six times from 381GB to 2,304 GB.

The platform will be shared across FAU's campuses, resulting in a centralized cross-campus interdisciplinary platform and augmented deep learning and related artificial intelligence tools for interdisciplinary research. The AIDL laboratory also will serve as the training and research platform to support graduate student teaching and research activities across multiple campuses, colleges, and disciplines as well as FAU's research pillars.

Big Data Training and Research Laboratory (Director: Dr. Taghi Koshgoftaar)
NSF Big Data Training and Research Laboratory project consisted of procurement and deployment of a large computing cluster appropriate for Big Data research and led to the developed large-scale computational resources capable of solving Big Data challenges at Florida Atlantic University (FAU). The tools and resources provided by this project include a high performance computer cluster and advanced databases and facilities to store, maintain, and secure large quantities of data.

The computational facilities constructed as a part of this project provide student and faculty researchers with access to state-of-the-art hardware and software required to work with Big Data. Researchers have access to multiple distributed file systems including Hadoop and Lustre, and can leverage GPU accelerated nodes for training deep artificial neural networks and for use in other highly parallel tasks. Since the facility's inception, its resources have been used in over 100 published peer reviewed journal and conference papers and continue to be used in many ongoing research projects in a number of Big Data and/or Deep Learning application domains, including anomaly detection, fraud detection, sports medicine, network security, transfer learning, facial recognition, social media mining, fake review detection, and text mining. six PhD and three Masters Students have utilized these facilities to complete their dissertation or thesis and graduate since 2015, with many more set to graduate in the near future.

Additionally, the resources and tools acquired through this project have led to the development of new educational courses for graduate students and advanced undergraduates specifically focused on the tools and techniques necessary for Big Data research, such as using the Hadoop distributed file system for machine learning, and Deep learning.

Bidtellect Laboratory (Director: Dr. Hill Zhu)
The Bidtellect Laboratory is an incubator to support big data analytics and digital advertising research, as well as serve as an educational platform. Bidtellect's proprietary state of the art technology allows native ad planning, buying, selling and overall management on a single platform. By utilizing Bidtellect's Native DSP (nDSP), Native SSP (nSSP) and openRTB 2.3 Native Exchange, advertisers and publishers can now implement effective Native campaigns at scale with maximum optimization.

D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 2 in Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

N/A

E. If a new capital expenditure for instructional or research space is required, indicate where this item appears on the university's fixed capital outlay priority list. Table 2 in Appendix A includes only Instruction and Research (I&R) costs. If non-I&R costs, such as indirect costs affecting libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs in particular would necessitate increased costs in non-I&R activities.

N/A

F. Describe specialized equipment that is currently available to implement the proposed program through Year 5. Focus primarily on instructional and research requirements.

The Department of Computer and Electrical Engineering and Computer Science, which will host the MSAI program, has a comprehensive list of equipment. In addition, the CEECS Department received two major research equipment grants recently, one for big data and another for deep learning, from National Science Foundation, to purchase new equipment, which will be available for the faculty and students in the program. There are no new requests for additional equipment and all the courses that exist or have been developed have considered the impact of additional students.

G. Describe additional specialized equipment that will be needed to implement and/or sustain the proposed program through Year 5. Include projected costs of additional equipment in Table 2 in Appendix A.

No additional specialized equipment is needed, as the program is modeled on existing master's degree programs in the CEECS Department.

H. Describe any additional special categories of resources needed to implement the program through Year 5 (access to proprietary research facilities, specialized services, extended travel, etc.). Include projected costs of special resources in Table 2 in Appendix A.

The College of Engineering and Computer Science, in particular the CEECS Department will use available resources, including facilities and services, to ensure the success of the MSAI program. There are no additional requests for this new program.

I. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 2 in Appendix A.

Students in this program will be eligible to receive research and teaching assistantships provided that they satisfy the departmental criteria. Due to the fact that many of the students will possess knowledge and skills in AI and machine learning, which will give them advantages in completing departmental scholarships. In fact, many of our faculty have research funding but cannot find qualified students. The MSAI program will help our faculty in their research in a very constructive way. No additional funds are requested.

J. Describe currently available sites for internship and practicum experiences, if appropriate to the program. Describe plans to seek additional sites in Years 1 through 5.

Currently we have internship with NCCI, JM Family, Citrix, Goldman Sachs, American Express, Nexis and Lexis, Oak Ridge National Lab, Florida Power and Light, and Motorola, among others. The departments plan to seek addition sites via joint collaboration to attract local industry partners.

APPENDIX A

TABLE 1-A
PROJECTED HEADCOUNT FROM POTENTIAL SOURCES
(Baccalaureate Degree Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1		Year 2		Year 3		Year 4		Year 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Upper-level students who are transferring from other majors within the university**	0	0	0	0	0	0	0	0	0	0
Students who initially entered the university as FTIC students and who are progressing from the lower to the upper level***	0	0	0	0	0	0	0	0	0	0
Florida College System transfers to the upper level***	0	0	0	0	0	0	0	0	0	0
Transfers to the upper level from other Florida colleges and universities***	0	0	0	0	0	0	0	0	0	0
Transfers from out of state colleges and universities***	0	0	0	0	0	0	0	0	0	0
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

* List projected annual headcount of students enrolled in the degree program. List projected yearly cumulative ENROLLMENTS instead of admissions.
** If numbers appear in this category, they should go DOWN in later years.
*** Do not include individuals counted in any PRIOR CATEGORY in a given COLUMN.

APPENDIX A

TABLE 1-B

PROJECTED HEADCOUNT FROM POTENTIAL SOURCES

(Graduate Degree Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1		Year 2		Year 3		Year 4		Year 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Individuals drawn from agencies/industries in your service area (e.g., older returning students)	5	4	5	4	6	5	6	5	7	5
Students who transfer from other graduate programs within the university**	3	2	2	2	0	0	0	0	0	0
Individuals who have recently graduated from preceding degree programs at this university	6	5	8	6	10	8	12	9	14	11
Individuals who graduated from preceding degree programs at other Florida public universities	3	2	5	4	6	5	6	5	7	5
Individuals who graduated from preceding degree programs at non-public Florida institutions	2	2	2	2	3	2	3	2	4	3
Additional in-state residents***	1	1	1	1	2	2	3	2	3	2
Additional out-of-state residents***	0	0	1	1	1	1	2	2	3	2
Additional foreign residents***	0	0	1	1	2	2	3	2	2	2
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	**20**	**16**	**25**	**21**	**30**	**25**	**35**	**27**	**40**	**30**

* List projected annual headcount of students enrolled in the degree program. List projected yearly cumulative ENROLLMENTS instead of admissions.

** If numbers appear in this category, they should go DOWN in later years.

*** Do not include individuals counted in any PRIOR category in a given COLUMN.

APPENDIX A

TABLE 2

PROJECTED COSTS AND FUNDING SOURCES

Instruction & Research Costs (non-cumulative)	Year 1								Year 5						
	Funding Source							Subtotal coulumns 1+...+7	Funding Source						Subtotal coulumns 9+...+ 14
	Reallocated Base* (E&G)	Enrollment Growth (E&G)	New Recurring (E&G)	New Non-Recurring (E&G)	Contracts & Grants (C&G)	Philanthropy Endowments	Enterprise Auxiliary Funds		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	Philanthropy Endowments	Enterprise Auxiliary Funds	
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Faculty Salaries and Benefits	224,045	0	0	0	0	0	0	$224,045	326,387	0	0	0	0	0	$326,387
A & P Salaries and Benefits	4,404	0	0	0	0	0	0	$4,404	4,404	0	0	0	0	0	$4,404
USPS Salaries and Benefits	9,695	0	0	0	0	0	0	$9,695	16,159	0	0	0	0	0	$16,159
Other Personal Services	0	0	0	0	0	0	0	$0	0	0	0	0	0	0	$0
Assistantships & Fellowships	18,000	0	0	0	0	0	0	$18,000	36,000	0	0	0	0	0	$36,000
Library	0	0	0	0	0	0	0	$0	0	0	0	0	0	0	$0
Expenses	5,000	0	0	0	0	0	0	$5,000	12,000	0	0	0	0	0	$12,000
Operating Capital Outlay	0	0	0	0	0	0	0	$0	0	0	0	0	0	0	$0
Special Categories	0	0	0	0	0	0	0	$0	0	0	0	0	0	0	$0
Total Costs	**$261,144**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$261,144**	**$394,950**	**$0**	**$0**	**$0**	**$0**	**$0**	**$394,950**

*Identify reallocation sources in Table 3.

**Includes recurring E&G funded costs ("reallocated base," "enrollment growth," and "new recurring") from Years 1-4 that continue into Year 5.

***Identify if non-recurring.

Faculty and Staff Summary

Total Positions	Year 1	Year 5
Faculty (person-years)	1.03	1.43
A & P (FTE)	0.05	0.05
USPS (FTE)	0.15	0.25

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	$261,144	$394,950
Annual Student FTE	16	30
E&G Cost per FTE	$16,322	$13,165

Table 2 Column Explanations		
Reallocated Base* (E&G)	1	E&G funds that are already available in the university's budget and will be reallocated to support the new program. Please include these funds in the Table 3 – Anticipated reallocation of E&G funds and indicate their source.
Enrollment Growth (E&G)	2	Additional E&G funds allocated from the tuition and fees trust fund contingent on enrollment increases.

New Recurring (E&G)	3	Recurring funds appropriated by the Legislature to support implementation of the program.
New Non-Recurring (E&G)	4	Non-recurring funds appropriated by the Legislature to support implementation of the program. Please provide an explanation of the source of these funds in the budget section (section III. A.) of the proposal. These funds can include initial investments, such as infrastructure.
Contracts & Grants (C&G)	5	Contracts and grants funding available for the program.
Philanthropy Endowments	6	Funds provided through the foundation or other Direct Support Organizations (DSO) to support of the program.
Enterprise Auxiliary Funds	7	Use this column for continuing education or market rate programs and provide a rationale in section III.B. in support of the selected tuition model.
Subtotal coulumns 1+...+7	8	Subtotal of values included in columns 1 through 7.
Continuing Base** (E&G)	9	Includes the sum of columns 1, 2, and 3 over time.
New Enrollment Growth (E&G)	10	See explanation provided for column 2.
Other*** (E&G)	11	These are specific funds provided by the Legislature to support implementation of the program.
Contracts & Grants (C&G)	12	See explanation provided for column 5.
Philanthropy Endowments	13	See explanation provided for column 6.
Enterprise Auxiliary Funds	14	Use this column for continuing education or market rate programs and provide a rationale in section III.B. in support of the selected tuition model.
Subtotal coulumns 9+...+ 14	15	Subtotal of values included in columns 9 through 14.

APPENDIX A

TABLE 3
ANTICIPATED REALLOCATION OF EDUCATION & GENERAL FUNDS*

Program and/or E&G account from which current funds will be reallocated during Year 1	Base before reallocation	Amount to be reallocated	Base after reallocation
TAG000279 Department of Computer, Electrical &	5,794,976	261,144	$5,533,832
Totals	$5,794,976	$261,144	$5,533,832

*** If not reallocating funds, please submit a zeroed Table 3**

APPENDIX A

TABLE 4
ANTICIPATED FACULTY PARTICIPATION

Faculty Code	Faculty Name or "New Hire" Highest Degree Held Academic Discipline or Speciality	Rank	Contract Status	Initial Date for Participation in Program	Mos. Contract Year 1	FTE Year 1	% Effort for Prg. Year 1	PY Year 1	Mos. Contract Year 5	FTE Year 5	% Effort for Prg. Year 5	PY Year 5
A	Oge Marques, Ph.D. CEECS	Professor	Tenure	Fall 2019	9	0.75	0.33	0.25	9	0.75	0.33	0.25
A	Taghi Khoshgoftaar, Ph.D. CEECS	Professor	Tenure	Fall 2019	9	0.75	0.35	0.26	9	0.75	0.35	0.26
A	Dingding Wang, PhD CEECS	Asst. Prof.	Tenure	Fall 2019	9	0.75	0.06	0.05	9	0.75	0.12	0.09
A	Hanqi Zhuang, PhD CEECS	Professor	Tenure	Fall 2019	9	0.75	0.06	0.05	9	0.75	0.12	0.09
A	Xingquan (Hill) Zhu, PhD CEECS	Professor	Tenure	Fall 2019	9	0.75	0.33	0.25	9	0.75	0.33	0.25
A	Mihaela Cardei, PhD CEECS	Professor	Tenure	Spring 2020	9	0.75	0.06	0.05	9	0.75	0.06	0.05
A	Yufei Tang, PhD CEECS & ISENSE	Asst. Prof.	Tenure	Fall 2019	9	0.75	0.06	0.05	9	0.75	0.12	0.09
A	Feng-Hao Liu, PhD CEECS	Asst. Prof.	Tenure	Fall 2021	9	0.75	0.00	0.00	9	0.75	0.06	0.05
A	Ravi Shankar, PhD CEECS	Professor	Tenure	Fall 2020	9	0.75	0.06	0.05	9	0.75	0.06	0.05
A	Kwang-Soo Yang, PhD CEECS	Asst. Prof.	Tenure	Fall 2021	9	0.75	0.00	0.00	9	0.75	0.06	0.05
A	Dimitris Pados, PhD CEECS & ISENSE	Professor	Tenure	Fall 2020	9	0.75	0.06	0.05	9	0.75	0.12	0.09
A	Elias Bou-Harb, PhD CEECS	Asst. Prof.	Tenure	Spring 2022	9	0.75	0.00	0.00	9	0.75	0.12	0.09
A	Behnaz Ghoraani, PhD CEECS & ISENSE	Asst. Prof	Tenure	Fall 2022	9	0.75	0.00	0.00	9	0.75	0.06	0.05
	Total Person-Years (PY)							**1.03**				**1.43**

Faculty Code		Source of Funding	PY Workload by Budget Classsification Year 1	Year 5
A	Existing faculty on a regular line	Current Education & General Revenue	1.03	1.43
B	New faculty to be hired on a vacant line	Current Education & General Revenue	0.00	0.00
C	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.00
D	Existing faculty hired on contracts/grants	Contracts/Grants	0.00	0.00
E	New faculty to be hired on contracts/grants	Contracts/Grants	0.00	0.00
		Overall Totals for Year 1	**1.03**	**Year 5 1.43**

Current Salary	Salary (Year 1)	S&B (Year 1)	PY (Year 1)	Salary (Year 5)	S&B (Year 5)	PY (Year 5)
128,594.89	131,166.79	167,893.49	55,405.00	141,979.15	181,733.31	59,972.00
132,580.79	135,232.41	173,097.48	60,584.00	146,379.91	187,366.28	65,578.00
93,894.47	95,772.36	122,588.62	7,355.00	103,667.08	132,693.86	15,923.00
128,765.93	131,341.25	168,116.80	10,087.00	142,167.99	181,975.03	21,837.00
113,468.61	115,737.98	148,144.62	48,888.00	125,278.51	160,356.50	52,918.00
128,052.64	130,613.69	167,185.53	10,031.00	141,380.46	180,966.99	10,858.00
94,023.62	95,904.09	122,757.24	7,365.00	103,809.67	132,876.38	15,945.00
91,918.23	93,756.59	120,008.44	-	101,485.15	129,901.00	7,794.00
121,887.37	124,325.12	159,136.15	9,548.00	134,573.51	172,254.09	10,335.00
91,918.23	93,756.59	120,008.44	-	101,485.15	129,901.00	7,794.00
188,700.00	192,474.00	246,366.72	14,782.00	208,340.05	266,675.26	32,001.00
90,292.95	92,098.81	117,886.48	-	99,690.71	127,604.11	15,312.00
119,352.75	121,739.81	155,826.95	-	131,775.08	168,672.10	10,120.00
			224,045.00			326,387.00

APPENDIX B

Please include the signature of the Equal Opportunity Officer and the Library Director.

Paula Behnke
Signature of Equal Opportunity Officer

March 11, 2019
Date

Carol Hixon
Signature of Library Director

3/12/19
Date

This appendix was created to facilitate the collection of signatures in support of the proposal. Signatures in this section illustrate that the Equal Opportunity Officer has reviewed section II.E of the proposal and the Library Director has reviewed sections X.A and X.B.

Taghi M. Khoshgoftaar
Motorola Endowed Chair Professor
Department of Computer and Electrical Engineering and Computer Science
Florida Atlantic University
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PROFESSIONAL PREPARATION

- 1985: M.S. in Computer Science, North Carolina State University, Raleigh, NC USA.
- 1982: Ph.D. in Statistical Computing, Virginia Polytechnic Institute and State University, Blacksburg, VA USA.
- 1979: M.S. in Applied Mathematics, Massachusetts Institute of Technology, Cambridge, MA USA.
- 1977: B.S. in Statistics (major) and Computer Science (minor), College of Statistics and Information Science, Tehran, Iran.

APPOINTMENTS

- 1985—Present: Professor, Department of Computer and Electrical Engineering and Computer Science, College of Engineering and Computer Science (and predecessor departments), Florida Atlantic University, Boca Raton, Florida USA.
- 1982-1985: Visiting Assistant Professor, Department of Mathematics and Computer Science, East Carolina University, Greenville, North Carolina USA.

PUBLICATIONS

Google Scholar: https://scholar.google.com/citations?user=-PgNSCAAAAAJ&hl=en **(h-index 67)**

Research Publications Summary

- 201 refereed journal papers
- 470 refereed conference papers
- 35 conference papers based on refereed abstracts
- 28 book chapters
- 11 books edited

Selected Publications

1. Bauder, R.A. and Khoshgoftaar, T.M. (2018). The Effects of Varying Class Distribution on Learner Behavior for Medicare Fraud Detection with Imbalanced Big Data. Journal of Health Information Science and Systems, **6**:9 (14 pages)

2. Richter, A.N. and Khoshgoftaar, T.M. (2018). A Review of Statistical and Machine Learning Methods for Modeling Cancer Risk Using Structured Clinical Data. Journal of Artificial Intelligence in Medicine, Volume 90, pages 1-14.

3. Prusa, J. D. and Khoshgoftaar, T.M. (2016). Designing a Better Data Representation for Deep Neural Networks and Text Classification. Proceedings of the IEEE 17th International Conference on Information Reuse and Integration. Pittsburgh, PA, pages 411-416.

4. Zuech, R., Khoshgoftaar, T.M. and Wald, R. (2015). Intrusion Detection and Big Heterogeneous Data: A Survey. Journal of Big Data, 2:3 (41 pages)

5. Van Hulse, J., Khoshgoftaar, T.M., Napolitano, A. and Wald, R. (2012).Threshold-based Feature Selection Techniques for High-Dimensional Bioinformatics Data. International Journal of Network Modeling and Analysis in Health Informatics and Bioinformatics, Vol. 1, pages 47–61, Springer, New York.

6. Dittman, D., Khoshgoftaar, T.M., Wald, R. and Wang, H. (2011). Stability Analysis of Feature Ranking Techniques on Biological Datasets. Proceedings of the IEEE International Conference on Bioinformatics and Biomedicine, Atlanta, GA, pages 252-256.

7. Kotlarchyk, A., Khoshgoftaar, T.M., Pavlovic, M., Zhuang, H., and Pandya, A. (2011). Identification of MicroRNA Biomarkers for Cancer by Combining Multiple Feature Selection Techniques. Journal of Computational Methods in Science and Engineering (JCMSE), Vol. 11, No. 5, pages 283-298.

8. Seliya, N. and Khoshgoftaar, T.M. (2011). The Use of Decision Trees for Cost Sensitive Classification: An Empirical Study in Software Quality Prediction. WIREs Data Mining and Knowledge Discovery, Vol. 1, No.5, pages 448-459.

9. Khoshgoftaar, T.M., Van Hulse, J. and Napolitano, A. (2011). Comparing Boosting and Bagging Techniques with Noisy and Imbalanced Data. IEEE Transactions on Systems, Man & Cybernetics: Part A: Systems and Humans, Vol. 41, No. 3, pages 552-568.

10. Khoshgoftaar, T.M., Van Hulse, J., and Napolitano, A. (2010). Supervised Neural Network Modeling: An Empirical Investigation Into Learning From Imbalanced Data With Labeling Errors. IEEE Transactions on Neural Networks, Vol. 21, No. 5, pages 813-830.

Selected Sponsored Research Projects

1. Game Changer Tech

Title: Center for Advanced Data Analytics (Phase 1 and Phase 2)
Principal Investigator (Jan 23, 2017 – Jan 22, 2019) $150,000

2. National Science Foundation grant

Title: MRI: Acquisition of Big Data Training and Research Laboratory
Principal Investigator (August 1, 2014 -- July 31, 2017) $600,000

3. LexisNexis (Boca Raton, Florida grant (NSF I/UCRC)

Title: Developing Machine Learning Algorithms on HPCC/ECL Platform
Principal Investigator (April 2012 -- August 2019) $310,000

4. National Science Foundation grant

Title: Industry/University Cooperative Research Center for Advanced Knowledge Enablement
Investigator (August 1, 2015 -- July 31, 2020) $250,000

5. Emerson grant (NSF I/UCRC)
Title: Predictive Battery Analysis
Principal Investigator (July 2012 -- May 2013) $40,000

6. Center of Ocean Energy and Technology grant (State of Florida)
Title: Machine Condition Monitoring
Principal Investigator (August 2009 -- December 2012) $450,000

Synergistic Activities

1. North American Editor of Software Quality Journal (July 1995 - June 1997), and Member of the Editorial Boards of the Software Quality Journal (1992 - Present), the Empirical Software Engineering Journal (2002 - 2006), the Software Engineering and Knowledge Engineering (2009-present), Knowledge and Information Systems (2009-2012), Social Network Analysis and Mining (2010-present) and Journal of Fuzzy Systems (2004- 2012). Co-Editor-in-Chief, Journal of Big Data (2014-present)
2. Program Chair (2004 and 2011) and General Chair (2005 and 2013) of IEEE International Conference on Tools with Artificial Intelligence.
3. Program Chair (2010) and Conference Chair (2012 and 2016) of the IEEE International Conference on Machine Learning and Applications.
4. Served on Technical Program Committees of various international conferences, symposia, and workshops; organized numerous technical sessions at various conferences; served on various panels; gave tutorials at conferences; and gave numerous invited talks in industry, conferences, research centers, and universities.
5. Served on the NSF panels for SBIR and Software Engineering and Languages, and reviewed other proposals (via email or mail)

Theses and Dissertations Supervised and Completed

1. Supervised 27 PhD dissertations to completion
   Currently supervising 14 PhD dissertations
   Participated in several dissertations as a member of supervisory committees

2. Supervised 61 master theses to completion
   Currently supervising two theses
   Participated in several theses as a member of supervisory committees

Selected Professional Recognition

1. Elected Fellow of the Knowledge Systems Institute, June 2013.
2. Was awarded Sabbatical (full-pay) Leave, FAU, Fall 2012.
3. Received Excellence Graduate Mentoring (Inaugural) Award, FAU, June 2008.
4. Received Travel Grant Award, FAU, September 2006.
5. Received the College of Engineering and Computer Science Researcher of the Year Award at the level of Full Professor, March 2006.
6. Received Travel Grant Award, FAU, December 2005.
7. Received College of Engineering Dean's Faculty Award, FAU, December 2004.
8. Was awarded Sabbatical (full-pay) Leave, FAU, Fall 2004.

9. Received College of Engineering Dean's Faculty Award, FAU, December 2002.
10. Received the FAU Researcher of the Year Award at the level of Full Professor, April 2000.

Instructional Experience- Courses Taught at FAU

1. Foundations of Computer Science (undergraduate)
2. Data Structures and Algorithm Analysis (undergraduate)
3. Design and Analysis of Algorithms (undergraduate)
4. Principles of Software Engineering (undergraduate)
5. Introduction to Computer Systems Performance Evaluation (undergraduate)
6. Introduction to Data Mining and Machine Learning (undergraduate)
7. Introduction to Web and Internet Mining (undergraduate)
8. Stochastic Models for Computer Science (undergraduate)
9. Senior Seminar (undergraduate)
10. Software Engineering (graduate)
11. Computer Systems Performance Evaluation (graduate)
12. Computer Performance Modeling (graduate)
13. Software Reliability Engineering (graduate)
14. Software Engineering Measurements (graduate)
15. Software Testing (graduate)
16. Testing and Analysis of Object-Oriented Software (graduate)
17. Data Mining and Machine Learning (graduate)
18. Web Mining (graduate)
19. Advanced Data Mining and Machine Learning (graduate)
20. Big Data Analytics with Hadoop (graduate)
21. Data Mining for Bioinformatics (graduate)
22. Deep Learning

CURRICULUM VITA

Xingquan (Hill) Zhu, PhD, Professor

Dept. of Computer & Electrical Engineering and Computer Science

Florida Atlantic University

Professional Address

Dept. of Computer & Electrical Engineering and Computer Science, EE-509

Florida Atlantic University

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Homepage: *http://www.cse.fau.edu/~xqzhu*

Google Scholar:

https://scholar.google.com/citations?user=YhKZXtcAAAAJ&hl=en

Research Interests

Big data, large scale machine learning, and data mining
Real-time analytics and decision support systems
Biomedical, bioinformatics, and health information systems

Professional Experience

- August 2018: Professor, Department of Computer & Electrical Engineering and Computer Science, Florida Atlantic University, Boca Raton, FL 33431, USA

Research Grants

1. MRI: MRI: Acquisition of Artificial Intelligence & Deep Learning (AIDL) Training and Research Laboratory
   Xingquan Zhu (PI)
   Sponsor: National Science Foundation
   Duration: 2018-2021 Amount: $652,850 (NSF) + $279,793 (Cost-share)
2. III: Medium: Collaborative Research: KMELIN: Knowledge Mining and Embedding Learning for Complex Dynamic Information Networks
   Xingquan Zhu (PI)
   Sponsor: National Science Foundation
   Duration: 2018-2022 Amount: $599,983
3. Real-Time Bidding Price Optimization
   Xingquan Zhu (PI)
   Sponsor: Bidtellect.com
   Duration: 2016 – 2018 Amount: $89,915.0
4. NSF I/UCRC: Machine Learning Algorithms for Uses Cases in Auto Industry
   Xingquan Zhu (PI) and Borko Furht
   Sponsor: National Science Foundation (FAU I/UCRC, JM Family)
   Duration: 2016 – 2017 Amount: $39,809.0
5. NSF I/UCRC: Application of Common Machine Learning Algorithms for Uses Cases in Auto Industry – Phase 2
   Dingding Wang (PI), **Xingquan Zhu** (Co-PI), and Borko Furht (Co-PI)
   Sponsor: National Science Foundation (FAU I/UCRC, JM Family)

Duration: 2017-2018 Amount: $60,087

6. PFI:AIR - TT: A Clinical Predictive Model Based Smart Decision Support System for Congestive Obstructive Pulmonary Disease (COPD) related Re-hospitalization
   Ankur Agarwal (PI), Andrew Duffell, Ravi Behara, and **Xingquan Zhu** (Co-PI)
   Sponsor: National Science Foundation (IIP: 1444949)
   Duration: 2014 - 2016 Amount: $199,594.0
7. MRI: Acquisition of Big Data Training and Research Laboratory
   Taghi Khoshgoftaar (PI), Ramesh Teegavarapu, Hari Kalva, **Xingquan Zhu** (Co-PI), and Pierre-Philippe Beaujean.
   Sponsor: National Science Foundation (CNS: 1427536)
   Duration: 2014-2017 Amount: $600,000.0
8. RED-CAKE: Novel Data Mining Approaches for Knowledge Based Skill Matching for Employers (research study)
   Xingquan Zhu (PI) and Borko Furht (Co-PI)
   Sponsor: National Science Foundation (FAU I/UCRC, incVersity)
   Duration: 2014 Amount: $ 5,000
9. Database-centric data analysis of molecular simulations
   Xingquan Zhu (PI)
   Sponsor: National Institutes of Health (subcontract NIH 1R01GM086707-01A1)
   Duration: 2010 - 2015 Amount: $ 56,319
10. Comparative Pancreatic Cancer Study Using Discriminative Gene Regulatory Network
    Xingquan Zhu (PI)
    Sponsor: American Cancer Society Institute Research Grants (ACS-IRG)
    Duration: 2009 Amount: $ 30,000.0
11. US Army Research, Travel grant
    Xingquan Zhu (PI)
    Sponsor: US Army Research (W911NF-06-1-0270)
    Duration: 2007 Amount: $ 8000.0
12. ICHECK: Identifying Deception Data with Impact-Sensitive Instance Ranking
    Xingquan Zhu (PI) and Xindong Wu (Co-PI)
    Sponsor: NSF-EPSCoR (subcontract EPS-0236976)
    Duration: 2005 Amount: $ 25,000.0
13. Pattern Matching with Wildcards and Length Constraints
    Xindong Wu (PI), Abdullah N. Arslan, and **Xingquan Zhu** (Co-PI)
    Sponsor: NSF (CCF-0514819)
    Duration: 2005-2008 Amount: $ 200,000.0

Keynote Speech

- *IEEE DSC 2017 Workshop on Data Science and Web Analytics*, June 26, 2017, Shenzhen, China.
- Data Mining track of the *30th Florida Artificial Intelligence Research Society annual conference* (FLAIRS-30), May 16-18, 2016, Key Largo, Florida, USA
- *IEEE ICDM 2014 Workshop on Scalable Data Analytics: Theory and Applications*, Dec. 14-17, 2014, Shenzhen, China.
- *The First International Conference on Data Science*, May 27-28, 2014, Beijing, China.
- *International Conference on Mobile Learning, E-Society & E-Management*, Sep. 6-7, 2011, Prague, Czech Republic.
- *The 2nd International Conference on Open Source Technologies*, Dec. 17-18, 2007, Lahore, Pakistan.

Tutorial

- *The 2nd IEEE International Conference on Data Science in Cyberspace*, June 26-29, 2017, Shenzhen, China.
  - Title: Data Science in Online Digital Advertising

Best Paper Award

- L. Chi, B. Li, and **X. Zhu**, Fast Graph Stream Classification Using Discriminative Clique Hashing, *Proc. Of the 17th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD-2013)*, April 14-17, Brisbane, Australia. (**Best Paper Award**)
- M. Fang and **X. Zhu**, I Don't Know the Label: Active Learning with Blind Knowledge, *Proc. Of the 21st International Conference on Pattern Recognition (ICPR-12)*, November 11-15, 2012, Tsukuba, Japan. (**Best Student Paper Award**)
- Y. Zhang, **X. Zhu**, X. Wu, and J. P. Bond, ACE: An Aggressive Classifier Ensemble with Error Detection, Correction and Cleansing, *Proc. of the 17th IEEE International Conference on Tools with Artificial Intelligence (ICTAI)*, Hong Kong, November 14-16, 2005. (**Best Paper Award**)

IEEE Digital Library Most Popular Paper

- Xindong Wu, **Xingquan Zhu**, Gong-Qing Wu, Wei Ding: Data Mining with Big Data. *IEEE Transactions on Knowledge and Data Engineering*, 26(1): 97-107, 2014.
  Ranked No. 7 across all IEEE digital library publications in December 2016
  http://ieeexplore.ieee.org/Xplore/home.jsp

Award and Membership

- Distinguished Visiting Professor, Fudan University, 2015
- IEEE Senior Member, 2012
- Australian Research Council (ARC) Future Fellowship (Level 2), 2010

Professional Activities

Editor:

1. **Associate Editors /Editorial Board**
   - **A.** ACM Trans. on Knowledge Discovery from Data (TKDD), 2017 to date.
   - **B.** IEEE Trans. On Knowledge and Data Engineering (TKDE), 2008 – 2012, 2014 to date
   - **C.** International Journal of Social Network Analysis and Mining (SNAM), 2010 to date
   - **D.** Journal of Big Data (JBD) (2013-Date)
   - **E.** Network Modeling Analysis in Health Informatics and Bioinformatics (NetMAHIB)(2014-Date)
   - **F.** International Journal of Monitoring & Surveillance Technologies Research (IJMSTR)(2014-Date)
   - **G.** International Journal of Machine Intelligence and Sensory Signal Processing (2016 – Date)
   - **H.** Knowledge and Information Systems Journal (KAIS), 2003 – 2008.
   - **I.** Advances in Data Warehousing and Mining, IGI Press, Inc (USA). 2007 – 2008
2. **Guest Editor /Book Editor**
   - **A.** Special Issue on Data Mining Applications and Case Study, Neurocomputing, 2011
   - **B.** Special Issue on Data Mining Applications and Prospect, Artificial Intelligence Review, 2011
   - **C.** Special Issue on Data Mining, International Journal of Software and Informatics (IJSI), 2008
   - **D.** **X. Zhu** and Ian Davidson (Eds.), "Knowledge Discovery and Data Mining: Challenges and Realities", IGI Publishing, April 2007
   - **E.** Special Issue on Mining Low-Quality Data, J. of Knowledge and Information System (KAIS), 2007

International Conference/Workshop Co-Chair:

(a). **Conference Co-Chair**

1. **ICMLA 2012:** The Eleventh IEEE International Conference on Machine Learning and Applications (ICMLA 2012), Boca Raton, 2012.

(b). **Program Committee Co-Chair**

1. BIBE 2014: The 14th IEEE International Conference on BioInformatics and BioEngineering (BIBE-2014), Boca Raton, FL, USA, Nov. 10-12, 2014.
2. GRC 2013: The 2013 IEEE International Conference on Granular Computing (GRC-2013), Beijing, China, Dec. 13-15, 2013.

3. **ICTAI 2011:** The 23rd IEEE International Conference on Tools with Artificial Intelligence, Boca Raton, FL, USA, Nov. 7-9, 2011.
4. **ICMLA 2010:** The Ninth IEEE International Conference on Machine Learning and Applications (ICMLA 2010), Washington DC, USA, Dec. 12-14, 2010.

(c). **Program Vice Chair (Senior PC)**

1. **BigData 2017:** The IEEE International Conf. on Big Data, Boston, MA, USA, Dec 11-14, 2017.
2. **ICDM 2017:** The 17th IEEE International Conf. on Data Mining, New Orleans, USA. Nov. 18-21, 2017.
3. **ICTAI 2017:** The 29th IEEE International Conf. on Tools with Artificial Intelligence, Boston, MA, USA, Nov. 6-Nov. 8, 2017.
4. **ICDM 2013**: The 13th IEEE International Conf. on Data Mining, Dallas, Texas, USA, Dec. 8-11, 2013.
5. **CIKM 2013**: The 22nd ACM International Conference on Information and Knowledge Management, Burlingame, CA, USA, Oct. 27-Nov. 1, 2013.
6. **ICDM 2011**: The 11th IEEE Intl. Conf. on Data Mining, Vancouver, Canada, Dec. 11-14, 2011.
7. **CIKM 2011**: The 20th ACM International Conference on Information and Knowledge Management, Glasgow, Scotland, UK, Oct. 24-28, 2011.
8. **ICMLA 2011**: The 2011 IEEE International Conference on Machine Learning and Applications, Honolulu, Hawaii, USA, on December 18-21, 2011.
9. **CIKM 2010**: The 19th ACM International Conference on Information and Knowledge Management, Toronto, Canada, Oct. 26-30, 2010.

International Conference Program Committee Members:

(a) Served on the international conference program committee members (over 200 times)

Selected Publications (87 journal articles and 146 conference proceeding papers)

Book:

- **Xingquan Zhu**, Haicheng Tao, Zhiang Wu, Jie Cao, Kris Kalish, and Jeremy Kayne, *Fraud Prevention in Digital Advertising*, Springer Briefs in Computer Science, ISBN 978-3-319-56792-1, 2017.
- **X. Zhu**, R. Alhajj, T. Khoshgoftaar, and N. Bourbakis, Proceedings of the IEEE 14th International Conference on Bioinformatics and Bioengineering, Boca Raton, FL, USA, Nov. 10-12, November 2014.
- D. Tao, M. Reformat, A. Wani, T. Khoshgoftaar, and **X. Zhu**, Proceedings of the 11th International Conference on Machine Learning and Applications, volume 1, Boca Raton, FL, USA, Dec. 12-15, 2012.
- A. Wani, T. Khoshgoftaar, **X. Zhu**, and N. Seliya, Proceedings of the 11th International Conference on Machine Learning and Applications, volume 2, Boca Raton, FL, USA, Dec. 12-15, 2012.
- T. Khoshgoftaar and **X. Zhu**, *The 23rd IEEE International Conference on Tools with Artificial Intelligence*, ICTAI 2011, Boca Raton, FL, USA, 7-9 November 2011. IEEE Computer Society.
- S. Draghici, T. Khoshgoftaar, V. Palade, W. Pedrycz, M. Wani, and **X. Zhu**, *The Ninth International Conference on Machine Learning and Applications*, ICMLA 2010, Washington, DC, USA, 12-14 December 2010 IEEE Computer Society 2010
- **X. Zhu** and I. Davidson, *Knowledge Discovery and Data Mining: Challenges and Realities with Real World Data*, Idea Group Inc. Publishing, 2007.

Patent:

- Relevance Maximizing, Iteration Minimizing, Relevance-Feedback, Content-Based Image Retrieval (CBIR). H. Zhang, Z. Su, **X. Zhu**, United States Patents: No.6748398. No.7111002, No.7113944, No.7546293.
- Relational Pattern Discovery Across Multiple Databases, X. Wu and **X. Zhu**, United States Patent, No.8112440, Filled: April 14, 2008, Granted: February 7, 2012.

Selected Journal Articles (Peer Reviewed):

1. Jia Wu, Shirui Pan, **Xingquan Zhu**, Chengqi Zhang, and Philip S. Yu, Multiple Structure-View Learning for Graph Classification, *IEEE Transactions on Neural Networks and Learning Systems*, 29(7):3236-3251, 2018.

2. Jia Wu, Shirui Pan, **Xingquan Zhu**, Chengqi Zhang, and Xindong Wu, Towards Multi-instance Learning with Discriminative Bag Mapping. *IEEE Transactions on Knowledge and Data Engineering*, 30(6):1065-1080, 2018.
3. Lianhua Chi and **Xingquan Zhu**, Hashing Techniques: A Survey and Taxonomy, *ACM Computing Surveys*, 50(1): 11:1-11:36, 2017.
4. Ting Guo, Jia Wu, **Xingquan Zhu**, and Chengqi Zhang, Combining Structured Node Content and Topology Information for Networked Graph Clustering, *ACM Transactions on Knowledge Discovery from Data*, 11(3): 29:1-29:29, 2017.
5. Shirui Pan, Jia Wu, **Xingquan Zhu**, Guodong Long, and Chengqi Zhang, Task Sensitive Feature Exploration and Learning for Multitask Graph Classification, *IEEE Transactions on Cybernetics*, 47(3): 744-758, 2017.
6. Jia Wu, Shirui Pan, **Xingquan Zhu**, Chengqi Zhang, and Xindong Wu, Positive and Unlabeled Multi-Graph Learning *IEEE Transactions on Cybernetics*, *IEEE Trans. Cybernetics* 47(4): 818-829, 2017.
7. Haishuai Wang, Peng Zhang, **Xingquan Zhu**, Ivor Wai-Hung Tsang, Ling Chen, Chengqi Zhang, and Xindong Wu, Incremental Subgraph Feature Selection for Graph Classification, *IEEE Transactions on Knowledge and Data Engineering*, 29(1):128-142, 2017.
8. Shirui Pan, Jia Wu, **Xingquan Zhu**, Guodong Long, Chengqi Zhang, Boosting for graph classification with universum, *Knowledge and Information Systems*, 50(1): 53-77, 2017.
9. Fei Xie, Xindong Wu, **Xingquan Zhu**, Efficient sequential pattern mining with wildcards for keyphrase extraction, *Knowledge-Based Systems*, 115: 27-39, 2017.
10. Dongkuan Xu, Jia Wu, Dewei Li, Yingjie Tian, **Xingquan Zhu**, Xindong Wu, SALE: Self-adaptive LSH encoding for multi-instance learning. *Pattern Recognition* 71: 460-482, 2017.
11. Jose L. Hurtado, Ankur Agarwal, and **Xingquan Zhu**, Topic discovery and future trend forecasting for texts, Journal of Big Data, 3(7), 2016.
12. Shirui Pan, Jia Wu, **Xingquan Zhu**, Chengqi Zhang, and Philip S. Yu, Joint Structure Feature Exploration and Regularization for Multi-Task Graph Classification, *IEEE Transactions on Knowledge and Data Engineering* , 28(3):715-728, 2016.
13. Meng Fang, Jie Yin, and **Xingquan Zhu**, Active Exploration for Large Graphs, *Data Mining and Knowledge Discovery*, 30(3):511-549, 2016.
14. Jia Wu, Zhibin Hong, Shirui Pan, **Xingquan Zhu**, Zhihua Cai, Chengqi Zhang, Multi-graph-view subgraph mining for graph classification, *Knowledge and Information Systems*, 48(1): 29-54, 2016.
15. Jia Wu, Shirui Pan, **Xingquan Zhu**, Peng Zhang, Chengqi Zhang, SODE: Self-Adaptive One-Dependence Estimators for classification. *Pattern Recognition*, 51: 358-377, 2016.
16. Meng Fang, Jie Yin, **Xingquan Zhu**, Supervised sampling for networked data, *Signal Processing*, 124: 93-102, 2016.
17. Shirui Pan, Jia Wu, and **Xingquan Zhu**, CogBoost: Boosting for Fast Cost-sensitive Graph Classification, *IEEE Transactions on Knowledge and Data Engineering*, 27(11):2933-2946, 2015.
18. Bin Li, **Xingquan Zhu**, Ruijiang Li, and Chengqi Zhang, Rating Knowledge Sharing in Cross-Domain Collaborative Filtering, *IEEE Transactions on Cybernetics*, 45(5):1054-1068, May 2015.
19. Shirui Pan, Jia Wu, **Xingquan Zhu**, and Chengqi Zhang, Graph Ensemble Boosting for Imbalanced Noisy Graph Stream Classification, *IEEE Transactions on Cybernetics*, 45(5):940-954, May 2015.
20. Jia Wu, Shirui Pan, **Xingquan Zhu**, and Zhihua Cai, Boosting for Multi-Graph Classification, *IEEE Transactions on Cybernetics*, 45(3): 430-443, March, 2015.
21. Peng Zhang, Chuan Zhou, Peng Wang, Byron J. Gao, **Xingquan Zhu**, Li Guo: E-Tree: An Efficient Indexing Structure for Ensemble Models on Data Streams. *IEEE Transactions on Knowledge and Data Engineering*, 27(2): 461-474, 2015.
22. Meng Fang, Jie Yin, Xingquan Zhu, Chengqi Zhang, TrGraph: Cross-Network Transfer Learning via Common Signature Subgraphs. *IEEE Trans. Knowledge and Data Engineering*, 27(9): 2536-2549, 2015.

HANQI ZHUANG, Ph.D.
Professor and Assoc. Chair

Department of Computer & Electrical Engineering and Computer Science
Florida Atlantic University, Boca Raton, FL 33431
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1. EDUCATIONAL BACKGROUND

- Ph.D. in Electrical Engineering, Florida Atlantic Univ., Boca Raton, FL, 1989
- M.S. in Electrical Engineering, Florida Atlantic Univ., Boca Raton, Florida, 1986
- B.S. in Electrical Engineering, Shanghai Univ., 1982.

2. EMPLOYMENT HISTORY

- 1999 - Present Prof., Dept. Comput. & Electr. Eng. & Comput. Sci., FAU
- 1994 - 1999 Assoc. Prof. Dept. Electr. Eng., FAU
- 1990 - 1994 Assist. Prof. Dept. Electr. Eng., FAU

3. INSTRUCTIONAL ACTIVITIES

- Undergraduate Courses Taught at FAU: 14 courses
- Graduate Courses Taught at FAU: 15 courses
- Ph.D. Dissertations Supervised: 14 completed.
- M.S. Theses Supervised: 19 completed.
- Number of Senior Projects Supervised: > 200 groups.

4. SCHOLARLY ACHIEVEMENTS

4.1 Publications

4.1.1 Refereed Books:

1. Bai, Y., H. Zhuang, and D. Wang, *Advanced Fuzzy Logic Technologies in Industrial Applications*, Springer, 2006.
2. Zhuang, H. and Z. S. Roth, *Camera-Aided Robot Calibration,* CRC Press, 1996.

4.1.2 Recent Refereed Journal Articles[1]:

1. Ibrahim, A., H. Zhuang, L.M. Cherubin, and N. Erdol, "Automatic Classification of Grouper Species by Their Sounds using Deep Neural Networks," *J. Acoustical Society of America - EL*, in Press.
2. Ibrahim, A., L.M. Cherubin, H. Zhuang, M.T. S. Umpierre, F. Dalgleish, N. Erdol, B. Ouyang, and A. Dalgleish, "An Approach for Automatic Classification of Grouper Vocalizations with Passive Acoustic Monitoring," *J. Acoustical Society of America*, Vol. 143, No. 2, February 2018.
3. Vegad, S., H. Patel, H. Zhuang, and M. Naik, "Audio-Visual Person Recognition Using Deep Convolutional Neural Networks," (Undergraduate Student Paper), *J Biostatics and Biometrics*, Vol. 8, No. 5, Oct. 2017, pp. 1-7, 2017.
4. Muhamed-Ali A., H. Zhuang, and A. Ali, "An Approach for Facial Expression Recognition," *Int Journal of Biometrics*, Vol. 9, No. 2, pp96-112, 2017.
5. Esfahanian, M., H. Zhuang, N. Erdol, and E. Gerstein, "Two-stage Detection of North Atlantic Right Whale Upcalls using Local Binary Patterns and Machine Learning Algorithms," *J. Applied Acoustics*, Vol. 120, May 2017, pp 158-166.

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[1] All the Journals listed are international journals and papers published are reviewed by anonymous reviewers

6. Esfahanian, M., H. Zhuang, and N. Erdol, "Sparse Representation for Classification of Dolphin Whistles by Type," *J. Acoustical Society of America – EL*, Vol. 136 (1), July, 2014.
7. Esfahanian, M., H. Zhuang, and N. Erdol, "On Contour-based Classification of Dolphin Whistles by Type," *J. Applied Acoustics*, Vol. 76, pp. 274-279, Feb 2014.
8. Esfahanian, M., H. Zhuang, and N. Erdol, "Using Local Binary Patterns as Features for Classification of Dolphin Calls," *J. Acoustical Society of America – EL*, Vol. 134, No. 1, 2013.
9. Bai, Y., H. Zhuang, and D. Wang, "Apply Fuzzy Interpolation Method to Calibrate Parallel Machine Tools," *Int. J. Advanced Manufacturing Technology*, Vol. 60, No. 5, pp. 553-560, 2012.
10. Kotlarchyk, A., T. Khoshgoftaar, M. Pavlovic, H. Zhuang and A. S. Pandya "Identification of MicroRNA Biomarkers for Cancer by Combining Multiple Feature Selection Techniques," *J. Computational Methods in Science & Engineering*, Vol. 11, No 5-6, pp. 283-298, 2011.

5. ACTIVE MAJOR SPONSORED RESEARCH

- Zhu, H., H. Zhuang, T. Khoshgaftaar, D. Pados, and L. Cherubin, "MRI: Acquisition of Artificial Intelligence & Deep Learning (AIDL) Training and Research Laboratory," NSF #1828181, $652,850, 10/1/2018-9/30/2023.
- Ali Zilouchian, Nancy Romance, Nurgun Erdol, and Hanqi Zhuang, "HIS- STEM & Articulation Program: An Articulated State College-University Framework for Increasing Graduation Rates of Hispanic and Low-income Students in Computer Science," Department of Education. Total award: $4,456,707, 10/01/2016-09/30/2021.
- Agarwal, A., H. Zhuang, G. Gumus, L. Dunphy, and R. Behara, "Phase II I/UCRC Florida Atlantic University Site: Center for Health Organization Transformation," NSF #1624497, $300,000, 7/15/2016-7/14/2021.

6. PENDING RESEARCH GRANT

- Cherubin, L., M. Ajemian, H., H. Zhuang, and N. Erdol, "Unveiling the 'grouper guard' - the first line of subtropical coastal defense to UUVs via integrated acoustic smart-sensing," DARPA. Total requested budget: $6.3m. Completed the final budget negotiation.

7. SIGNIFICANT PROFESSIONAL SERVICE

- NSF Panel Review, 1995-Present. Average once a year.

8. SELECTED PROFESSIONAL RECOGNITION

- Finalist, University Distinguished Teacher of the Year Award, 2010.
- University Teaching Excellence and Innovation Award, 2002-2003.
- NSF Research Initiation Award, 1992.

Prof. Oge Marques, PhD

Curriculum Vitae

4 March 2019

Contact Information

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Email: omarques@fau.edu | http://www.eng.fau.edu/directory/faculty/marques/

Education (selected)

- Ph.D. in Computer Engineering, Florida Atlantic University, Boca Raton, FL (USA), Aug. 2001.
- Master's in Electronic Engineering, Philips International Institute, Eindhoven (NL), May 1989.
- B.Sc. in Electrical Engineering, CEFET-PR, Curitiba-PR (Brazil), Feb. 1987.

Current and Past Positions (selected)

- Professor, College of Engineering & Computer Science, FAU (2001 – Present)
- Professor (by courtesy), College of Business, FAU (2015 – Present)
- Associate Director, NSF Industry/University Cooperative Research Center (I/U CRC) for Advanced Knowledge Enablement (CAKE), FAU (2016 – Present)
- Associate Professor, CEECS Department, FAU (2007–2014)
- Assistant Professor, Department of Computer Science and Engineering, FAU (2001–2007)

Professional Recognition, Honors, and Awards (selected)

- *Leshner Leadership Institute Public Engagement Fellow,* AAAS (American Association for the Advancement of Science) (2019-2020).
- Engineering Educator of the Year Award, The Engineers' Council, West Palm Beach, FL (2019).
- Excellence and Innovation in Undergraduate Teaching Award, FAU (2018, 2011 and 2004).
- ACM Distinguished Speaker (2014 - present).
- *Outstanding Mid-Career Teaching* Award, American Society for Engineering Education - Southeastern Section (ASEE-SE) (2011).
- *Senior Member* of the IEEE (Institute of Electrical and Electronics Engineers) (2009 - present).
- *Senior Member* of the ACM (Association for Computing Machinery) (2009 - present).
- Member of Tau Beta Pi, the oldest engineering honor society, inducted as *Eminent Engineer* (2009 - present).
- Member of Sigma Xi, the honor society of research scientists and engineers (2009 - present).
- Member of Upsilon Pi Epsilon, the first honor society dedicated to the discipline of the computing and information disciplines (2004 - present).
- College of Engineering and Computer Science *Dean's Faculty Award* (2004-05).
- Member of Phi Kappa Phi, the oldest all-discipline honor society (1999 - present).

Membership in Professional Associations and Societies

- Senior Member, Association for Computing Machinery (ACM)
- Senior Member, Institute of Electrical and Electronics Engineers (IEEE)
- Member, American Society for Engineering Education (ASEE)
- Member, American Association for the Advancement of Science (AAAS)
- Member, Society for Imaging Informatics in Medicine (SIIM)

Languages

- *Portuguese*: native language
- *English*: fluent (speaking, reading, writing)
- *Spanish*: fluent (speaking, reading); intermediate (writing)
- *French*: intermediate (speaking, reading); basic (writing)

Public Speaking Engagements (selected, 2014 – present)

- Invited talk: "Human Augmentation", *Technische Universität Wien*, Vienna, Austria, July 2019. (*upcoming*)
- Invited talk: "Human Augmentation", Center for Brains, Minds and Machines (CBMM), Massachusetts Institute of Technology (MIT), May 2019. (*upcoming*)
- Invited talk: "Using games to solve challenging multimedia problems", St. Pölten University of Applied Sciences, St. Pölten, Austria, December 2018.
- Invited talk: "Medical image analysis using deep learning", *Technische Universität Wien*, Vienna, Austria, December 2018.
- Guest lecture: "Machine Learning and Applications", *FH Campus Wien*, University of Applied Sciences, Vienna, Austria, December 2018.
- Invited talk: "Medical image analysis using deep learning", Johns Hopkins University, Baltimore, MD, November 2018.
- Guest lecture: "Introduction to medical image analysis using deep learning", Johns Hopkins University, Baltimore, MD, November 2018.
- Invited talk: "Medical image analysis and medical information retrieval, with and without deep learning", Lister Hill National Center for Biomedical Communications, National Library of Medicine (NLM), National Institutes of Health (NIH), Bethesda, MD, October 2018.
- Invited talk: "The Artificial Intelligence revolution in Medicine: technology, risks, applications and implications", *Université d'Orléans*, Orléans, France, September 2018.
- Tutorial: "Deep Learning for Computer Vision Using MATLAB", ENSEEIHT Engineering School, University of Toulouse, France, September 2018.
- Seminar: "Machine Learning and Applications", *Université d'Orléans*, Orléans, France, September 2018.
- Invited talk: "Machine Learning and its applications", Vlatacom Institute, Belgrade, Serbia, August 2018.
- Invited talk: " Can you trust what you see? The magic of visual perception", University of Belgrade, Serbia, August 2018.

- Invited talk: "Using games to solve challenging multimedia problems," Wichita State University, Wichita, KS, April 2018.
- Lecture: "Self-driving cars, robot radiologists, and more: how artificial intelligence is changing the world forever", Lifelong Learning Society (LLS), Florida Atlantic University, March 2018.
- Lecture: "Looking through the artist's eyes", Lifelong Learning Society (LLS), Florida Atlantic University, March 2018.
- Lecture: "Visual intelligence: using works of art to sharpen world perception", Lifelong Learning Society (LLS), Florida Atlantic University, December 2017.
- Tutorial: "Medical image analysis using deep learning", *IEEE 7th* International Conference on Image Processing Theory, Tools and Applications (IPTA 2017), Montreal, Nov 28 – Dec 1, 2017.
- Keynote speech: "Using games to solve challenging multimedia problems," SBGames (*XVI Simpósio Brasileiro de Jogos e Entretenimento Digital*) 2017, Curitiba, Brazil, Nov 2-4, 2017.
- Invited talk: "Using games to solve challenging multimedia problems," U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC), Vicksburg, MS, June 2017.
- Invited talk: "Can you trust what you see? The magic of visual perception", *Technische Universität Wien*, Vienna, Austria, May 2017.
- Tutorial: "Medical image analysis using deep learning", *IASTED International Conference on Biomedical Engineering*, Innsbruck, Austria, February 2017.
- Invited talk: "Machine Learning and Applications", Indian Institute of Information Technology and Management, Kerala (IIITM-K), Trivandrum, India, December 2016.
- Plenary talk: "Inspiring Actions for Successful Engineering Education", Fourth IEEE International Conference on MOOCs, Innovation and Technology in Education (MITE 2016), Madurai, India, December 2016.
- Lecture: "Face recognition by humans and computers", Lifelong Learning Society (LLS), Florida Atlantic University, November 2016.

Research Summary

Focus: ***intelligent processing of visual information***, a combination of artificial intelligence, image processing, computer vision, human vision, and machine learning, with recent emphasis on medical applications.

In addition to applying artificial intelligence to image analysis and computer vision problems, my research has been inspired by the **human factors** associated with visual perception, object recognition, image retrieval, and other intelligent visual processing tasks. Consequently, I have also devoted a significant amount of effort researching the **cognitive foundations of human visual perception** and building **serious games** and other human computation solutions (e.g., crowdsourcing) to engage users in such tasks.

My research has been funded by the National Science Foundation (NSF), Office of Naval Research (ONR), and the Department of Defense (DoD), among others. Results of my research have been published in widely recognized international journals and conferences (see ***Publications***). I currently (co-)supervise 2 PhD Dissertations (one at FAU, one at *Alpen-Adria Universität Klagenfurt* (Austria)) and one Master's student (at FAU). I have previously (co-) supervised to completion 6 PhD students and 15 Master's students, in three different countries/universities.

Publications (selected, 1999 - present)

Summary: **one patent**, **10 books**, **20+ refereed international journal publications**, **70+ refereed papers in scientific conferences**, and several book chapters, invited papers, and other publications. Publications reflect collaborations with different teams of authors/editors and have led to **2372 citations**, an **h-index of 25**, and an **i10-index of 44** (*source: Google Scholar, last update: February 25, 2019*). A complete list of publications (along with other information) can be found at my ORCID profile: http://orcid.org/0000-0003-4321-2719. A **partial list** follows.

Patent

- **O. Marques**, L.M. Mayron, and G.B. Borba, "System and Methods of Image Retrieval", 2011. US Patent 7,933,452.

Books

- **O. Marques** and H. Vieira Neto, "Processamento Digital de Imagens" ("Digital Image Processing") (*in Portuguese*), *Editora Brasport*, Rio de Janeiro, Brazil, 1999.
- **O. Marques** and B. Furht, "Content-Based Image and Video Retrieval", *Kluwer Academic Publishers*, Norwell, MA, 2002.
- **O. Marques**, "Practical Image and Video Processing Using MATLAB®", *Wiley-IEEE Press*, New York, NY, 2011.
- M. Lux and **O. Marques**, "Visual Information Retrieval Using Java and LIRE", *Morgan & Claypool*, 2013.
- **O. Marques**, "Practical Image and Video Processing Using MATLAB" (*in Chinese*), *Tsinghua University Press / John Wiley & Sons*, 2013.
- J. Gibson and **O. Marques**, "Optical Flow and Trajectory Estimation Methods", Springer, 2016.
- **O. Marques**, "Innovative Technologies in Everyday Life", Springer, 2016.
- B. Stojanović, **O. Marques** and A. Nešković, "Segmentation and separation of overlapped latent fingerprints: algorithms, techniques, and datasets", Springer, 2019 (*to appear*).
- **O. Marques**, "Image Processing and Computer Vision for iOS", Springer, 2019 (*to appear*).

Journal Papers and Magazine Articles (selected)

- **O. Marques**, L.M. Mayron, G.B. Borba, and H.R. Gamba, "An attention-driven model for grouping similar images with image retrieval applications", *EURASIP Journal on Advances in Signal Processing*, Special Issue on Image Perception, Vol. 2007, Article ID 43450, 17 pages, 2007.
- D. Culibrk, **O. Marques**, D. Socek, H. Kalva, and B. Furht, "Neural Network Approach to Background Modeling for Video Object Segmentation", *IEEE Transactions on Neural Networks*, Vol. 18, No. 6, pp. 1614-1627, November 2007.
- D. Socek, S.S. Magliveras, D. Culibrk, **O. Marques**, H. Kalva and B. Furht, "Digital Video Encryption Algorithms Based on Correlation-Preserving Permutations", *EURASIP Journal on Information Security*, Volume 2007, Article ID 52965, 15 pages, DOI:10.1155/2007/52965.
- M. Lux, **O. Marques**, K. Schöffmann, L. Böszörmenyi, G. Lajtai, "A Novel Tool for Summarization of Arthroscopic Videos", *Multimedia Tools and Applications*, 2009, DOI: 10.1007/s11042-009-0353-1.
- K. Schöffmann, F. Hopfgartner, **O. Marques**, L. Böszörmenyi, and J.M. Jose, "A Review on Video Browsing Interfaces and Applications", *SPIE Reviews* 1, 018004 (2010), DOI: 10.1117/6.0000005.

- **O. Marques**, E. Barenholtz, and V. Charvillat, "Context modeling in computer vision: techniques, implications, and applications", *Multimedia Tools and Applications*, 2010, DOI: 10.1007/s11042-010-0631-y.
- A. Marcus and **O. Marques**, "An Eye on Visual Sensor Networks", *IEEE Potentials*, April 2012, 31(2), 38-43, DOI: 10.1109/MPOT.2011.2178279.
- S. Chatzichristofis, C. Iakovidou, Y. Boutalis, and **O. Marques**, "Co.Vi.Wo.: Color Visual Words Based on Nonpredefined Size Codebooks", *IEEE Transactions on Systems, Man, and Cybernetics. Part B, Cybernetics*, July 2012, DOI: 10.1109/TSMCB.2012.2203300
- A. Carlier, A. Salvador, X. Giro-i-Nieto, V. Charvillat, and **O. Marques**, "Assessment of Crowdsourcing and Gamification Loss in User-Assisted Object Segmentation". *Multimedia Tools and Applications*, September 2015, DOI: 10.1007/s11042-015-2897-6.
- J. Gibson and **O. Marques**, "Sparsity in Optical Flow and Trajectories", *Signal, Image and Video Processing*, March 2016, Volume 10, Issue 3, pp 487-494.
- B. Stojanović, **O. Marques** and A. Nešković, "Latent overlapped fingerprint separation: a review". *Multimedia Tools and Applications* (2016). DOI:10.1007/s11042-016-3908-y
- M. Taschwer and **O. Marques**, "Automatic Separation of Compound Figures in Scientific Articles". *Multimedia Tools and Applications* (2016). DOI: 10.1007/s11042-016-4237-x
- **O. Marques**, "Visual Information Retrieval: the state of the art", *IEEE IT Professional*, vol. 18, no. 4, pp. 7-9, July-Aug. 2016. doi: 10.1109/MITP.2016.70 (*invited paper*)
- C. Lagger, M. Lux, and **O. Marques**. "What Makes People Watch Online Videos: An Exploratory Study". *ACM Comput. Entertain.* 15, 2, Article 6 (2017) https://doi.org/10.1145/3034706.
- J. Burdick, **O. Marques**, J. Weinthal, and B. Furht, "Rethinking Skin Lesion Segmentation in a Convolutional Classifier", *Journal of Digital Imaging* (2017) https://doi.org/10.1007/s10278-017-0026-y
- B. Stojanović, **O. Marques**, and A. Nešković, "Deep learning-based approach to latent overlapped fingerprints mask segmentation", *IET Image Processing Journal* (2018). DOI: 10.1049/iet-ipr.2017.1227

Conference Proceedings (selected)

- J. Gibson and **O. Marques**, "Stereo Depth with a Unified Architecture GPU", Workshop on "Computer Vision on GPUs", co-located with IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR) 2008, June 24-26, 2008, Anchorage, Alaska.
- A. Romero Lopez, X. Giro-i-Nieto, J. Burdick, and **O. Marques**, "Skin lesion classification from dermoscopic images using deep learning techniques", *IASTED International Conference on Biomedical Engineering*, Innsbruck, Austria, February 2017. DOI: 10.2316/P.2017.852-053
- A. Ishay and **O. Marques**, "ImageCLEF 2018 Tuberculosis Task: Ensemble of 3D CNNs with Multiple Inputs for Tuberculosis Type Classification", Conference and Labs of the Evaluation Forum (CLEF) 2018, Avignon, France, September 2018.
- M. Lungren, L.S. Folio, H.M. Do, **O. Marques**, S. Antani, and L.R. Folio, "Proposed Launchpad of Publicly Available Diagnostic Imaging Databases," *SIIM Annual Meeting*, Denver, CO, June 2019. (*accepted*)
- F. Farhadi, J. Dakai, L.B. Machado, J. Yao, G. Cohen, Z. Xu, H.M. Do, **O. Marques**, and L.R. Folio, "Optimal radiologist annotations for accelerating deep learning training," *SIIM Annual Meeting*, Denver, CO, June 2019. (*accepted*)

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Research Interest

My primary research interests are in data mining and big data analytics, information retrieval, and machine learning studying both algorithmic and application issues.

Education

Ph.D. Computer Science, Florida International University, Dec. 2010
B.S. Computer Science, University of Science and Technology of China, Jul. 2003

Research Experience

Assistant Professor, Florida Atlantic University, Boca Raton, FL, August 2014-Present
Research Intern, NEC Laboratories America, Inc., Cupertino, CA, Summer 2007, 2008, 2009

Selected Journal Publications

Sahar Sohangir, Dingding Wang, Anna Pomeranets, Taghi Khoshgoftaar. **Deep Learning for Financial Sentiment Analysis**. In *Journal of Big data, 5(1):3*, 2018.

Sahar Sohangir, Dingding Wang. **Improved sqrt-cosine similarity measurement**. . In *Journal of Big data, 4(1):25*, 2017.

Dingding Wang, Mitsunori Ogihara, Calos Gallo, Juan A. Villamar, Justin Smith, Wouter Vermeer, Gracelyn Cruden, Nanette Benbow, Hendricks Brown. **Automatic Classification of Communication Logs into Implementation Stages via Text Analysis.** In *Implementation Science, 11(1):119*, 2016.

Karl Weiss, Taghi M Khoshgoftaar, Dingding Wang. **A Survey of Transfer Learning**. In *Journal of Big Data*, 2016.

John Renaud, Scott Britton, Dingding Wang, Mitsunori Ogihara. **Mining Library and University Data to Understand Library Use Patterns**. In *The Electronic Library*, 33(3): 355-372, 2015.

Dingding Wang, Shenghuo Zhu, Tao Li, and Yihong Gong. **Comparative Document Summarization via Discriminative Sentence Selection**. In *ACM Transactions on Knowledge Discovery from Data (ACM TKDD)*, 6(3):12:1-18, 2013.

Dingding Wang, Shenghuo Zhu, Tao Li. **SumView: A Web-Based Engine for Summarizing Product Reviews and Customer Opinions**. In *Expert Systems and Applications*, 40(1):27-33, 2013.

Dingding Wang and Tao Li. **Weighted Consensus Multi-Document Summarization.** In *Information Processing & Management (IPM)*, 48(3):513-523, 2012.

Lei Li, Dingding Wang, Shunzhi Zhu, and Tao Li. **Personalized News Recommendation: A Review and An Experimental Investigation.** In *Journal of Computer Science and Technology*, 26(5):754-766, 2011.

Dingding Wang, Shenghuo Zhu, Tao Li, Yun Chi, and Yihong Gong. **Integrating Document Clustering and Multi-Document Summarization.** In *ACM Transactions on Knowledge Discovery from Data (ACM TKDD)*, 5(3):14:1-26, 2011.

Dingding Wang, Shenghuo Zhu, Tao Li, and Yihong Gong. **iHelp: An Intelligent Online Helpdesk System.** In *IEEE Transactions on Systems, Man, and Cybernetics: Part B*, 41(1): 173-182, 2010.

Shenghuo Zhu, Dingding Wang, Kai Yu, Tao Li, and Yihong Gong. **Feature Selection for Gene Expression using Model-based Entropy.** In *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 7(1): 25-36, 2010.

Bo Shao, Dingding Wang, Tao Li, and Mitsunori Ogihara. **Music Recommendation Based on Acoustic Features and User Access Patterns.** In *IEEE Transactions on Audio, Speech and Language Processing*, 17(8):1602-1611, 2009.

Selected Conference Publications

Sahar Sohangir, Nicholas Petty, Dingding Wang. **Financial Sentiment Lexicon Analysis.** In *Proceedings of IEEE 12th International Conference on Semantic Computing (ICSC 2018)*, 2018.

Tao Li, Wubai Zhou, Chunqiu Zeng, Qing Wang, Qifeng Zhou, Dingding Wang, Jia Xu, Yue Huang, Wentao Wang, Mingjing Zhang, Steve Luis, Shu-Ching Chen, Naphtali Rishe. **DI-DAP:An Efficient Disaster Information Delivery and Analysis Platform in Disaster Management.** In *Proceedings of the 25th ACM Conference on Information and Knowledge Management (CIKM 2016)*, 2016.

Ramesh Baral, Dingding Wang, Tao Li, Shu-Ching Chen. **GeoTeCS: Exploiting Geographical, Temporal, Categorical and Social aspects for Personalized POI Recommendation.** In *Proceedings of the 17th IEEE International Conference on Information Reuse and Integration (IEEE IRI 2016)*, 2016.

Dingding Wang, Lei Li, Tao Li. **NewsCubeSum: A Personalized Multidimensional News Update Summarization System.** In *Proceedings of 14th International Conference on Machine Learning and Applications (ICMLA 2015)*, 2015.

Dingding Wang, Sahar Sohanger, Tao Li. **Update Summarization using Semi-Supervised Learning Based on Hellinger Distance.** In *Proceedings of the 24th ACM Conference on Information and Knowledge Management (CIKM 2015)*, 2015.

Longhui Zhang, Lei Li, Tao Li, and Dingding Wang. **PatentDom: Analyzing Patent Relationships on Multi-View Patent Graphs.** In *Proceedings of the 23rd ACM Conference on Information and Knowledge Management (CIKM 2014)*, pages 1369-1378, 2014.

Dingding Wang, Tao Li, and Mitsunori Ogihara. **Generating Pictorial Storylines via Minimum-**

Weight Connected Dominating Set Approximation in Multi-view Graphs. In *Proceedings of the Twenty-Sixth AAAI Conference on Arti_cial Intelligence (AAAI 2012)*, pages 683-690, 2012.

Chen Lin, Chun Lin, Jingxuan Li, Dingding Wang, Yang Chen, and Tao Li. **Generating Event Storyline from Microblogs.** In *Proceedings of the 21st ACM Conference on Information and Knowledge Management (CIKM 2012)*, pages 175-184, 2012.

Dingding Wang, Mitsunori Ogihara, Erliang Zeng, and Tao Li. **Combining Gene Expression Profiles and Protein-Protein Interactions for Identifying Functional Modules.** In *Proceedings of 11th International Conference on Machine Learning and Applications (ICMLA 2012)*, pages 114-119, 2012.

Dingding Wang and Mitsunori Ogihara. **Potential Relationship Discovery in Tag-Aware Music Style Clustering and Artist Social Networks.** In *Proceedings of the 12th International Society for Music Information Retrieval Conference* (ISMIR 2011), pages 435-440, 2011.

Lei Li, Dingding Wang, Tao Li, Daniel Knox, and Balaji Padmanabhan. **SCENE : A Scalable Two-Stage Personalized News Recommendation System.** In *Proceedings of the 34th Annual ACM SIGIR Conference* (SIGIR 2011), pages 125-134, 2011.

Yi Zhang, Dingding Wang, and Tao Li. **iDVS: An Interactive Multi-Document Visual Summarization System.** In *Proceedings of European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases* (ECML/PKDD 2011), pages 569-584, 2011.

Dingding Wang, Tao Li, and Chris Ding. **Weighted Feature Subset Non-Negative Matrix Factorization and its Applications to Document Understanding.** In *Proceedings of 2010 IEEE International Conference on Data Mining* (ICDM 2010), pages 541-550, 2010.

Dingding Wang and Tao Li. **Document Update Summarization using Incremental Hierarchical Clustering.** In *Proceedings of the Conference on Information and Knowledge Management* (CIKM 2010), pages 279-287, 2010.

Dingding Wang, Tao Li and Mitsunori Ogihara. **Are Tags Better Than Audio? The Effect of Joint Use of Tags and Audio Content Features for Artistic Style Clustering.** In *Proceedings of the Eleventh International Society for Music Information Retrieval Conference* (ISMIR 2010), pages 57-62, 2010.

Dingding Wang, Shenghuo Zhu, Tao Li, and Yihong Gong. **Comparative Document Summarization via Discriminative Sentence Selection.** In *Proceedings of the Conference on Information and Knowledge Management* (CIKM 2009), pages 1963-1966, 2009.

Dingding Wang, Chris Ding, and Tao Li. **K-Subspace Clustering.** In *Proceedings of the European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases* (ECML/PKDD 2009), pages 506-521, 2009.

Dingding Wang, Shenghuo Zhu, Tao Li, and Yihong Gong. **Multi-document Summarization using Sentence-based Topic Models.** In *Proceedings of the 47th Annual Meeting of the Association for Computational Linguistics* (ACL 2009), pages 297-300, 2009.

Dingding Wang, Shenghuo Zhu, Tao Li, Yun Chi, and Yihong Gong. **Integrating clustering and multi-document summarization to improve document understanding.** In *Proceedings of the Conference on Information and Knowledge Management* (CIKM 2008), pages 1435-1436, 2008.

Dingding Wang, Tao Li, Shenghuo Zhu, and Chris Ding. **Multi-Document Summarization via Sentence-Level Semantic Analysis and Symmetric Matrix Factorization.** In *Proceedings of the International ACM SIGIR Conference* (SIGIR 2008), pages 307-314, 2008.

Yanfang Ye, Dingding Wang, Tao Li, and Dongyi Ye. **IMDS: Intelligent Malware Detection System.** In *Proceedings of ACM International Conference on Knowledge Discovery and Data Mining,* (KDD 2007), pages 1043-1047, 2007.

Teaching

COP 3540 Introduction to Database Structures
COP 4703 Applied Database Systems
CAP 6776 Information Retrieval
CAP 6930 Natural Language Processing

Graduate Students

Ph.D Advisor of Sahar Sohangir (since Spring 2015), Feng Liu (since Fall 2016).

Services

Program Co-Chair of the 18th International Conference on Machine Learning and Applications (ICMLA 2019); Poster and Demo Chair of 14th IEEE International Conference on Machine Learning and Applications (ICMLA 2015); Program Co-Chair of Web Information Systems and Engineering (WISE 2015); Local Arrangement Chair of IEEE 14th International Conference on Bioinformatics and Bioengineering (BIBE 2014); Registration Chair of The 12th International Society for Music Information Retrieval Conference (ISMIR 2011).

Program committee of AAAI 2019, the International Joint Conference on Artificial Intelligence (IJCAI 2017), the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2017), the 16th International Conference on Machine Learning and Applications. (ICMLA 2017), IEEE International Conference on Semantic Computing (ICSC 2015), ACM 21st Conference on Information and Knowledge Management (CIKM 2012), Conference on Empirical Methods in Natural Language Processing (EMNLP 2010), the 10th International Conference on Machine Learning and Applications. (ICMLA 2011).

Journal Reviewer for Decision Support Systems, Knowledge and Information Systems, IEEE Transactions on Knowledge and Data Engineering, ACM Transactions on Intelligent Systems and Technology, International Journal of Intelligent Systems Technologies and Applications, International Journal of Machine Learning and Cybernetics, Computational Intelligence, Central European Journal of Computer Science, Theory of Computer Science.

Patents

Multi-Document Summarization Utilizing Document Clustering. US Patent Issued #8,402,369. March 19, 2013.

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PROFESSIONAL APPOINTMENTS

Tenure-Track Assistant Professor, Computer & Electrical Engineering and Computer Science, Florida Atlantic University 08/2016–present

Research Faculty Fellow, Institute for Sensing and Embedded Network Systems Engineering, Florida Atlantic University 08/2016–present

EDUCATION

Ph.D. in Electrical Engineering, University of Rhode Island, USA 08/2016
Dissertation: "*A Computational Intelligence Framework for Smart Grid*"
Advisor: Prof. Haibo He (Department Chair & Robert Haas Endowed Chair Professor)

M.S. in Electrical Engineering and Automation, Hohai University, China 06/2011
Thesis: "*Coordinated Optimal Control of Power System with Wind Farm*"

B.Eng. in Electrical Engineering and Automation, Hohai University, China 06/2008

TEACHING

1. EEL-6935:"Smart Grid," at FAU, Fall 2017, Fall 2018.
2. EEL-4216:"Electric Power Systems," at FAU, Spring 2017, Spring 2018.
3. EEL-5613:"Modern Control," at FAU, Summer 2019 (plan).
4. Spring 2012: TA of URI ELE-202 "Digital Circuit Design Lab."
5. Fall 2011: TA of URI ELE-215 "Linear Circuits Laboratory."

ACADEMIC AWARDS

IEEE PESGM Best Conference Paper in Stability Control and Protection	2017
URI Steve Bouley and Rhonda Wilson Graduate Fellowship	2016
IEEE Transactions on Smart Grid Best Reviewer	2015
IEEE PESGM Graduate Student Poster Contest Winner, Second Prize	2015
Chinese Government Award for Outstanding Students Abroad	2015
IEEE International Conference on Communications (ICC) Best Paper Award	2014

PUBLICATIONS (SELECTED)

Peer-Reviewed Journal Papers. Underlines indicate the students under supervision.

1. E. Lindbeck, **Y. Tang**, D. Wilson, B. Dunlap, J. VanZwieten, and E. Muljadi, "Marine Hydrokinetic Generation System Modeling and Fault Diagnosis," in *Sustainable Energy, IEEE Transactions on*, 2019. (Under review)
2. M. Shi, **Y. Tang**, X. Zhu, J. Liu and H. He, "Topical Network Embedding," in *Data Mining and Knowledge Discovery Journal*, 2019. (Under review)
3. M. Shi, **Y. Tang**, and X. Zhu, "MLNE: Multi-Label Network Embedding," in *Neural Networks and Learning Systems, IEEE Transactions on*, 2019. (Under review)
4. M. Shi, J. Liu, **Y. Tang**, and X. Zhu, "WSNE: Web Service Network Embedding with Structure and Functional Content," in *Software Engineering, IEEE Transactions on*, 2019. (Under review)
5. M. Shi, **Y. Tang**, and J. Liu, "Functional and Contextual Attention-based LSTM for Service Recommendation in Mashup Creation," in *Parallel and Distributed Systems, IEEE Transactions on*, 2018. (In press)

6. H. Li, P. Ju, and **Y. Tang**, "Analytic Method for Forced Oscillation in Smart Grid Under Stochastic Continuous Disturbances," in *Smart Grid, IEEE Transactions on*, 2018. (In press)
7. M. Shi, J. Liu, D. Zhou, and **Y. Tang**, "A Topic-Sensitive Method for Mashup Tag Recommendation Utilizing Multi-Relational Service Data," in *Services Computing, IEEE Transactions on*, 2018. (In press)
8. H. Shuai, J. Fang, X. Ai, **Y. Tang**, J. Wen, and H. He, "Stochastic Optimization of Economic Dispatch for Microgrid Based on Approximate Dynamic Programming," *Smart Grid, IEEE Transactions on*, 2018. (In press)
9. G. Jiang, H. He, P. Xie, and **Y. Tang**, "Stacked Multi-Level-Denoising Auotoencoders: A New Representation Learning Approach for Wind Turbine Gearbox Fault Diagnosis," *Instrumentation & Measurement, IEEE Transactions on*, vol. 66, no. 9, pp. 2391-2402, Sept. 2017.
10. C. Mu, **Y. Tang**, and H. He, "Improved Sliding Mode Design for Load Frequency Control of Power System Integrated an Adaptive Learning Strategy," *Industrial Electronics, IEEE Transactions on*, vol. 64, no. 8, pp. 6742-6751, Aug. 2017.
11. Y. Guo, X. Li, **Y. Tang**, and J. Li, "Heuristic Artificial Bee Colony Algorithm for Uncovering Community in Complex Networks," *Mathematical Problems in Engineering Journal*, vol. 2017, Article ID 4143638, 12 pages, 2017.
12. **Y. Tang**, C. Luo, and H. He, "A Chance Constrained Optimal Reserve Scheduling Approach for Economic Dispatch Considering Wind Penetration," *IEEE/CAA Journal of Automatica Sinica*, vol. 4, no. 2, pp. 186-194, April 2017.
13. J. Yan, H. He, X. Zhong, and **Y. Tang**, "Q-learning Based Vulnerability Analysis of Smart Grid against Sequential Topology Attacks," *Information Forensics & Security, IEEE Transactions on*, vol. 12, no. 1, pp. 200-210, Jan. 2017.
14. L. Dong, **Y. Tang**, H. He, and C. Sun, "An Event-Triggered Approach for Load Frequency Control With Supplementary ADP," *Power Systems, IEEE Transactions on*, vol. 32, no. 1, pp. 581-589, Jan. 2017.
15. **Y. Tang**, C. Mu, and H. He, "SMES Based Damping Controller Design Using Fuzzy-GrHDP Considering Transmission Delay," *Applied Superconductivity, IEEE Transactions on*, vol. 26, no. 7, pp. 1-6, Oct. 2016.
16. **Y. Tang**, Z. Ni, X. Zhong, H. He, D. Zhao, and X. Xu, "Fuzzy-Based Goal Representation Adaptive Dynamic Programming," *Fuzzy Systems, IEEE Transactions on*, 2016, vol. 24, no. 5, pp. 1159-1175, Oct. 2016.
17. **Y. Tang**, H. He, Z. Ni, and J. Wen, "Adaptive Modulation for DFIG and STATCOM With High-Voltage Direct Current Transmission," *Neural Networks and Learning Systems, IEEE Transactions on*, vol. 27, no. 8, pp. 1762-1772, 2016.
18. Z. Ni, **Y. Tang**, X. Sui, H. He, and J. Wen, "An Adaptive Neuro-Control Approach for Multi-Machine Power Systems," *International Journal of Electrical Power Energy Systems*, vol. 75, pp. 108-116, 2016.
19. **Y. Tang**, H. He, J. Wen and J. Liu, "Power System Stability Control for a Wind Farm Based on Adaptive Dynamic Programming," *Smart Grid, IEEE Transactions on*, vol. 6, no. 1, pp. 166-177, 2015.
20. **Y. Tang**, J. Yang, J. Yan, and H. He, "Intelligent Load Frequency Controller Using GrADP for Island Smart Grid with Electric Vehicles And Renewable Resources," *Neurocomputing*, vol. 170, no. 1, 2015.
21. J. Yan, **Y. Tang**, H. He, and Y. Sun, "Cascading Failure Analysis With DC Power Flow Model and Transient Stability Analysis," *Power Systems, IEEE Transactions on*, vol. 30, no. 1, pp. 285-297, 2015.
22. Y. Zhu, J. Yan, **Y. Tang**, Y. Sun, and H. He, "Joint Substation-Transmission Line Vulnerability Assessment Against the Smart Grid," *Information Forensics and Security, IEEE Transactions on*, vol. 10, no. 5, pp. 1010-1024, 2015.

23. **Y. Tang**, H. He, Z. Ni, J. Wen, and X. Sui, "Reactive Power Control of Grid-Connected Wind Farm Based on Adaptive Dynamic Programming," *Neurocomputing*, vol. 125, no. 1, pp. 125-133, 2014.
24. X. Sui, **Y. Tang**, H. He, and J. Wen, "Energy-Storage-Based Low-Frequency Oscillation Damping Control Using Particle Swarm Optimization and Heuristic Dynamic Programming," *Power Systems, IEEE Transactions on*, vol. 29, no. 5, pp. 2539-2548, 2014.
25. Y. Zhu, J. Yan, **Y. Tang**, Y. Sun, and H He, "Resilience Analysis of Power Grids Under the Sequential Attack," *Information Forensics and Security, IEEE Transactions on*, vol. 9, no. 12, pp. 2340-2354, 2014.
26. **Y. Tang**, P. Ju, H. He, C. Qin, and F. Wu, "Optimized Control of DFIG-Based Wind Generation Using Sensitivity Analysis and Particle Swarm Optimization," *Smart Grid, IEEE Transactions on*, vol. 4, no. 1, pp. 509-520, 2013.

Peer-Reviewed Conference Papers

1. M. Shi, **Y. Tang**, J. Liu, and B. Cao, "TA-BLSTM: Tag Attention-Based Bidirectional Long Short-Term Memory for Service Recommendation in Mashup Creation," *International Joint Conference on Neural Networks (IJCNN)*, 2019. (Under review)
2. Y. Huang, **Y. Tang**, and J. VanZwieten, "An Adversarial Learning Approach for Prognostic Health Management," *International Joint Conference on Neural Networks (IJCNN)*, 2019. (Under review)
3. E. Lindbeck, **Y. Tang**, and J. VanZwieten, "Advanced Signal Processing for Marine Hydrokinetic Turbine Fault Detection," *Marine Energy Technology Symposium (METS)*, 2019. (Under review)
4. B. Freeman, **Y. Tang**, and J. VanZwieten, "Morlet Continuous Time Wavelet Transform for MHK Rotor Blade Fault Detection," *Power and Energy Society General Meeting (PESGM)*, 2019. (Under review)
5. Y. Huang, **Y. Tang**, and J. VanZwieten "Remaining Useful Life Estimation of Hydrokinetic Turbine Blades Using Power Signals," *Power and Energy Society General Meeting (PESGM)*, 2019. (Under review)
6. **Y. Tang**, J. VanZwieten, B. Dunlap, D. Wilson, C. Sultan, and N. Xiros, "In-Stream Hydrokinetic Turbine Fault Detection and Fault Tolerant Control - A Benchmark Model," *American Control Conference (ACC)*, 2019. (Accepted)
7. D. Wilson, S. Passmore, **Y. Tang**, and J. VanZwieten, "Bidirectional Long Short-Term Memory Networks for Rapid Fault Detection in Marine Hydrokinetic Turbines," *17th IEEE International Conference On Machine Learning And Applications*, IEEE ICMLA 2018.
8. **Y. Tang**, B. Freeman, D. Wilson, and J. VanZwieten, "FAST-Based In-Stream Hydrokinetic Generation System Modeling for MCM and PHM," Marine Energy Technology Symposium (METS), 2018.
9. D. Wilson, **Y. Tang**, J. Yan, and Z. Lu, "Deep Learning-Aided Cyber-Attack Detection in Power Transmission Systems," *Power and Energy Society General Meeting (PESGM), 2018 IEEE*, 2018.
10. Z. Lu and **Y. Tang**, "How Can Cyber-Physical Interdependence Affect the Mitigation of Cascading Power Failure?" *International Conference on Computer Communications (INFOCOM), 2018 IEEE*, 2018.
11. **Y. Tang** and H. He, "Inter-Connected Power System Frequency Stability with Wind Penetration by Using Fuzzy-GrHDP," *Power and Energy Society General Meeting (PESGM), 2017 IEEE*, 2017. **(Best Paper Award)**
12. **Y. Tang**, C. Mu, and H. He, "Near-Space Aerospace Vehicles Attitude Control Based on Adaptive Dynamic Programming and Sliding Mode Control," *International Joint Conference on Neural Networks (IJCNN)*, 2017.
13. **Y. Tang** and J. Yang, "Dynamic Event Monitoring Using Unsupervised Feature Learning Towards Smart Grid Big Data," *International Joint Conference on Neural Networks (IJCNN)*, 2017.

14. C. Mu, **Y. Tang**, and H. He, "Observer-Based Sliding Mode Frequency Control for Micro-Grid with Photovoltaic Energy Integration," *Power and Energy Society General Meeting (PESGM), 2016 IEEE*, 2016.
15. J. Yan, **Y. Tang**, H. He, and Y. Sun, "Power Grid Resilience Against False Data Injection Attacks," *Power and Energy Society General Meeting (PESGM), 2016 IEEE*, 2016.
16. C. Luo, J. Yang, **Y. Tang**, H. He, and M. Liu, "Chance constraint based risk-aware optimal power flow for cascading failure prevention," *Transmission & Distribution Conference and Exposition (PES T&D), 2016 IEEE*, 2016.
17. **Y. Tang**, H. He, and J. Wen, "Optimal operation for energy storage with wind power generation using adaptive dynamic programming," *Power and Energy Society General Meeting (PESGM), 2015 IEEE*, 2015.
18. **Y. Tang**, C. Mu, and H. He, "Superconducting magnetic energy storage based power system control using adaptive dynamic programming," *International Conference on Applied Superconductivity and Electromagnetic Devices, 2015 IEEE*, 2015.
19. J. Yan, **Y. Tang**, Y. Zhu, Y. Sun, and H. He, "Smart grid vulnerability under cascade-based sequential line-switching attacks," *Global Communications Conference (GLOBECOM), 2015 IEEE*, 2015.
20. **Y. Tang**, J. Yang, J. Yan, Z. Zeng, and H. He, "Frequency control using on-line learning method for island smart grid with EVs and PVs," *Neural Networks (IJCNN), 2014 International Joint Conference on*, 2014.
21. **Y. Tang**, X. Zhong, Z. Ni, J. Yan, and H. He, "Impact of signal transmission delays on power system damping control using heuristic dynamic programming," *Computational Intelligence Applications in Smart Grid (CIASG), 2014 IEEE Symposium on*, 2014.
22. Z. Ni, **Y. Tang**, H. He, and J. Wen, "Multi-machine power system control based on dual heuristic dynamic programming," *Computational Intelligence Applications in Smart Grid (CIASG), 2014 IEEE Symposium on*, 2014.
23. Y. Zhu, J. Yan, **Y. Tang**, Y. Sun, and H. He, "The sequential attack against power grid networks," *International Conference on Communications (ICC), 2014 IEEE*, 2014. **(Best Paper Award)**
24. **Y. Tang**, H. He, and J. Wen, "Adaptive control for an HVDC transmission link with FACTS and a wind farm," *Innovative Smart Grid Technologies (ISGT), 2013 IEEE PES*, 2013.
25. **Y. Tang**, H. He, and J. Wen, "Optimized control of DFIG based wind generation using swarm intelligence," *Power and Energy Society General Meeting (PESGM), 2013 IEEE*, 2013.
26. **Y. Tang**, H. He, and J. Wen, "Comparative study between HDP and PSS on DFIG damping control," *Computational Intelligence Applications In Smart Grid (CIASG), 2013 IEEE Symposium on*, 2013.
27. **Y. Tang**, S. Fu, B. Tang, and H. He. "A modified PSO based particle filter algorithm for object tracking," *SPIE Defense, Security, and Sensing*, 2013.
28. X. Fang, H. He, Z. Ni, and **Y. Tang**, "Learning and control in virtual reality for machine intelligence," *Intelligent Control and Information Processing (ICICIP), 2012 Third International Conference on*, 2012.

INVITED TALKS AND LECTURES (SELECTED)

1. "Big Data in Smart Grid: Opportunities and Challenges for Machine Intelligence," Florida Power & Light (FPL) Company, Juno Beach, FL, Nov. 2018.
2. "Resilient Power and Energy Systems," College of Engineering & Computing, Florida International University, Miami, FL, Oct. 2018.
3. "Proactive Defense Against Cyber-Physical Smart Grid Attacks," Florida Center for Cybersecurity Annual Conference, Tampa, FL, April, 2018.
4. "Towards an Adaptive Learning Framework for Smart, Secure and Efficient Connected Autonomy," Lockheed Martin, Orlando, FL, April, 2018.

RESEARCH GRANT AND CONTRACTS

1. PI: "Optimized Integration of Hydrokinetic Energy for Remote, Networked, and Resilient Microgrids," Walter and Lalita Janke Innovations in Sustainability Science Research Fund, Co-PI: James VanZwieten (FAU), 11/01/2017-04/30/2019, Award: $ 50,000.
2. PI: "Proactive Defense Against Cyber-Physical Smart Grid Attacks," Florida Center for Cybersecurity (FC2), Co-PI: Zhuo Lu (USF), 07/01/2017-12/30/2018, Award: $ 50,000.
3. Co-PI: "Collaborative Research: Design and Control of Networked Offshore Hydrokinetic Power-Plants with Energy Storage," National Science Foundation (NSF), PI: James VanZwieten (FAU), Grant No. ECCS-1809164, 08/15/2018-07/31/2021, Award: $ 103,085.
4. Co-PI: "SeeGan: Deep Learning-Aided Human Attention Modeling for Robots Learning," I-SENSE, PI: Elan Barenholtz (FAU), 05/01/2018-04/30/2019, Award: $ 26,000.
5. Senior Personnel: "MRI: Acquisition of Artificial Intelligence & Deep Learning (AIDL) Training and Research Laboratory," National Science Foundation (NSF), PI: Xingquan Zhu (FAU), Grant No. CNS-1828181, 10/01/2018-09/30/2021, Award: $ 652,850.
6. Senior Personnel: "REU Site: Removing Barriers to Ocean Current Based Electricity Production through Undergraduate Research," National Science Foundation (NSF), PI: James VanZwieten (FAU), Grant No. EEC-1659468, 03/15/2017-02/29/2020, Award: $ 400,000.
7. Senior Personnel: "REU Site: Sensing and Smart Systems," National Science Foundation (NSF), PI: Jason Hallstrom (FAU), Grant No. CNS-1659484, 01/01/2017-12/31/2019, Award: $ 339,984.

LEADERSHIP, OUTREACH AND SERVICE

Leadership: I have established concrete local and international collaborations with researchers from world-class research institutions. In the US, these collaborations include University of Rhode Island (URI), Texas A&M University (TAMU), Mississippi State University (MSU), Auburn University, and the Florida Center for Cyber Security (FC2) at the University of South Florida (USF). In China, I have established collaborations with researchers from Wuhan University, Huazhong University of Science and Technology, and Tianjin University. These ties are employed to (1) secure research data and collaboratively extract high priority research problems/topics, (2) generate fundable research proposals with high impact, and (3) contribute to science and technology by means of publications and development of technologies and capabilities.

Outreach and Supervisory: I demonstrate strong commitment to equity, diversity, and inclusion by attracting, supporting, and supervising minority students, women, undergraduates, and K-12 students. To date, I have trained (including currently training) a total of 14 students: 4 Ph.D., 3 Master's, 5 undergraduates, and 2 high school interns.

Since 2016, I have been empowering hands-on Cyber-Physical Systems curriculum development by preparing and introducing several new graduate and undergraduate courses at FAU. These include, but are not limited to, a graduate course "Smart Grid" for big data analysis in smart power grid with cyber-infrastructure, and an undergraduate course "Electric Power Systems" with renewable energy focus, respectively. I have also committed to bringing broader impact for my research, examples include representative of I-SENSE for "*2017 Science Center Engineer It Competition and Family Day*" at the South Florida Science Center and Aquarium, and the leading faculty (co-Director) for "*2018 Middle School Summer Engineering Technology Program, Summer Camp: Building Smart Cities*" at the FAU College of Engineering & Computer Science.

Service and Committee Experience: I currently serve as reviewer on various top-tier journals, such as IEEE Journal of Oceanic Engineering, IEEE Transactions on Smart Grid, IEEE Transactions on Big Data, IEEE Transactions on Neural Networks and Learning Systems, and IEEE/CAA Journal of Automatica Sinica. I also serve as program committee on many top conferences, such as AAAI Conference on Artificial Intelligence, International Joint Conference on Neural Networks, and IEEE Power and Energy Society General Meeting.

Feng-Hao Liu

CONTACT

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Florida Atlantic University
777 Glades Road, EE 529
Boca Raton, FL 33431
fenghao.liu@fau.edu
http://faculty.eng.fau.edu/fenghao

EDUCATION

Ph.D., Computer Science — Sep 2009 - May 2013
Brown University, Providence, RI.
Thesis: "*Error Tolerant Cryptography*"
Advisor: Anna Lysyanskaya

Sc.M., Computer Science — Sep 2007 - May 2009
Brown University, Providence, RI.

B.S., Electrical Engineering — Sep 2001- Jun 2005
National Taiwan University, Taipei, Taiwan.
Minor: Mathematics

RESEARCH INTERESTS

I am interested in information security and cryptography to tackle security challenges in various scenarios of cloud computing. I have studied and developed new techniques for different security tasks, such as: how to compute on encrypted data, how to verify computation in outsourced environments, and how to protect memory/computation under physical attacks.

APPOINTMENTS

Assistant Professor, *Florida Atlantic University* — May 2015 - Current

Postdoctoral Research Associate, *Maryland Cybersecurity Center at University of Maryland*
July 2013 - May 2015

- Hosted by Prof. Jonathan Katz, Prof. Elaine Shi and Prof. Dana Dachman-Soled

Research Assistant, *Dept. of Computer Science, Brown U., RI.* — Sep 2009 - May 2013

- Worked with Prof. Anna Lysyanskaya

Summer Intern, *Microsoft Research, Redmond, WA* — Jun 2012 - Aug 2012

- Worked with Dr. Melissa Chase and Dr. Nishanth Chandran in the Crypto Group
- Investigated different applications of re-encryption, relaxations of obfuscation, and lattice-based constructions

Research Assistant, *IIS, Academia Sinica, Taiwan.* — Dec 2006 - Jun 2007

- Worked with Prof. Bo-Yin Yang
- Implemented several multivariate cryptographic systems, in Java and C++

- Investigated a new stream cipher QUAD, and made generalizations and improvements

***Second Lieutenant**, Chung Cheng Armed Forces Preparatory School, Taiwan.* Jul 2005 - Oct 2006

- Oversaw over 80 senior high school students, teaching both discipline and academic studies
- Advised as a math teaching assistant that increased average math scores and admission rates of all senior students by 15%, from 75% to 90%

ADVISING

• Linir Zamir	MS towards PHD, Fall 2017 - current
• Qiqi Lai	Visiting Scholar, May 2018 - current
• Zhedong Wang	Visiting PHD student (Co-Advice), Sep 2017 - current
• Deepthi Chigurupalli	MS, graduated Fall 2017
• Chengbo Xu	Visiting Scholar, Dec 2016 - Dec 2017

FUNDING

NSF CRII: SaTC: Practical Cryptographic Coding Schemes Against Memory Attacks. PI (175,000).

HONORS

Selected as U.S. delegate to Heidelberg Laureate Forum via ORAU	Aug 2015
Best Student Paper Award of Theoretical Cryptography Conference (TCC) 2010	Feb 2010
Outstanding Mandatory Military Officer Award, Taiwan, ROC	Oct 2006
Bronze Medal, ranked 4 in Taiwan, Asian Pacific Mathematics Olympiad (APMO)	Nov 2001
2nd price, ranked 4 $\sim$ 10 in Taiwan, National Mathematics Contest, Taiwan	Jan 2001

PUBLICATIONS

Published (or Accepted to be Published)

1. Xiong Fan, Feng-Hao Liu, and Zhedong Wang. *"Decentralized ABE and FE for Inner Products, Revisited."* To appear in PKC 2019.
2. Dana Dachman-Soled, Feng-Hao Liu, Elaine Shi, and Hong-Sheng Zhou. *" Locally Decodable and Updatable Non-Malleable Codes and Their Applications."* Accepted to Journal of Cryptology (2018), to appear.
3. David Cash, Feng-Hao Liu, Adam O'Neill, Mark Zhandry, and Cong Zhang. *"Parameter-Hiding Order Revealing Encryption."* In Advances in Cryptology - ASIACRYPT 2019, volume 11272 of Lecture Notes in Computer Science, pages 181-210. Springer, 2018.
4. Dana Dachman-Soled, S. Dov Gordon, Feng-Hao Liu, Adam O'Neill, and Hong-Sheng Zhou. *" Leakage-Resilient Public-Key Encryption from Obfuscation."* In Journal of Cryptology, 2018. "https://doi.org/10.1007/s00145-018-9286-z"
5. Aggelos Kiayias, Feng-Hao Liu, and Yiannis Tselekounis. *"Non-Malleable Codes with Manipulation Detection for Partial Functions."* In Advances in Cryptology – CRYPTO 2018, volume 10993 of Lecture Notes in Computer Science, pages 577-607. Springer, 2018.
6. *"Computation Over Encrypted Data."* Invited Book Chapter of Cloud Computing Security: Foundations and Challenges, CRC Press. 2016.

7. Aggelos Kiayias, Feng-Hao Liu, and Yiannis Tselekounis. *"Practical Non-Malleable Codes from ℓ-more Extractable Hash Functions."* In CCS 2016, Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security. ACM, 2016.
8. Daniel Apon, Xiong Fan, and Feng-Hao Liu. *"Bi-Deniable Inner Product Encryption from LWE."* In TCC 2016-B, volume 9986 of Lecture Notes in Computer Science, pages 299 - 329. Springer, 2016.
9. Dana Dachman-Soled, S. Dov Gordon, Feng-Hao Liu, Adam O'Neill, and Hong-Sheng Zhou. *" Leakage-Resilient Public-Key Encryption from Obfuscation."* In Public-Key Cryptography (PKC) 2016, volume 9615 of Lecture Notes in Computer Science, pages 101 - 128. Springer, 2016
10. S. Dov Gordon, Feng-Hao Liu, and Elaine Shi. *" Constant-Round MPC with Fairness and Guarantee of Output Delivery"* In Crypto 2015, volume 9216 of Lecture Notes in Computer Science, pages 63 - 82. Springer, 2015.
11. Dana Dachman-Soled, Feng-Hao Liu, and Hong-Sheng Zhou. *" Leakage-Resilient Circuits Revisited - Optimal Number of Computing Components without Leak-free Hardware."* In Eurocrypt 2015, volume 9057 of Lecture Notes in Computer Science, pages 131-158. Springer, 2015.
12. Dana Dachman-Soled, Feng-Hao Liu, Elaine Shi, and Hong-Sheng Zhou. *" Locally Decodable and Updatable Non-Malleable Codes and Their Applications."* In TCC 2015, volume 9014 of Lecture Notes in Computer Science, pages 427-450. Springer, 2015.
13. S. Dov Gordon, Jonathan Katz, Feng-Hao Liu, Elaine Shi, and Hong-Sheng Zhou. *"Multi-client Verifiable Computation with Stronger Security Guarantees."* In TCC 2015, volume 9015 of Lecture Notes in Computer Science, pages 144-168. Springer, 2015.
14. Shafi Goldwasser, S. Dov Gordon, Vipul Goyal, Abishek Jain, Jonathan Katz, Feng-Hao Liu, Amit Sahai, Elaine Shi, and Hong-Sheng Zhou. *"Multi-input Functional Encryption."* In Eurocrypt 2014, volume 8441 of Lecture Notes in Computer Science, pages 578-602. Springer, 2014.
15. Nishanth Chandran, Melissa Chase, Feng-Hao Liu, Ryo Nishimaki and Keita Xagawa. *"Re-encryption, functional re-encryption, and multi-hop re-encryption: A framework for achieving obfuscation-based security and instantiations from Lattices."* In Public-Key Cryptography (PKC) 2014, volume 8383 of Lecture Notes in Computer Science, pages 95-112. Springer, 2014.
16. Alexandra Berkoff and Feng-Hao Liu. *"Leakage Resilient Fully Homomorphic Encryption"* In Theoretical Cryptography Conference (TCC) 2014, volume 8349 of Lecture Notes in Computer Science, pages 515-539. Springer, 2014.
17. Kai-Min Chung, Daniel Dadush, Feng-Hao Liu and Chris Peikert. *"On the Lattice Smoothing Parameter Problem."* In Computational Complexity Conference (CCC) 2013.
18. Feng-Hao Liu and Anna Lysyanskaya. *"Tamper and Leakage Resilience in the Split-State Model."* In Advances in Cryptology – CRYPTO 2012, volume 7417 of Lecture Notes in Computer Science, pages 517-532. Springer, 2012.
19. Yun-Ju Huang, Feng-Hao Liu and Bo-Yin Yang. *"Public-Key Cryptography from New Multivariate Quadratic Assumptions."* In Public Key Cryptography – PKC 2012, volume 7293 of Lecture Notes in Computer Science, pages 190-205. Springer, 2012.
20. Kai-Min Chung, Yael Tauman Kalai, Feng-Hao Liu and Ran Raz. *"Memory Delegation."* In Advances in Cryptology – CRYPTO 2011, volume 6841 of Lecture Notes in Computer Science, pages 151-168. Springer, 2011.

21. Ching-Yua Yu, Kai-Min Chung, Sherman Chow and Feng-Hao Liu. *"Efficient Secure Two-Party Exponentiation."* In Topics in Cryptology – CT-RSA 2011 – The Cryptographers' Track at the RSA Conference 2011, volume 6558 of Lecture Notes in Computer Science, pages 17-32. Springer, 2011.
22. Kai-Min Chung, Feng-Hao Liu, Chi-Jen Lu and Bo-Yin Yang. *"Efficient String-Commitment from Weak Bit-Commitment."* In Advances in Cryptology - ASIACRYPT 2010, volume 6477 of Lecture Notes in Computer Science, pages 268-282. Springer, 2010.
23. Feng-Hao Liu and Anna Lysyanskaya. *"Algorithmic Tamper-Proof Security Under Probing Attacks."* In Security and Cryptography for Networks (SCN) 2010, volume 6280 of Lecture Notes in Computer Science, pages 106-120. Springer, 2010.
24. Kai-Min Chung and Feng-Hao Liu. *"Tight Parallel Repetition Theorems for Public-coin Arguments."* In Theoretical Cryptography Conference (TCC) 2010, volume 5978 of Lecture Notes in Computer Science, pages 19-36. Springer, 2010. **(Best Student Paper Award)**
25. Feng-Hao Liu, Chi-Jen Lu and Bo-Yin Yang. *"Secure PRNGs from Specialized Polynomial Maps over Any F_q."* In Post-Quantum Cryptography (PQCrypto) 2008, volume 5299 of Lecture Notes in Computer Science, pages 181-202. Springer, 2008 .

INVITED RESEARCH LECTURES

Improved Identity-based Encryption from Lattices.
- *Chongqing University* — *Dec 2017*
- *Tsinghua University* — *Dec 2016*

Constant-Round MPC with Fairness and Guarantee of Output Delivery.
- *Florida Atlantic University (CCIS Seminar)* — *Sep 2015*
- *Crypto, Santa Barbara, USA* — *Aug 2015*

Computation in the Presence of Leakage.
- *United States Naval Academy* — *Dec 2014*
- *Virginia Commonwealth University* — *Nov 2014*

Locally Decodable and Updatable Non-Malleable Codes and Their Applications.
- *University of Athens, Greece* — *July 2014*

Multi-input Functional Encryption.
- *Eurocrypt, Denmark* — *May 2014*

Public-Key Cryptography from New Multivariate Quadratic Assumptions.
- *Microsoft Research - Redmond* — *Jun 2012*
- *Public Key Cryptography, Darmstadt, Germany* — *May 2012*

Delegation in the Cloud.
- *Brown Industrial Partners Program Symposium* — *Feb 2012*

Tamper and Leakage Resilience in the Split-State Model.
- *Crypto, Santa Barbara, USA* — *Aug 2012*
- *NYU Theory Seminar* — *Nov 2011*
- *IBM TJ Watson Crypto Seminar* — *Nov 2011*

Efficient String-Commitment from Weak Bit-Commitment.

- *Asiacrypt, Singapore* *Dec 2010*

Algorithmic Tamper-Proof Security Under Probing Attacks.
- *Security and Cryptography for Networks (SCN), Italy* *Sep 2010*

Fully Homomorphic Encryption Using Ideal Lattices.
- *Seminar in Academia Sinica, Taiwan* *July 2009*

TEACHING

***Instructor**, CEECS Department, Florida Atlantic University, FL*
- COT 6930/6446: Randomized Algorithms and Secure Designs
- COT 6200: Philosophy of Computation
- STA 4821: Stochastic Models in CS
- COT 4420: Formal Languages and Automata Theory
- COP 3530: Data Structures and Algorithm Analysis
- COP 2200: Introduction to Programming in C

OTHER SELECTED ACTIVITIES

Program Committee Member
- PKC 2019, Asiacrypt 2017, Asiacrypt 2016, AsiaPKC 2016, PKC 2016, International Workshop on Security in Cloud Computing (Asiaccs-SCC 2014), Information Security Conference (ISC 2014)

***Volunteer at Brown Ballroom Competitions**, Brown Ballroom Dance Team* Nov 2011 & 2012
- Processed registration data for the scrutineering system

***Moderator at Strait Talk Symposium**, Watson Institute, Brown U., RI.* Oct 2012
- Moderated a discussion panel in the symposium about the topic: "Cyber-security and US-China-Taiwan Relations"

***Theory Lunch Organizer**, Dept. of Computer Science, Brown U., RI.* Sep 2009 - Dec 2009
- Voluntarily organized a weekly event theory lunch for the theory group

External Reviewer
- Crypto, Eurocrypt, TCC, PKC, STOC, FOCS, ICALP (multiple years).

Thesis Committee
- Andrew Steinberg (MS, FAU)

KwangSoo Yang

Affiliation: Florida Atlantic University,
Department of Computer & Electrical Engineering and Computer Science

Mailing Address: 777 Glades Road, EE 428, Boca Raton, FL 33431-0991

Email: yangk@fau.edu

Telephone: 561-297-1205

Research Interests: Spatial Database, Spatial Data Mining, Transportation Science

Education

Yonsei University (South Korea)	Electricity Engineering	B.S.	1998
University of Minnesota	Computer Science	M.S.	2010
University of Minnesota	Computer Science	Ph.D.	2015

Sponsored Research

- **NSF OAC CAREER**: Spatial Network Database approach for Emergency Management Information Systems (Mar. 2019 - Feb. 2024, National Science Foundation
- Development of a Traffic Map Evaluation Tool for TMC Applications ($243,706); Feb. 2017 – Dec. 2018, Florida Department of Transportation, (Co-PI with PI Dr. Stevanovic, FAU)

Professional Experience

- Assistant Professor, Florida Atlantic University, Boca Raton, FL. 2015-present
- Software Engineer, LG-CNS, Seoul, Korea (http://www.lgcns.com), 2001–2008

Publications (in chronological order)

Peer-reviewed journal articles

1. Kwang Woo Nam, Wei Ding, KwangSoo Yang, "Measuring similarity between geo-tagged videos using largest common view", Electronics Letters, IET (2019).
2. KwangSoo Yang, Apurv Shekhar, Dev Oliver, Shashi Shekhar, "Capacity-Constrained Network-Voronoi Diagram", IEEE Transactions on Knowledge & Data Engineering, 27(11):2919-2932 (2015)
3. KwangSoo Yang, Apurv Shekhar, Faizan Ur Rehman, Hatim Lahza, Saleh Basalamah, Shashi Shekhar, Imtiaz Ahmed, Arif Ghafoor, "Intelligent Shelter Allotment for Emergency Evacuation Planning: A Case Study of Makkah", IEEE Intelligent Systems, 30(5): 66-76 (2015)
4. Venkata Gunturi, Shashi Shekhar, KwangSoo Yang, "A Critical-time-point Approach to All-departure-time Lagrangian Shortest Paths", IEEE Transactions on Knowledge & Data Engineering, 27(10): 2591 - 2603 (2015)
5. KwangSoo Yang, Michael R. Evans, Venkata M.V. Gunturi, James M. Kang, Shashi Shekhar, "Lagrangian Approaches to Storage of Spatio-temporal Network Datasets," IEEE Transactions on Knowledge & Data Engineering, 26(9): 2222-2236 (2014)
6. Shashi Shekhar, KwangSoo Yang, Venkata M. V. Gunturi, Lydia Manikonda, Dev Oliver, Xun

Zhou, Betsy George, Sangho Kim, Jeffrey M. R. Wolff, Qingsong Lu: Experiences with evacuation route planning algorithms. International Journal of Geographical Information Science 26(12): 2253-2265 (2012)

Peer-reviewed proceedings articles

1. Ohriniuc Roxana, Reich Aaron, KwangSoo Yang: Coverage Constrained Spatial CO-clustering, In Proceedings of 26th ACM SIGSPATIAL Intl. Conference on Advances in Geographic Information Systems: Pages 492-495 (2018)
2. Reich Aaron, Ohriniuc Roxana, KwangSoo Yang: Size Constrained k Simple Polygons, In Proceedings of 26th ACM SIGSPATIAL Intl. Conference on Advances in Geographic Information Systems: Pages 500-503 (2018)
3. Yiqun Xie, Kwangsoo Yang, Shashi Shekhar, Brent Dalzell and David Mulla, "Spatially Constrained Geodesign Optimization (GOP) for Improving Agricultural Watershed Sustainability", Workshops at the Thirty-First AAAI Conference on Artificial Intelligence (2017)
4. KwangSoo Yang: Distance-Constrained k Spatial Sub-Networks: A Summary of Results, GIScience, LNCS 9927: pages 68-84 (2016)
5. KwangSoo Yang, Apurv Hirsh Shekhar, Dev Oliver, Shashi Shekhar: Capacity-Constrained Network-Voronoi Diagram: A Summary of Results. Spatial and Temporal Databases, proceeding of 13th Intl. Symposium on Spatial and Temporal Databases Springer LNCS 8098: pages 56-73 (2013)
6. Shekhar, Shashi, Viswanath Gunturi, Michael R. Evans, and KwangSoo Yang. "Spatial big-data challenges intersecting mobility and cloud computing." In Proceedings of the Eleventh ACM International Workshop on Data Engineering for Wireless and Mobile Access, pp. 1-6. ACM (2012)
7. KwangSoo Yang, Venkata M. V. Gunturi, Shashi Shekhar: A Dartboard Network Cut Based Approach to Evacuation Route Planning: A Summary of Results. GIScience, LNCS: pages 7478: 325-339 (2012)
8. KwangSoo Yang, Shashi Shekhar, Jing Dai, Sambit Sahu, Milind R. Naphade: Smarter Water Management: A Challenge for Spatio-Temporal Network Databases. Spatial and Temporal Databases, proceeding of 12th Intl. Symposium on Spatial and Temporal Databases, LNCS 6849: pages 471-474 (2011)
9. Venkata M. V. Gunturi, Ernesto Nunes, KwangSoo Yang, Shashi Shekhar: A Critical-Time-Point Approach to All-Start-Time Lagrangian Shortest Paths: A Summary of Results. Spatial and Temporal Databases, proceeding of 12th Intl. Symposium on Spatial and Temporal Databases, LNCS 6849: pages 74-91 (2011)
10. Michael R. Evans, KwangSoo Yang, James M. Kang, Shashi Shekhar: A Lagrangian approach for storage of spatio-temporal network datasets: a summary of results. In Proceedings of 18th ACM SIGSPATIAL Intl. Conference on Advances in Geographic Information Systems, pages 212-221 (2010)

Books & Book chapters

1. Evans, Michael R., Dev Oliver, KwangSoo Yang, and Shashi Shekhar. "Enabling Spatial Big Data via CyberGIS: Challenges and Opportunities." CyberGIS for Geospatial Discovery and Innovation. pp. 143-170. Springer, ISBN: 978-94-024-1529-2 (2019)
2. KwangSoo Yang, Shashi Shekhar: Spatial Network Big Databases: Queries and Storage Methods, Springer, ISBN 978-3-319-56657-3 (2017)
3. Evans, Michael R., KwangSoo Yang, Viswanath Gunturi, Betsy George, and Shashi Shekhar. "Spatio-temporal Networks: Modeling, Storing, and Querying Temporally-Detailed Roadmaps." In Space-Time Integration in Geography and GIScience, pp. 77-108. Springer, ISBN: 978-94-017-

9204-2 (2015)

4. Shekhar, Shashi, Michael R. Evans, Viswanath Gunturi, KwangSoo Yang, and Daniel Cintra Cugler. "Benchmarking Spatial Big Data." In Specifying Big Data Benchmarks, LNCS, Volume 8163, pp. 81-93. Springer, ISBN 978-3-642-53974-9 (2014)

Abstracts

1. KwangSoo Yang, Apurv Hirsh Shekhar, Dev Oliver, Shashi Shekhar: Capacity-Constrained Network-Voronoi Diagram (Extended Abstract), IEEE 32nd International Conference on Data Engineering (ICDE), ISBN: 978-1-5090-2020-1 (2016)
2. KwangSoo Yang et al., Capacity-Constrained Network-Voronoi Diagram: An Extended Abstract, Proceedings of the 12th International Conference on GeoComputation (2013)

Technical Reports

1. KwangSoo Yang, Faizan Ur Rehman, Hatim Lahza, Saleh Basalamah, Shashi Shekhar, Arif Ghafoor, "Intelligent Shelter Allotment for Emergency Evacuation Planning: A Case Study of Makkah", HajjCore tech. report P1104-T1 (2012)

Patents

1. Shortest Travel Path Determination Using Critical Start Time Points, Publication number: US20140058674 A1, Publication type: Application, Application number US 13/974,777, Publication date: Feb 27, 2014, Inventors: Shashi Shekhar, Venkata Maruti Viswanath Gunturi, KwangSoo Yang
2. Conveyance planning using dartboard network, Publication number: WO2013172959 A2, Publication type: Application, Application number PCT/US2013/031478, Publication date: Nov 21, 2013, Inventors: Shashi Shekhar, KwangSoo Yang, Venkata Maruti Viswanath Gunturi

Teaching

- COP 3540 Introduction to Database Structures
- COP 6731 Theory and Implementation of Database Systems
- COP 6726 New Directions in Database

Synergistic Activities

- TPC member for GraphSM 2017
- PC member for ACM SIGSPATIAL 2016
- Editorial Board Member of Korea Spatial Information Society

Awards and Honors

- NSF Career Award 2019
- Doctor Dissertation Fellow, The University of Minnesota Doctoral Dissertation Fellowship.
- Received a "Thank a Teacher" note from students (UMN Center for Teaching&Learning)
- Distinguished Service Award, Leader of IT Research Division, (LG-CNS) Dec. 2002

Dimitris A. Pados

Office: Engineering East 325, Florida Atlantic University, 777 Glades Rd, Boca Raton, FL 33431-0991; Tel.: (561) 297-2988; E-mail: dpados@fau.edu

Home: 6094 Via Crystalle, Delray Beach, FL 33484-6495; Cell.: (716) 465-4880

Date: March 5, 2019

Technical Areas of Specialization

Machine learning and adaptive signal processing; data analytics; communications theory and systems. Applications to connected autonomous systems; data conformity evaluation; feature extraction from faulty data; L_1-norm principal-component analysis; digital data embedding and hiding; cognitive software-defined radios and networks; autonomous secure wireless communications; underwater communications; mmWave and THz communications.

Employment History (1990 - present)

Aug.'17–present *Charles E. Schmidt Eminent Chair Professor* (June 2018-present); *I-SENSE Fellow; Director, Center for Connected Assured Autonomy,* Dept. of Computer and Electrical Eng. & Computer Science, Florida Atlantic University, Boca Raton, FL. Courses developed and taught: EEL 6935 (graduate) Smart Antennas, EEL 6532 (graduate) Information Theory.

Aug.'97–Aug.'17 *Clifford C. Furnas Chair Professor* (2014-Aug. 2017); *Dept. Chair of Electrical Engineering* (appointed June 2017); *Professor* (2007-2014); *Dept. Associate Chair of Electrical Eng.* (2009-2010); *Associate Professor* (2002-2007); *Assistant Professor* (1997-2002), Department of Electrical Engineering, University at Buffalo, State University of New York, Buffalo, NY. Courses developed and taught: EE 634 (graduate) Principles of Information Theory and Coding, EE 614 (graduate) Smart Antennas for Wireless Communications, EE 484 (senior) Communication Systems 2. Other courses taught: EE 203 (sophomore) Circuit Analysis 2.

May'97–July'97 *Summer Research Faculty,* Air Force Research Laboratory, Surveillance Division, Rome, NY. Research on adaptive airborne array radar and space-time adaptive processing.

Aug.'94–Aug.'97 *Assistant Professor,* Department of Electrical and Computer Engineering and Center for Telecommunications Studies, University of Louisiana, Lafayette, LA. Courses developed and taught: Signals and Systems (senior), Digital Logic Design (junior). Other courses taught: Probability Theory (graduate), Introduction to Computer Engineering (freshman).

Sept.'90 –Aug.'94 *Research Assistant,* Communications Systems Laboratory, Dept. of Electrical Eng., University of Virginia, Charlottesville, VA; *Teaching Assistant* (1992), Dept. of Computer Science and Dept. of Electrical Engineering, University of Virginia, Charlottesville, VA.

Education

Ph.D. Electrical Engineering, *University of Virginia,* August 1994.
Major area of concentration: *Communications.*
Minor areas of concentration: *Mathematics, Computer Science (Data Networks).*
Dissertation: "On Neural Classification and Decentralized Hypothesis Testing."

Diploma Computer Engineering and Science (5-year), *Univ. of Patras,* Greece, Oct. 1989.

Publications

Journal Publications: Sixty-two (62) predominantly *IEEE* journal papers

Select recent journal papers:

[1] S. K. Saha, Y. Ghasempour, M. K. Haider, T. Siddiqui, P. DeMelo, N. Somanchi, L. Zakrajsek, A. Singh, O. Torres, D. Uvaydov, J. Jornet, E. Knightly, D. Koutsonikolas, D. A. Pados, Z. Sun, and N. Thawdar, "X60: A programmable testbed for wideband 60 GHz WLANs with phased arrays," *Elsevier Computer Commun..*, vol. 133, pp. 77-88, Jan. 2019.

[2] G. Sklivanitis, A. Gannon, K. Tountas, D. A. Pados, S. N. Batalama, S. Reichhart, M. J. Medley, N. Thawdar, U. Lee, J. D. Matyjas, S. Pudlewski, A. Drozd, A. Amanna, F. Latus, Z. Goldsmith, and D. Diaz, "Airborne cognitive networking: Design, development, and deployment," *IEEE Access,* vol. 6, pp. 47217-47239, Sept. 2018.

[3] N. Tsagkarakis, P. P. Markopoulos, G. Sklivanitis, and D. A. Pados, "L1-norm principal-component analysis of complex data," *IEEE Transactions on Signal Processing,* vol. 66, pp. 3256-3267, June 2018.

[4] Y. Liu, D. A. Pados, Joohee Kim, and Chen Zhang, "Reconstruction of compressed-sensed multiview video with disparity and motion compensated total-variation minimization," *IEEE Transactions on Circuits and Systems for Video Technology,* vol. 28, pp. 1288-1302, June 2018.

[5] P. P. Markopoulos, S. Kundu, S. Chamadia, and D. A. Pados, "Efficient L1-norm principal-component analysis via bit flipping," *IEEE Transactions on Signal Processing,* vol. 65, pp. 4252-4264, Aug. 2017.

Peer-reviewed Conference Proceedings: One-hundred-fifty (150) predominantly *IEEE* papers

Seect recent conference papers

[1] E. G. M. Verzegnassi, K. Tountas, D. A. Pados, and F. Cuomo, "Data conformity evaluation: A novel approach for IoT security," in *Proceedings 2019 IEEE 5th World Forum on Internet of Things (WF-IoT),* Limerick, Ireland, Apr. 15-18, 2019.

[2] K. Tountas, G. Sklivanitis, and D. A. Pados, "Directional space-time waveform design for interference-avoiding MIMO configurations,"in *Proceedings 2019 IEEE Intern. Workshop on Antenna Tech. (iWAT),* Miami, FL, Mar. 3-6, 2019 **(iWAT 2019 best paper award finalist.)**

[3] K. Tountas, G. Sklivanitis, and D. A. Pados, and S. N. Batalama, "Dynamic joint PHY-MAC waveform design for IoT connectivity," in *Proceedings IEEE ICASSP 2019 (International Conf. on Acoust., Speech, and Signal Proc.),* Brighton, UK, May 12-17, 2019.

[4] M. S. Pour, E. Bou-Harb, K. Varma, N. Neshenko, D. A. Pados, and Kim-Kwang Raymond Choo, "Understanding the IoT cyber threat landscape: A data dimensionality reduction technique to infer and characterize internet-scale IoT probing campaigns," in *Proceedings DFRWS EU 2019,* Oslo, Norway, Apr. 24-26, 2019.

[5] K. Tountas and D. A. Pados, "Conformity evaluation and L1-norm principal-component analysis of tensor data," in *Proceedings of SPIE, Defense + Commercial Sensing, Big Data: Learning, Analytics, and Applications Conf.*, Baltimore, MD, April 14-18, 2019, vol. 10989.

[6] K. Tountas, G. Sklivanitis, D. A. Pados, and S. N. Batalama, "All-spectrum digital waveform design via bit flipping," in *Proceedings IEEE GLOBECOM 2018, Signal Proc. for Comm. Symposium,* Abu Dhabi, UAE, Dec. 9-13, 2018.

[7] A. Gannon, G. Sklivanitis, P. P. Markopoulos, D. A. Pados, and S. N. Batalama, "Semi-blind signal recovery in impulsive noise with L1-norm PCA," in *Proceedings 52nd Asilomar Conf. on Signals, Systems, and Computers,* Pacific Grove, CA, Oct. 28-31, 2018.

[8] A. Gannon, S. Balakrishnan, G. Sklivanitis, D. A. Pados, and S. N. Batalama, "Short data record filtering for adaptive underwater acoustic communications," in *Proceedings IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM),* Sheffield, UK, July 8-11, 2018, pp. 316-320.

[9] G. Sklivanitis, J. Ashdown, K. Tountas, and D. A. Pados, "Sparse waveform design for secure LPD/LPI underwater acoustic communications," in *Proceedings MTS/IEEE OCEANS,* Charleston, SC, Oct. 22-25, 2018, pp. 1-6.

[10] G. Sklivanitis, K. Tountas, D. A. Pados, and S. N. Batalama, "Small-sample-support channel estimation for massive MIMO systems," in *Proceedings IEEE ICASSP 2018 (International Conf. on Acoust., Speech, and Signal Proc.),* Calgary, AB, Canada, April 15-20, 2018, pp. 3904 – 3908.

Book Chapter

P. P. Markopoulos, S. Kundu, S. Chamadia, N. Tsagkarakis, and D. A. Pados, "Outlier-Resistant Data Processing with L1-Norm Principal Component Analysis" in *Advances in Principal Component Analysis,* G. R. Naik (Ed.), SpringerNature 2018.

Research Grants

Summary: Total dollar value **$12,406,580**; own share of expenditures **$4,481,868**.

Select recent research grants:

[1] PI/PD (%effort: 50%), "All-spectrum Interference-avoiding Communications: Theory and Software-defined-radio Implementations," *Air Force Research Laboratory,* Mar. 1, 2019 – Sept. 30, 2019, $25,000. Administrative Unit: FAU Division of Research.

[2] Co-PI/PD (%effort: 50%), "Toward Mobile Quantum Links," *Harris Corporation,* Jan. 1, 2019 – Dec. 31, 2019, $50,000. Administrative Unit: FAU Division of Research.

[3] PI/PD (%effort: 50%), "Autonomous Interference Avoiding Networking on the Mxxx GE Platform," *GE Aviation; Advanced and Special Projects Division*, Nov. 1, 2018 – Aug. 31, 2019, $225,000. Administrative Unit: FAU Division of Research, Acc. # TAG006803.

[4] Co-PI/PD (%effort: 20%), "MRI: Acquisition of Artificial Intelligence & Deep Learning (AIDL) Training and Research Laboratory," *National Science Foundation,* Division of Computer and Network Systems, Proposal No. CNS-1828181, Sept. 1, 2018 – Aug. 31, 2021, $652,850. PI/PD: Xingquan Zhu, Assist. Prof. CEECS, Florida Atlantic Univ., Boca

Raton, FL. Administrative Unit: FAU Division of Research.

[5] Co-PI/PD (%effort: 33%), "I-Corps Sites: Type I - Florida Atlantic University I-Corps Site for Advancing Entrepreneurship and Innovation," *National Science Foundation,* Division of Industrial Innovation and Partnerships, Proposal No. IIP-1829243, Oct. 1, 2018 – Sept. 30, 2021, $254,997. PI/PD: Ken Dawson-Scully, Assoc. Prof. Dept. of Biology, Florida Atlantic Univ., Boca Raton, FL. Administrative Unit: FAU Division of Research.

[6] Co-PI/PD (%effort: 50%), "Cognitive Networking of the Oceans: Localization and Tracking Fundamentals," *National Science Foundation,* Division of Computer and Network Systems, Award No. CNS-1704813, Sept. 1, 2017 – Aug. 31, 2020, $500,000; PI/PD S. N. Batalama, Prof. and Dean College of Eng. and Comp. Sc., Florida Atlantic University. Administrative Unit: FAU Division of Research, Acc. # TAG005579.

[7] Co-PI/PD (%effort: 20%), "CRI: II-New: TeraNova: An Integrated Testbed for True Terahertz Communications," *National Science Foundation*, July 1, 2017 – Dec. 31, 2018, $749,979. PI/PD: J. Jornet, Assist. Prof. EE, Univ. at Buffalo, SUNY. Administrative Unit: Research Foundation of SUNY.

[8] Co-PI/PD (%effort: 25%), "II-New: X60: A Cross-Layer Reconfigurable Multi-Gigabit WLAN Testbed at 60 GHz," *National Science Foundation*, Division of Computer and Network Systems, Award No. CNS-1629929, Sept. 1, 2016 – Aug. 31, 2018, $629,000. PI/PD: D. Koutsonikolas, Assist. Prof. CSE, Univ. at Buffalo, SUNY. Administrative Unit: Research Foundation of SUNY.

Honors, Awards, Recognitions

- 2019 Best Paper Finalist: ***IEEE Intern. Workshop on Antenna Tech. (iWAT)***, Miami, FL, March 2019, w/ K. Tountas and G. N. Sklivanitis.
- 2016 Best Paper Selection: ***IEEE Intern. Conf. on Multimedia Big Data (IEEE BigMM)***, Taipei, Taiwan, April 2016, w/ Ying Liu and Chia-Hung Yeh.
- 2015 **ResearchGate**: Your research is in the spotlight. *"... you were the most downloaded researcher from your department [SUNY-Buffalo EE] last week"* (each week since beginning of RG data (7/2015) until end of download reporting (11/2015).)
- 2014 Best of **IEEE GLOBECOM** - Top 50 Papers Special Presentation (2171 submissions):, Austin, TX, December 2014, w/ Lili Wei, Rose Q. Hu, and Geng Wu.
- 2014 **Nutaq** Software-Defined Radio Academic US National Contest Grand Winner (w/ Georgios Sklivanitis, Ph.D. student, EE Dept., UB; prize $16,000).
- 2013 The **ISWCS** (International Symposium on Wireless Communication Systems) Best Paper Award in Physical Layer Communications and Signal Processing, Ilmenau, Germany, August 2013, w/ P. P. Markopoulos and G. N. Karystinos.
- 2011 University at Buffalo Exceptional Scholar - Sustained Achievement Award. *"This award was created to recognize an unprecedented accomplishment in a senior scholar's career, distinguishing a body of work of enduring importance that has gone beyond the norm in a particular field of study."*

Honors, Awards, Recognitions (cntd)

- 2010 IEEE ICC (International Conf. on Communications) Best Paper Award in Signal Proc. for Communications, Cape Town, South Africa, May 2010, w/ W. Su, F. Chen, and J. D. Matyjas.
- 2009 SUNY Chancellor's Award for Excellence in Teaching. *"The Chancellor's Awards for Excellence are System-level honors conferred to acknowledge and provide system-wide recognition of and tribute to these individuals' expertise, dedication, and commitment. Award recipients personify professional excellence and serve as role models for the State University of New York community – 'To Learn, to Search, to Serve.' "*
- 2005 Web of Science Highly Cited Article (New bounds on the total squared correlation and optimum design of DS-CDMA binary signature sets), *" ... in the top 1% within its field according to Essential Science Indicators[SM]. Your work is highly influential, and is making a significant impact among your colleagues in your field of study."*
- 2003 IEEE Transactions on Neural Networks Outstanding Paper Award (papers published in 2000 and 2001 w/ G. N. Karystinos.
- 2001 IEEE ICT (International Conf. on Telecomm.) Best Paper Award, Bucharest, Romania, June 2001 w/ G. N. Karystinos.

Professional Activities in 2018-2019

- Keynote Speaker, BLUEMED European Union Interreg MED Programme, International Scientific Conference in Management of Accessible Underwater Cultural and Natural Heritage Sites, "Dive in Blue," Athens, Greece, October 16 – 18, 2019.
- Organizer IEEE INFOCOM 2019 "Wireless Communications and Networking in Extreme Environments (WCNEE) Workshop," Paris, France, April 29 – May 2, 2019.
- Technical Program Committee, SPIE Defense + Commercial Sensing Symposium, Big Data: Learning, Analytics, Baltimore, MD, April 14-18, 2019.
- Technical Program Chair, Symposium on Tensor Methods for Signal Processing and Machine Learning, IEEE GlobalSIP 2018, Anaheim, CA, Nov. 26-28, 2018.
- Organizer, Special Session "Signal Processing and Communications for Resilient Autonomous Systems," Tenth IEEE Sensor Array and Multichannel Signal Processing (SAM) Workshop, Sheffield, UK, July 8-11, 2018.
- Organizer, Special Session "L1-norm array data processing," 52nd Annual Asilomar Conference on Signals, Systems, and Computers, Oct. 28-31, 2018.
- Technical Program Committee, SPIE Defense + Commercial Sensing Symposium, Compressive Sensing VII: From Diverse Modalities to Big Data Analytics, Orlando, FL, April 18-19, 2018.
- Organizer IEEE INFOCOM 2018 "Wireless Communications and Networking in Extreme Environments (WCNEE) Workshop," Honolulu, HI, April 16-19, 2018.

ELIAS BOU-HARB, Assistant Professor at FAU

Cyber Security R&D | Data Analytics | Critical Infrastructure Security

1-754-551-0812, ebouharb@fau.edu, West Palm Beach, FL, USA
http://cybersec.fau.edu

Dr. Bou-Harb possesses more than 14 years of experience in the global IT field, 9 years in the cyber security area, 4 years in the strategic and technical consultancy domain and 2 years as an executive in the financial sector. A tenure-track faculty, at 30 years old, specializing in cyber security R&D, Dr. Bou-Harb is an expert in cyber threat intelligence, real-time traffic analysis and correlation, and digital/network forensics. His impactful work in that area generated several operational cyber security capabilities, produced more than 60 academic and technical publications in prestigious international conferences and journals and awarded him several top-notch grants valued at more than $3M in the past two years. Dr. Bou-Harb is the recipient of 4 best paper awards at international venues due to his excellent oral and written communication skills. He is distinguished by his significant critical thinking capabilities, vast research ability and potential, extreme enthusiasm, high levels of determination and aptitude to complete milestones within specific stringent deadlines.

Throughout his academic and technical career, Dr. Bou-Harb has gained the ability to represent information in various methods, the aptitude to design and conduct an observational, testing and an application experiment, and the capability to effectively communicate scientific ideas and results. Moreover, he has gained operational engineering capabilities in cyber security R&D, real-time big data analytics, cyber-attack detection and mitigation, efficient malware fingerprinting and real-time traffic analysis.

After executing a Postdoctoral fellowship funded by the Natural Sciences and Engineering Research Council of Canada at the prestigious Carnegie Mellon University, USA, Dr. Bou-Harb has joined the department of Computer Science at Florida Atlantic University (FAU) in January 2016 as a tenure-track Assistant Professor.

Researchgate https://www.researchgate.net/profile/Elias_Bou-Harb
RateMyProf https://tinyurl.com/yd9ca8kr
In the news https://tinyurl.com/ybk86wpd
https://tinyurl.com/ydzdnfur

EXPERTISE

- Cyber Security R&D
- Data Science
- Cyber Threat Intelligence
- Cyber Forensics
- Security for Internet of Things
- Security for Cyber-Physical Systems
- Deep learning
- Cyber Attacks' Detection & Mitigation
- Darknet, Malware & Passive DNS Analysis

Grants & Awards

- U.S. Department of Homeland Security Grant, $2.3M
- U.S. National Science Foundation Grant, $500K
- Canadian NSERC PostDoc Fellowship, $90,000
- Best Paper Award – Symposium on Personal, Indoor and Mobile Radio Communications, Canada
- Best Paper Award – Conference on Availability, Reliability and Security, Germany
- Best Paper Award – Symposium on Network Computing and Applications, USA
- Best Paper Award – Digital Forensics Research Conference, USA

ORGANIZATIONS SERVED

- Florida Atlantic University
- Carnegie Mellon University
- Canadian RCMP/CSIS
- Ericsson Canada
- Concordia University
- Deloitte Cyber Consulting
- New Horizons IT Training

GRANTS, AWARDS & HONORS

- **National Science Foundation (NSF)** Grant: *CyberTraining CIP*: *Cyberinfrastructure Expertise on High-throughput Networks for Big Science Data Transfers.* ($500,000). 2018-2021. **Awarded**. **Co-PI.**

- **U.S. Department of Homeland Security (DHS)** Grant. *CPSTraps*: *Towards Large-scale Empirical Data Collection, Curation and Analysis for Securing CPS.* ($2,340,652). 2018-2021. **Accepted. PI.**

- **National Science Foundation (NSF)** research Initiation Initiative (CRII) Grant: *CRII: OAC: Inferring, Attributing, Mitigating and Analyzing the Malicious Orchestration of Internet-scale Exploited IoT Devices: A Network Telescope Approach.* ($175,000). 2017-2019. **Awarded**. **Sole PI.**

- **Qatar's National Priorities Research Program (NPRP)** Grant. *Assessing and managing ICT security risks of industrial controls systems for oil and natural gas production and transmission*. ($120,000). 2017-2019. **Awarded**. **Co-PI.**

- The **Florida Center for Cybersecurity** (**FC2**) 2017 **Capacity Building** Program: *An Operational Cyber Security Capability for Analyzing the Darknet Space for Predictive Indicators of Cyber Threat Activity*. ($75,000). 2017-2018. **Awarded**. **Sole PI.**

- **National Institute of Standards and Technology (NIST)**, The measurement science and engineering (MSE) research grant program: *Large-scale Empirical Measurements for Inferring, Attributing and Analyzing the Malicious Orchestration of Compromised IoT Devices.* ($375,000). 2019-2021. **Under Review**. **Sole PI.**

- **National Science Foundation (NSF)** Grant: *OAC Core: Small: Devising Data-driven and Formal Methodologies by Employing Large-scale Empirical Data to Fingerprint, Attribute, Remediate and Analyze Internet-scale IoT Maliciousness* ($500,000). 2019-2022. **Under Review**. **PI.**

- **U.S. Office of Naval Research** (**ONR**) Young Investigator Program (YIP): *A Multidimensional Approach for Securing US Cyberspace & Critical Infrastructure by Investigating Malware.* ($510,000). **Under Review**.

- Natural Sciences and Engineering Research Council of Canada (**NSERC**) Postdoctoral Fellowship (**PDF**): Top **1%** of all Canadian Computer Science Ph.D. Students, ($90, 000). **Sole PI.**

- Fonds Québécois de la Recherche sur la Nature et les Technologies (**FQRNT**) Postdoctoral Fellowship, ($70, 000). **Sole PI.**

- **4 Best paper awards. IEEE PIMRC 2017, ACM DFRW 2014, IEEE ARES 2013, IEEE NCA 2013.**

CONTRIBUTIONS TO RESEARCH AND DEVELOPMENT

A. Published referred contributions (1 book chapter and 25 journal publications)

Book Chapters

- **E. Bou-Harb** and C. Fachkha, "On inferring and characterizing large-scale probing and DDoS campaigns," in *Computer and Network Security Essentials*, pp. 461-474, Springer, Cham, 2018. (My role: conception of ideas, research design and development, and writing of manuscript. 70% contribution)

Refereed Journal Publications

- S. Torabi, **E. Bou-Harb**, C. Assi, A. Boukhtouta, and M. Debbabi, "Investigating Internet-Scale Reconnaissance Activities by Compromised IoT Devices Through the Lens of A Large-Scale Network Telescope," in *IEEE Transactions on Information Forensics and Security*, "In Press", 2019. (My role: conception of ideas, research design and development, and writing of manuscript. 35% contribution)

- M. Safaeipour and **E. Bou-Harb**, "Implications of theoretic derivations on empirical passive measurements in the presence of the Mirai Botnet," *Elsevier's Computer & Security*, "In Press", 2018. (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, editorial modifications. 35% contribution)

- J. Crichigno, **E. Bou-Harb** and N. Ghani, " A Comprehensive Tutorial on Science DMZ, *IEEE Communications Surveys & Tutorials.* "In Press", 2018. (My role: conception of ideas, research design and development, and writing of manuscript. 35% contribution)

- D. Olivera, N. Ghani, J. Crichigno, **E. Bou-Harb**. SDN Testbed for Evaluation of Large-Scale Electro-Magnetic Pulse (EMP) Attacks. *IEEE Communications Magazine*, "In Press", 2018. (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, editorial modifications. 20% contribution)

- **E. Bou-Harb** and N. Ghani, "Passive inference of attacks on CPS communication protocols," *Elsevier's Journal of Information Security and Applications*, "In Press", 2018. (My role: conception of ideas, research design and development, and writing of manuscript. 80% contribution).

- Husák, M., Komárková, J., **Bou-Harb, E.**, and Čeleda, P. (2018). Survey of Attack Projection, Prediction, and Forecasting in Cyber Security. *IEEE Communications Surveys & Tutorials.* (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, editorial modifications. 35% contribution)

- **E. Bou-Harb**, C. Assi, and M. Debbabi, "CSC-detector: a system to infer large-scale probing campaigns," in *IEEE Transactions on Dependable and Secure Computing*, vol. PP, no. 99, pp. 1-1, 2018. (My role: conception of ideas, research design and development, and writing of manuscript. 85% contribution)

- Shaikh, F., **Bou-Harb, E.**, Neshenko, N., Wright, A. P., and Ghani, N. (2018). Internet of Malicious Things: Correlating Active and Passive Measurements For Inferring and Characterizing Internet-scale Unsolicited IoT Devices. *IEEE Communications Magazine*, 56(9), 170-177. (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, editorial modifications. 40% contribution)

- **E. Bou-Harb**, M. Husák, M. Debbabi, and C. Assi, "Big data sanitization and cyber situational awareness: a network telescope perspective," in *IEEE Transactions on Big Data*, Special Issue on Big Data Applications in Cyber Security and Threat Intelligence, vol. PP, no. 99, pp. 1-1, 2018. doi: 10.1109/TBDATA.2017.2723398. (My role: conception of ideas, research design and development, and writing of manuscript. 80% contribution)

- **E. Bou-Harb** and M. Scanlon, "Behavioral service graphs: a formal data-driven approach for prompt investigation of enterprise and internet-wide infections," in *Digital Investigation*, vol. 20, Supplement, pp. S47-S55, 2017. ISSN 1742-2876. doi: 10.1016/j.diin.2017.02.002. (My role: conception of ideas, research design and development, and writing of manuscript. 90% contribution)

- **E. Bou-Harb**, W. Lucia, N. Forti, S. Weerakkody, N. Ghani, and B. Sinopoli, "Cyber meets control: a novel federated approach for resilient CPS leveraging real cyber threat intelligence," in *IEEE Communications Magazine*, vol. 55, no. 5, pp. 198-204, May 2017. doi: 10.1109/MCOM.2017.1600292CM. (My role: conception of ideas, research design and development, and writing of manuscript. 80% contribution)

- J. Crichigno, M. Pourvali, F. Shaikh, A. Rayes, **E. Bou-Harb**, and N. Ghani, "Optimal traffic scheduling for intrusion prevention systems," in *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems*, vol. 6, no. 2, pp. 73-79, 2017. (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, and editorial modifications. 15% contribution)

- **E. Bou-Harb**, M. Debbabi, and C. Assi, "Big data behavioral analytics meet graph theory: on effective botnet takedowns," in *IEEE Network*, vol. 31, no. 1, pp. 18-26, January/February 2017. doi: 10.1109/MNET.2016.1500116NM. (My role: conception of ideas, research design and development, and writing of manuscript. 85% contribution)

- **E. Bou-Harb**, M. Debbabi, and C. Assi, "A novel cyber security capability: inferring Internet-scale infections by correlating malware and probing activities," in *Computer Networks*, vol. 94, pp. 327-343, 2016. ISSN 1389-1286. doi: 10.1016/j.comnet.2015.11.004. (My role: conception of ideas, research design and development, and writing of manuscript. 85%contribution)

- C. Fachkha, **E. Bou-Harb**, and M. Debbabi, "Inferring distributed reflection denial of service attacks from darknet," in *Computer Communications*, vol. 62, pp. 59-71, 2015. ISSN 0140-3664. doi: 10.1016/j.comcom.2015.01.016. (My role: discussion of ideas, research and design, reviewing and discussing results, and writing most of the manuscript. 35% contribution)

- C. Fachkha, **E. Bou-Harb,** and M. Debbabi, "On the inference and prediction of DDoS campaigns," in *Wireless Communications and Mobile Computing*, vol. 15, pp. 1066–1078, 2015. doi: 10.1002/wcm.2510. (My role: discussion of ideas, research and design, reviewing and discussing results, and writing most of the manuscript. 35% contribution)

- **E. Bou-Harb**, N.-E. Lakhdari, H. Binsalleeh, and M. Debbabi, "Multidimensional investigation of source port 0 probing," in *Digital Investigation*, vol. 11, Supplement 2, pp. S114-S123, 2014. ISSN 1742-2876. doi: 10.1016/j.diin.2014.05.012. (My role: conception and discussion of ideas, research design and development, and writing most of the manuscript. 65% contribution).

B. Other refereed contributions (42 conference publications including 4 best paper awards)

Refereed Conference Publications

- M. Husák, M. Safaeipour, N. Neshenko, **E. Bou-Harb**, and P. Čeleda, "Assessing Internet-wide Cyber Situational Awarenessof Critical Sectors," in Proceedings of the *IEEE 13th International Conference on Availability, Reliability and Security (ARES 2018)*, p. 22, ACM, 2018. (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, editorial modifications. 35% contribution)

- S. Torabi, **E. Bou-Harb**, C. Assi, A. Boukhtouta, and M. Debbabi, "Inferring, Characterizing, and Investigating Internet-Scale Malicious IoT Device Activities", in Proceedings of the *IEEE/IFIP 48th International Conference on Dependable Systems and Networks (DSN-2018)*. (My role: conception of ideas, research design and development, and writing of manuscript. 40% contribution)

- M. Husák, M. Safaeipour, N. Neshenko, **E. Bou-Harb**, and P. Čeleda, "Data-Driven Intelligence for Characterizing Internet-scale IoT Exploitations," in Proceedings of *IEEE Conference on Communications and Network Security (CNS 2018)*. (My role: discussion of ideas, providing guidance on research plan, reviewing and discussing results, editorial modifications. 35% contribution)

- M. Safaeipour and **E. Bou-Harb**, "Implications of Theoretic Derivations on Empirical Passive Measurements for Effective Cyber Threat Intelligence Generation," in Proceedings of *IEEE International Conference on Communications (ICC)*, Kansas City, 2018. (My role: conception of ideas, research design and development, and writing of manuscript. 50% contribution)
- Christian Miranda, Georges Kaddoum and **E. Bou-Harb**, "Cross-Layer Authentication Protocol Design for Ultra-Dense 5G HetNets," in Proceedings of *IEEE International Conference on Communications (ICC)*, Kansas City, 2018. (My role: conception of ideas, research design and development, and writing of manuscript. 30% contribution)

- Farooq Shaikh, **Elias Bou-Harb**, Jorge Crichigno, Nasir Ghani, "A Machine Learning Model for Classifying Unsolicited IoT Devices by Observing Network Telescopes", in Proceedings of *IEEE Conference on Communications and Network Security (CNS 2018)*. (My role: conception of ideas, research design and development, and writing of manuscript. 35% contribution)

- Sameera Almulla, Claude Fachkha, **E. Bou-Harb**, "Cyber Security Threats Targeting CPS Systems: A Novel Approach Using Honeypots", In Proceedings of the *IEEE 12th International Conference on Emerging Security Information, Systems and Technologies (SecureWare 2018)*. (My role: conception of ideas, research design and development, and writing of manuscript. 30% contribution)

- Jorge Crichigno, Zoltan Csibi, **Elias Bou-Harb**, Nasir Ghani, "Impact of Segment Size and Parallel Streams on TCP BBR", In Proceedings of the *IEEE 2018 41st International Conference on Telecommunications and Signal Processing (TSP)*. (My role: conception of ideas, research design and development, and writing of manuscript. 30% contribution)

- Charles Wheelus, **Elias Bou-Harb**, Xingquan Zhu, "Tackling Class Imbalance in Cyber Security Datasets", In Proceedings of the *2018 IEEE International Conference on Information Reuse and Integration (IRI)*. (My role: conception of ideas, research design and development, and writing of manuscript. 40% contribution)

Curriculum Vitae

Behnaz Ghoraani, B.Sc., M.Sc., Ph.D.

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Boca Raton, FL 33431
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E-mail: bghoraani@fau.edu
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EDUCATION

Postdoctoral Fellow 2010-2012
Faculty of Medicine, University of Toronto, Toronto, Canada

Doctor of Philosophy 2006–2010
Department of Electrical and Computer Engineering, Ryerson University, Toronto, Canada
Thesis: *Developed Advanced Signal Processing Techniques in Multimedia and Biomedical Engineering.*

Master of Applied Science 1998–2000
Department of Electronics and Electrical Engineering, Amir Kabir University of Technology, Tehran, Iran

Bachelor of Applied Science 1994–1998
Department of Electronics and Electrical Engineering, Sharif University of Technology, Tehran, Iran

RESEARCH INTERESTS

Biosensor and Biomedical signal analysis, Non-stationary Data Analytics, Feature extraction and classification, Time-frequency signal analysis, Pattern classification and recognition, Dictionary learning, Computer-aided clinical decision making

SELECTED HONOURS, AWARDS, AND RECOGNITIONS [Selected]

Graduate Student received NSF young professional award	August 2016
Graduate Student Selected as an IEEE EMBS Student Paper Competition Finalist	July 2016
Senior Member of the Institute of Electrical and Electronics (IEEE)	2012
The G. Gordon M. Sterling Engineering Intern Award	2011
Appreciation of the extraordinary service to the IEEE Women in Engineering Society	2011
Outstanding New Leader Award In appreciation to excellent service	2008-2009

PROFESSIONAL AND ACADEMIC EXPERIENCE

Computer and Electrical Engineering at Florida Atlantic University, Boca Raton, FL — August 2016– present
Assistant Professor – Tenure track

Institute for Sensing and Embedded Network Systems Engineering, Boca Raton, FL — August 2016– present
Faculty Fellow

Biomedical Engineering at Rochester Institute of Technology (R.I.T.), Rochester, NY — August 2012–August 2016
Assistant Professor – Tenure track

PhD in Engineering at R.I.T., Rochester, NY — August 2014–August 2016
Core Graduate Faculty

Microsystems Engineering at R.I.T., Rochester, NY — August 2012–August 2016
Core Graduate Faculty

Ph.D. in Computing and Information Sciences at R.I.T., Rochester, NY — December 2012–August 2016
Extended Faculty

Biomedical Engineering at Ryerson University, Toronto, Canada — 2009–2012
Instructor

Division of Cardiology at Toronto General Hospital, Toronto, Canada — 2008–2010
Research Assistant

Electrical and Computer Engineering at Ryerson University, Toronto, Canada — 2005–2010
Research Assistant

Faculty of Engineering at Ryerson University, Toronto, Canada — 2006–2010
Teaching Assistant

Alcatel at Celestica, Toronto, Canada — 2004–2005
Test Engineer

Kanavaran Inc., Tehran, Iran — 2000–2004
Electronics Design Engineer

INTELLECTUAL PROPERTY

Systems and Methods for Localizing Signal Sources using Multi-Pole Sensors
U.S. Patent Application Serial No. 15/595,110
Filed: May 15, 2017

Systems and Methods for Guiding a Multi-Pole Sensor Catheter to Locate Cardiac Arrhythmia Sources
U.S. Patent Application Serial No. 15/727,393
Filed: September 25, 2017

ACTIVE FUNDED RESEARCH PROPOSALS

Florida Department of Health — 2019-2021
Technology-based Systems to Measure Dual-task (Motor-cognitive) Performance as a Biomarker for Early Detection of Alzheimer's Disease — $94K
Role: PI

National Institute of Health (NIH) Heart, Long, and Blood Institute — 2015-2019
Catheter Guidance Algorithm for Identification of Atrial Fibrillation Ablation Targets — $456K
Role: PI

National Science Foundation CNS — 2017-2019
REU Site: Sensing and Smart Systems — $340K
Role: Co-PI

COURSES DEVELOPED

Biosignal Analysis – Graduate level, Florida Atlantic University — 2017-2019
Data Analytics – Graduate level, R.I.T. — 2015-2016
Biomedical Signals and Systems Analysis – 3rd year students, R.I.T. — 2012-2016
Numerical and Statistical Analysis of Complex Biomedical System – 4th year students, R.I.T. — 2013-2014
Quarter to Semester Conversion
Engineering Analysis II– 3rd year students, R.I.T. — 2012-2013
Computations in Genetic Engineering – Graduate elective, Ryerson University — 2010-2011

Electronics and Biomedical Sensors – 4th year students, Ryerson University 2009-2010

REVIEW DUTIES FOR GOVERNMENT PROPOSALS/Awards/CONFERENCES [Last 5 years]

Assistant Editor of the IEEE Signal Processing Magazine eNewsletter 2019-2020
Chair of the IEEE Signal Processing Society Young Professional Committee 2018-2020
Women in Engineering Chair 2017, 2018
IEEE Life Sciences Conference, Sydney, Australia ('17) Montreal, Canada ('18)
Track Chair "Biosensors and Biomedical Signals" 2017, 2018
IEEE Life Sciences Conference, Sydney, Australia ('17) Montreal, Canada ('18)
Organized Special Track session, "Biomedical Imaging and Signal Processing Tools 2017, 2018
for Cardiac Arrhythmias: Diagnosis, Treatment Planning and Therapy Delivery", at the IEEE International Symposium on Computer-based Medical Systems (CBMS), Thessaloniki, Greece ('17) Sweden ('18)
Committee of the Sheehan's Scholarship for Exceptional Women in CEECS February 2017
Panelist at the Women in Engineering/Computer Science Panel Discussion @ FAU, November 2016
Austrian Science Funding Reviewer September 2016
Invited Session Chair "Neurological Disorders" August 2016
At the 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society
NIH Early Career Reviewer 2015–present
NSF panel review 2014–present
AdvanceRIT Faculty Connect Grants Steering and Review Committee 2015–2016

REVIEW DUTIES FOR JOURNALS

IEEE Transactions on Signal Processing, IEEE Transactions on Biomedical and Health Informatics, Digital Signal Processing, Medical Engineering & Physics, Biomedical Signal Processing and Control, Transactions on Neural Systems & Rehabilitation Engineering, International Journal of Entropy, International Journal of Advancements in Computing Technology, International Journal of PLOS ONE, Numerical Methods in Biomedical Engineering, International Journal of Computer Science and System Biology, International Journal of Molecular Science, British Journal of Applied Sciences and Technology, EP EuroPace, Computer Methods and Programs in Biomedicine, Computers in Biology and Medicine, Journal of Entropy, The IEEE Transactions on Audio, Speech and Language Processing, The Journal of European Association for Signal Processing (EURASIP), The Elsevier journal on Biomedical Signal Processing and Control,

STUDENT ADVISING

Current PhD/Masters Students

Prasanth Ganesan – Ph.D. in Engineering, FAU 2015–present
Murtadha Hssayeni – Ph.D Computer Engineering, FAU 2018-present
Tuan Vo Nhut – Ph.D. in Engineering, FAU 2019-present

Graduated Masters Students

Murtadha Hssayeni – M.S. Computer Engineering, R.I.T. 2016
Anthony Salmin – B.S./M.S. Electrical Engineering, R.I.T. 2016
Sathyashree Basavaraju – M.S. Electrical Engineering, R.I.T. 2018

Vignesh Ramji – M.S. Electrical Engineering, R.I.T. 2016
Miguel Dominguez – M.S. Electrical Engineering, R.I.T. 2016
Now: PhD student in PhD in Engineering Program at RIT
Prasanth Ganesan – M.S. Electrical Engineering, R.I.T. 2015
Now: PhD student in Dr. Ghoraani's lab.
Supachan Traitruengsakul – M.S. Electrical Engineering, R.I.T. 2015
Now: Lecturer at Ratchasuda Collage Mahidol University, Thailand
Daniel Sinkiewicz – BS./M.S. in Electrical Engineering, R.I.T. 2014
Now: Communications Engineer at The Mitre Corporation
Baabak Mamaghani – BS./M.S. in Electrical Engineering, R.I.T. 2014
Now: Research Assistant at R.I.T.
Steven Ladavich – B.S./M.S. in Electrical Engineering, R.I.T. 2014
Now: Technical Sales Representative at Texas Instruments

INVITED TALKS [last 2 years]

BioFlorida Conference, HealthIT Advancements: Going Digital to Improve Healthcare & Treatment October 2018
Women in Data Science Conference, Biomedical Signal Feature Extraction for Computer-assisted Clinical Decision Making March 2018
Massachusetts General Hospital, Developing Algorithms to Localize AF ablation Targets November 2017
FAU College of Nursing, Applying Technology to Research Proposals November 2017
Florida Atlantic University, Women in Engineering/Computer Science Panel Discussion November 2017
Life Sciences Career Event, BioFlorida October 2016

PUBLICATIONS

Journals [Last 4 years]

J1) P. Ganesan, A. Salmin, E.M. Cherry, D.T. Huang, A. Pertsov, and **B. Ghoraani**, "Iterative Navigation of Multipole Diagnostic Catheters to Locate Repeating-pattern Atrial Fibrillation Drivers", *Journal of Cardiovascular Electrophysiology*, February 2019.

J2) M.D. Hssayeni, J. Jimenez-Shahed, and **B. Ghoraani**, "Hybrid Feature Extraction for Detection of Degree of Motor Fluctuation Severity in Parkinson's Disease Patients. *Entropy*, 21(2), p.137, January 2019.

J3) M.D. Hssayeni, M.A. Burack, J. Jimenez-Shahed, and **B. Ghoraani**, "Assessment of Response to Medication in Individuals with Parkinson's Disease", *Medical Engineering & Physics*, accepted March 2019.

J4) S. Traitruengsakul, L. E. Seltzer, A. R. Paciorkowski, and **B. Ghoraani**, "Developing A Novel Epileptic Discharge Localization Algorithm for Electroencephalogram Infantile Spasms During Hypsarrhythmia", *Medical & Biology Engineering and Computing Journal*, Pages: 1-10, February 2017.

J5) D. Sinkiewicz, L. Friesen, **B. Ghoraani**, "A novel method for extraction of neural response from single channel cochlear implant auditory evoked potentials". Medical Engineering & Physics. 40 (2017) PP: 47–55.

J6) **B. Ghoraani**, "Class-specific Discriminant Time-frequency Analysis Using Novel Jointly-learnt Non-negative Matrix Factorization", *EURASIP Journal on Advances in Signal Processing*, Sept 2016.

J7) S. Ladavich and **B. Ghoraani**, "Rate-Independent Detection of Atrial Fibrillation by Statistical Modeling of Atrial Activity", *Biomedical Signal Processing and Control Journal*, Pages: 274–281, 2015.

J8) P. Ganesan, E. Cherry, A. Pertsov, and **B. Ghoraani**, "Characterization of Electrograms From Multi-polar Diagnostic Catheters During Atrial Fibrillation", *the Simulations of Heart Function Journal - BioMed Research International*, 2015.

J9) M. Sterling, D. Huang, and **B. Ghoraani**, "Developing a New Computer-aided Clinical Decision Support System For Prediction of Successful Post-cardioversion Patients With Persistent Atrial Fibrillation", *Computational and Mathematical Methods in Medicine Journal - Congestive Heart Failure*, 1(6), 2015.

J10) A. Zeller and **B. Ghoraani**, "Body Surface Mapping of T-wave Alternans Depends on the Distribution of Myocardial Scarring", *The Open Cardiovascular Medicine Journal*, 26, 2015.

Conference Proceedings and Abstracts [Last 2 years]

C1) **B. Ghoraani**, "A Novel Resource-Aware Tensor Decomposition Design Based on Reinforcement Learning", *IEEE International Conference on Acoustics, Speech, and Signal Processing*, accepted, May 2019.

C2) M.D. Hssayeni, M.A. Burack, J. Jimenez-Shahed, and **B. Ghoraani**, "Symptom-based, Dual-channel LSTM Network for The Estimation of Unified Parkinson's Disease Rating Scale III", *IEEE International Conference on Biomedical and Health Informatics*, accepted, May 2019.

C3) M.D. Hssayeni, M.A. Burack, J. Jimenez-Shahed, and **B. Ghoraani,** "Activity-independent detection of mediation states in individuals with Parkinson's disease using wearable sensors", *Annual meeting of the American Academy of Neurology*, accepted, May 2019.

C4) **B. Ghoraani**, A.M. Suszko, R.J. Selvaraj, A. Subramanian, S. Krishnan, V.S. Chauhan, "Effectiveness of T wave Alternans Testing for Risk Stratification of Ventricular Tachyarrhythmias and Sudden Death in Patients with Cardiomyopathy", International Society for Computerized Electrocardiology Annual Conference, accepted, April 2019.

C5) P. Ganesan, E. Cherry, A. Pertsov, and **B. Ghoraani**, "Development of a Rotor-Mapping Algorithm to Locate Ablation Targets During Atrial Fibrillation", *The IEEE Life Sciences Conference*, Pages: 41-44, Montreal, Canada, October 2018,

C6) P. Ganesan, H. Zilouchian, E. Cherry, A. Pertsov, and **B. Ghoraani**, "Developing an Iterative Tracking Algorithm to Guide a Catheter Towards Atrial Fibrillation Rotor Sources in Simulated Fibrotic Tissue", *Accepted at the International Conference of the Computing in Cardiology*, Masstricht, Netherlands, September 2018.

C7) P. Ganesan, H. Zilouchian, E. Cherry, A. Pertsov, and **B. Ghoraani**, "Localization of Atrial Fibrillation Rotors in Fibrotic Tissue Using Circular Diagnostic Catheters", *Accepted at the International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Honolulu, Hawaii, July 2018.

C8) M. Hssayeni, J. Adams and **B. Ghoraani**, "Deep Learning for Medication Assessment of Individuals with Parkinson's Disease Using Wearable Sensors," *Accepted at the International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Honolulu, Hawaii, July 2018.

C9) P. Ganesan, K. Shillieto, **B. Ghoraani**, "Simulation of Spiral Waves and Point Sources in Atrial Fibrillation with Application to Rotor Localization", *30th IEEE International Symposium on Computer-Based Medical Systems, IEEE CBMS 2017*, Pages: 379- 384Thessaloniki, Greece, June 2017.

C10) V. Ramji, M. Hssayeni, M. Burack, **B. Ghoraani**, "Parkinson's Disease Medication State Management Using Data Fusion of Wearable Sensors", *in the proceedings of the International Conference of the IEEE Biomedical and Health Informatics*, Pages: 193 - 196, Orlando, February 2017.

C11) P. Ganesan, A. Salmin, E. Cherry, A. Pertsov, D. Huang, and **B. Ghoraani**, "A Tracking Algorithm to Guide Multi-pole Diagnostic Catheters Towards Atrial Fibrillation Sustaining Sources in Simulated Fibrotic Tissue", Abstract *at Proceedings of the 38th Heart Rhythm Scientific Sessions*, Chicago, May 2017.

Ravi Shankar, PhD, MBA, PE, Fellow (AHA)

Director, Center for Systems Integration (CSI)
Professor, Comp. and Elec. Eng. and Comp. Science (CEECS)
Florida Atlantic University (FAU), Boca Raton, FL 33431
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Research: http://csi.fau.edu/
Team course sites: http://android.fau.edu/ , http://robotics.fau.edu/, http://semanticweb.fau.edu/
Github open source App site: https://github.com/RShankar?tab=repositories
LinkedIn profile: https://www.linkedin.com/in/shankar2015

Objective:

Contribute to progress on issues of national importance by leveraging my various strengths in

- Technology (systems, engineering, medicine, algorithms, semantic web, and automation),
- Education (STEM education, eLearning and interdisciplinary collaboration), and
- Management (innovation, management, leadership, industry experience, and grantsmanship)

Experience:

Education: Data Science Certificate, Coursera (non-degree), Johns Hopkins U, Oct 2015 (expected)
MBA, College of Business, Florida Atlantic University, Boca Raton, FL, May 2000
PhD, Electrical and Computer Engineering, University of Wisconsin, Madison, 1982
M.S, Electrical and Computer Engineering, University of Wisconsin, Madison, 1977

Employment and Professional Experience:

- **2012-2013,** *Sabbatical,* On building a consortium for smart phone and mobile Apps (CUSP)
- **1993-Present,** *Director, CSI,* a center for multi-college university-industry collaboration
- **1982-Present,** *Promoted and Tenured, Assistant to Full Professor,* CEECS disciplines, FAU
- **2009-Present,** On multi-college teaching coordination to help student teams develop Apps
- **2003-2008,** *Research Director,* Motorola Grant ($1 M). Increased design productivity six fold
- **2001-2002,** *Senior Consultant,* Cadence Design Systems, leading maker of chip design software
- **1998-1999,** *Sabbatical,* On rapid and low cost prototyping for STEM hands-on experience.
- **1991-2002,** *Consultant*, Vasocor, on clinical studies for early prediction of atherosclerosis
- **1992-1993,** *Research Director,* Vasocor Grant ($750K), on medical imaging for atherosclerosis.
- **1986-2008,** *Consultant,* IBM, APTEK, Harris, and Motorola, on engineering design automation.
- **1977-1982,** *Teaching & Research Assistant*, Elec. and Comp. Eng., U of Wisconsin, Madison, WI

Teaching Experience:

- **2008- Present,** *Mobile Applications*, based on open source tools for Google's Android, Arduino for robotics, Jena and Protégé for the semantic web, and EMF for auto code generation.
- **2000-2007,** *System on a chip (SoC)*, with courses on Network on Chip, Concurrency, SystemC for mixed-signal systems, Design and Verification, and Biologically Inspired Architectures.
- **1999-2000,** *Innovation*, with course on new product development, College of Business
- **1986-1999**, *VLSI*, with courses on Microelectromechanical Systems (MEMS), Neural VLSI; Low Power Design, Silicon-on-Insulator (SOI), Structured VLSI Design; Introduction to VLSI
- **1982-1992,** *Computer Architecture,* with courses on Embedded System Design, Concurrent Processing, Neural Networks, Microcomputers, Digital Computer Architecture
- **1985-2000,** *Engineering Design Automation*, with courses on CAD-Based Computer Design , Structured Digital Design; Computer Hardware Design, Semi-custom VLSI Design in DSP

- **1982-1985,** *Data Acquisition*, Data Acquisition and Measurement Systems and Biomedical Instrumentation Lab (at the Univ. of Wisconsin-Madison)

Scholarly Achievements

Statement of Professional Interests: Mobile Systems, System Complexity, Semantic and Intelligent web, Engineering Design Productivity, Systems Integration, Concurrency Modeling, SoC (System-on-a-chip) Design, VLSI (analog, digital and neural) Design, Computer Architecture, Distributed Parallel Processing, MEMS, and Biomedical Engineering.

Theses and Dissertations Supervised: 30 MS theses (4 on-going) and 9 PhD dissertations (one on-going) in the following domains (current to earlier): Semantic Web, System Modeling, Productivity, Computer Architecture,Concurrency, Artificial Neural Networks, Design Automation, VLSI Design, Instrumentation, and Biomedical Engineering.

Patents (in Computer and Biomedical Engineering): Click here for details.

- Two patents on highly scaleable multiplier architecture for low power mobile systems. US patents numbers: 7,873,823 (issued in January 2011 and 7080114 (issued in January 2005)
- Five patents on early and/or noninvasive diagnostic methods for atherosclerosis and diabetes. US patent numbers: 8,197,416 (issued in June 2012), 8,185,182 (issued in June 2012), 5,343,867 (issued in September 1994), 5,297,556 (issued in March 1994), and 5,241,963 (issued in September 1993).

Journal Publications (in Technology and Education):

- Mitsova, D., Wissinger, F., Esnard, A-M, Shankar, R., and Giles, P., A Collaborative Geospatial Shoreline Inventory Tool to Guide Coastal Development and Habitat Conservation, ISPRS Int. J. Geo-Inf., **2013**, *2*(2), 385-404; doi:10.3390/ijgi2020385
- Fonoage, M., Cardei, I., and Shankar, R., Mechanisms for Requirements Driven Component Selection and Design Automation, *IEEE Systems Journal*, Vol. 4, No. 3, Sept 2010, pp. 396-403
- Shankar, R., Gopinathan, M., and Webster, J.G., Digital Signal Processing in clinical validation studies with impedance plethysmography, Paper draft, CSI Technical Report, *csi.fau.edu*.
- Shankar, R., Shao, S.Y., and Webster, J.G., A Fully Automated Multi-Channel Digital Electrical Impedance Plethysmograph, Paper Draft, CSI Technical Report, *csi.fau.edu*.
- Shankar, R., Webster, J.G., Object-Process Modeling of Glucose Metabolism in Health and Disease, Paper Draft, CSI Technical Report, *csi.fau.edu*.
- Agarwal, A., Shankar, R., and Iskander, C.,Survey of NoC Architectures and Contributions, *Scientific International Journal of Engineering Computing and Architectures*, Vol. 3, Issue 1, 2009
- Agarwal, A., Shankar, R., A Concurrency Model for Network on Chip Design Methodology, *Journal of Modeling and Simulation*, Vol. 29, Issue 3, pp. 238-247, 2009
- Agarwal, A., Mustafa, M., Shankar, R., Pandya, A.S., and Lho, Y., A Deadlock Free Router Design for Network on Chip Architecture, *Journal of Korea Institute of Maritime Information and Communication Sciences*, Vol. 11, No. 4, pp. 696 - 706, April 2007
- Shankar, R., Freytag, L., and Alon, D., "A CAE-based Course for Design of Digital Systems," *Computers in Education Journal*, ASEE, Vol. 1, No. 3, pp. 76-85, July-September 1991.
- Zhongkai, Z., and Shankar, R, "A Tutorial on CMOS VLSI Design for an Introductory Course," *Computers in Education Journal*, ASEE, Vol. 1, No. 3, pp. 22-30, July-September 1991.
- Shankar, R., and Webster, J.G., "Noninvasive Measurement of Compliance of Human Leg Arteries," *IEEE Trans. Biomed Eng.*, Vol. 38, No. 1, pp. 62-67, January 1991.

- Shankar, R., & Bond, M.G., "Correlation of Noninvasive Arterial Compliance with Anatomic Pathology of Atherosclerotic Nonhuman Primates, " *Atherosclerosis*, Vol. 85, pp. 37-46, Dec 1990
- Pajunen, G., Steinmetz, M., and Shankar, R., "Model Reference Adaptive Control with Constraints for Postoperative Blood Pressure Management," *IEEE Trans. Biomed. Eng.*, Vol. 37, No. 7, pp. 679-687, July 1990.

Books:

- Agarwal, A., Shankar, R., and Pandya, A.S., Embedding Intelligence into EDA Tools to Meet the Future Technology Trends, in *Integrated Intelligent Systems for Engineering Design*, X. F. Zha and R. J. Howlett (Eds), IOS Press, Amsterdam, Netherlands, 2006, pp. 389-408
- Shankar, R., and Fernandez, E., *VLSI and Computer Architecture*, 490 pages, Academic Press, Inc., August 1989.

Refereed Conference Proceedings (recent ones):

- Mitsova, D., Shankar, R., and McAfee, F., Mobile GIS Applications for Coastal Planning, accepted, *AESS 2015, (Assn for Environmental Studies and Sciences)*
- Islam, S., Shankar, R., Freytag, G., and Serrano, M., Empowerment with Informal Learning: Applicatrin of Mobile Technoloty to Teach Computer Science in K-12, *2nd International Conference on Microelectronics, Circuits and Systems, Micro2015*, August 2015, India.
- Shankar, R., Smart Phone Apps to Empower Middle School Students: Building a STEM Pipeline, *Twenty-Second International Conference on Learning*, The Learner Knowledge Community, Madrid, Spain, July 9, 2015
- Donate, K., Shankar, R., Mitsova-Boneva, D., McAfee, F., Searching the World Wide Web – Finding the Right Information the First Time, *122nd Annual ASEE Conference*, Seattle, WA, June 2015
- Shankar, R., Lapix, J., Ploger, D., Augustin, M., Weinthal, C., and Aguerrevere, S., Precision Low-Cost Robotics for Math Education Work In Progress, *122nd Annual ASEE Conference*, Seattle, WA, June 2015
- Shankar, R., Mentor and Mentee Pipeline in Smart Phone App Development, *2014 Annual Mentoring Conference*, at the Mentoring Institute, UNM, Albuquerque, NM, October 2014, presentation at: https://prezi.com/usdx8fzhyq47/mentoring-pipeleine-smart-phone-apps/?utm_campaign=share&utm_medium=copy
- Wissinger, F., Shankar, R., and Restrepo, J., Hydrologic Modeling Methodology, *IEEE SysCon*, Ottawa, CA, April 2014
- Carvalho, F., and Shankar, R., Biomedical Signal Processing: Designing an Engineering Laboratory Course Using Low-Cost Hardware and Software, *121st Annual ASEE Conference*, Indianapolis, IN, June 2014
- Shankar, R., McAfee, F., Harris, M., Behara, R., and Fowlkes, J., Android Exchange (AEx) - A Virtual Community for Students on eTeams, submitted to *EEE'13 - The 2013 International Conf. on e-Learning, e-Business, ... and e-Government,* Las Vegas, NV, July 2013.
- Shankar, R., McAfee, F., and Harris, M., Smart Phone App Development: A Multi-College Approach, *2013 Annual Conference, ASEE*, June 2013.
- Shankar, R., Dickson, J., and Mozelny, C., A Tool for ABET Accreditation, *2013 Annual Conference, ASEE*, June 2013.
- Shankar, R., Ploger, D., and Nemeth, A., Robotics: Enhancing Pre-College Mathematics Learning with Real-world Examples, *2013 Annual Conf., ASEE*, June 2013

- Islam, S., Shankar, R., and Freytag, G., Leveraging Semantic Web to Retrieve Customized Medical Information, *IEEE Syscon Conference*, April 2013.
- Ploger, D., Shankar, R., Nemeth, A., and Hecht, S.A., Exporting Engineering Technology Practice to Enhance Pre-College Mathematics Learning, Practice Brought Into the Engineering Technology Classroom, *2012 ASEE Gulf Southwest Annual Conf.*, April 2012 El Paso, Texas.
- Borras, J., Shankar, R., and Furht, B., Mobile Technology Consortium (MTC): An Industry-University Alliance, *Conf. on Industry and Education Collaboration*, Phoenix, AZ, Feb. 2013.
- Shankar, R., Borras, J., McAfee, F.X., Harris, M., Ploger, D., Masory, O., Behara, R., Impact of Motorola's Vision on FAU's Engineering Curriculum, *Conf. on Industry and Education Collaboration*, Phoenix, AZ, February 2013.
- Islam, S., Freytag, G., and Shankar, R., Intelligent Health Information System to Empower Patient with Chronic Diseases, *IEEE IRI Workshop on Health Informatics*, Las Vegas, 2012.
- Mitsova, D., Esnard, A-M., Shankar, R., Wissinger, F. Viciedo, M., Holding Back the Sea: Approaches toward Shoreline Management and Planning to Reduce Erosion Hazards, Risk and Response: *Sea Level Rise Summit*, Ft. Lauderdale, FL, June 2012
- Shankar, R., Gundel, J., Nemeth, A., Ploger, D., and Hecht, S.A., Robotic Art for STEM, *FCRAR2012*, Boca Raton, FL, May 2012.
- Shankar, R., Ploger, D., Masory, O., and McAfee, F.X., Robotic Games for STEM Education, *ASEE Mid-Atlantic Regional conference*, Temple University, Philadelphia, PA, October 2011
- Shankar, R., McAfee, F., Carvalho, G., Silva, N., and Harris, M., STEM Education with Innovation and Entrepreneurship, *ASEE MidAtlantic Conference*, Temple University, Philadelphia, PA, October 2011
- Shankar, R., Preparing System Engineers of Tomorrow, *ASEE Southeastern Section Annual Conference*, Marietta, GA, April 2009
- Shankar, R.,, and Agarwal, A., KISMET: An Open Source Process for Faculty Participation in ABET Accreditation, *ASEE Southeastern Section Annual Conference*, Marietta, GA, April 2009
- Castellanos, R., Kalva, H., and Shankar, R., Low Power DCT using Highly Scalable Multipliers, *ICIP 2009*, Feb 2009.
- Fonoage, M., Cardei, I., and Shankar, R., *IEEE Systems Conference*, 2009
- Jayadevappa, S., and Shankar, R., The Changing Ways of Computer Science & Engineering Education – A Suitable Pedagogy to Adapt Better, *2009 ASEE Annual Conf. and Exposition*, Austin, TX, June 2009
- Shankar, R., and Islam, S., A Reference Model Based Patient Management System: Opportunities and Challenges, *25th Southern Biomedical Engineering Conference*, May 2009
- Mozelny, C., and Shankar, R., The Health Advisor: Application for Parkinson's Disease, *25th Southern Biomedical Engineering Conference*, May 2009

Sponsored Research Cash Grants : $ 4.5 M (Systems: $ 2.4 M, Biomed: $ 1.1M. Royalties: $1M)

- Shankar, R., Integration of medical device measurements with patient's EMR, ARC Devices, August 2015- December 2015 — $100K
- Citizen Science Apps, Grant from the Museum of Science and Discovery, Ft. Lauderdale, FL, August 2015 — $18K
- Integrating Mobile Apps and Robotics into STEM Education, FAU Tech Fee Grant, October 2013 — $21K
- A Shore Characterization Tool to extend ARCGIS (PI: Mitsova), FAU, 2012 — $10 K
- Android App Development, FAU, 2010 — $8 K
- Accelerated Mobile Product Development Co-PI: Agarwal), SBA, 2009-2010 — $123 K
- Highly Scaleable Multiplier, GAP Funding from Tech Transfer/FAU, 2007 — $15 K
- One Pass to Production (Co-PI: Furht et al), Motorola/iDEN, 2003-2008 — $1000 K
- EDA Undergrad Curriculum, Cadence Design Systems, Inc, 2001-2002 — $20 K
- Low Power Optimization, SABA Grant, Motorola, 2000 –2001 — $22 K

- Advanced System Control (Co-PI: Pajunen), Motorola, 1999 $72 K
- Integration of RF and Digital Design Flow, Harris SemiConductors, 1997 $25 K
- Modularly Expandable Mixed Signal IC Tester, NSF and Motorola 1994 - 1997 $260 K
- A Seamless Env. for Productivity, PI/Co-PI, NSF and Motorola, 1994-1995 $85 K
- Early and Noninvasive Detection of Atherosclerosis, Vasocor, 1991-1993 $750 K
- Character Recognition with Neural Networks (PI: Pandya), IBM, 1990-92 $86 K
- Layout Topology Optimization for DCVS Logic (Co-PI: Barrett), IBM, 1990-91 $77 K
- Wafer Scale Integration for Image Perception, DARPA/SUS, 1989-1990 $78 K
- VLSI Implementation issues for neural networks, FHTIC, 1989-1992 $109 K
- Early Detection of Atherosclerosis, FAU, 1989-1990 $27 K
- Patterned Functional Electrical Stimulation for Hemiplegics, FHTIC, 1989-1990 $35 K
- Design of Analog VLSI Cell Library, USF, Tampa, 1986-1988 $40 K
- VLSI Design of Communication Systems (Co-PI: Szabo), APTEK, 1986-1987 $75 K
- Early Noninvasive Detection of Atherosclerosis, FHTIC, 1985-1987 $133 K
- Distributed Computing and VLSI Design (Co-PI: Raskin), IBM 1984-1986 $125 K

Synergistic (and Large Team) Activities:

- **Consortium for Smart Phone, Mobile and Web Applications (CUSP) (2011 to Present):** Multi-disciplinary efforts that combines my various backgrounds in biomedical, electrical, computer engineering, computer science, innovation, and management. Multi-college joint courses have evolved on smart phones, robotics and the semantic web. These span high school to graduate school, across a number of colleges. This has facilitated communication across colleges which can be leveraged to evolve a university infrastructure of research enhancement, social entrepreneurism and STEM.
- **Android Smart Phone Apps (2009- Present):** SBA funded us in 2009 to develop courses on Android Mobile phone App development. Since then, we have offered courses for high school to graduate level and beyond, and have involved students and faculty members from arts, anthropology, and engineering to develop marketable Apps. During the last year, we expanded the course to include business students in a face-to-face course; and later offered it as an eLearning course. Our Android site is well visited by developers around the world (220 K visits).
- **Multi-Disciplinary Engineering Collaborations (2003-2008):** I led groups of 20+ computer science, computer and electrical engineering faculty members and students on a major 6 year Motorola project on radically increasing engineering design productivity. The group changed year-to-year with new goals. This was entitled "One Pass to Production" (OPP)
- **Industry Research and Development (2001-2002):** I worked as a senior consultant and technical account manager at Cadence supporting all system and chip design activities at Motorola. This allowed me to meet engineers and managers in all the disciplines and understand their design and product development flow. Citations of the OPP publication are at the CSI site.
- **Technology Transfer (1991-2001):** My biomed patents resulting from pilot studies on human and monkey subjects were licensed to Vasocor Inc. I led a 30+ technical group (5/92-5/93) in developing Vasogram I. Vasogram II was used in a multi-center clinical validation study. (Herrington et al., Circulation, 2004). My noninvasive measure for atherosclerosis was successfully correlated with abdominal aortic measurements with MRI.

Professional Recognition:

- Panel Member, Education Alternatives for Combining Engineering and Management, IEMC, Newfoundland, CA, September 2005
- Outstanding Faculty Award, Annual Award, College of Engineering, FAU, December 2003.
- Plaque of Appreciation, for leadership in implementing 'One Pass to Production' and 'Digital Six Sigma' programs, Motorola's iDEN Cell Phone Division, September 2003.

- Leadership award, for leading the department in establishing collaborative relationship with Motorola, CSE Dept., FAU, March 2003.
- Panel Member, Education Alternatives in Biomedical Eng., Biocomplexity Conf., Dartmouth, 2002
- Team of the Year award, to our Motorola Enterprise Team at Cadence Design Systems, 2002.

Other Information

Research Commercialization: FAU's first licensing contract based upon my research on early and non-invasive detection of atherosclerosis, signed March 1991. Royalty payments of $1 Million have been received by the FAU Research Corporation through 2004.

Continuing Education:

- Certification of Achievement. Web 2.20 Tools You can Use to Improve Learning, The Sloan Consortium, December 2012.
- eLearning Designer/Facilitator Certification at FAU, passed with honors, May 2012
- CITI (Collaborative Institutional Training Initiative) Certification obtained for both Biomedical Research Investigators and Social & Behavioral Research investigators, September 2011
- NIH, UMLS (Unified Medical Language System) One-day Training, Fall 2007
- Rhapsody, UML Tool for Real-Time, Motorola Funding, FAU, April 2004
- NSF Sponsored Workshop on Biocomplexity, at Dartmouth College, Hanover, NH, July 2002.
- Leadership Training, Three-day course, The Client Partner, Aspen Consulting Inc., April 2002.
- Senior Consultant at Cadence, with focus in the complex and challenging area of SFV (Systems and Functional Verification), during January 2001 to July 2002.
- Active support of Cadence tools and design flow, during January 2001 – 2003 at Motorola.
- Design experience with UML, MLD, SystemC, Verilog, SPW, Cascade, Analogy, PSPICE, HSPICE, Matlab, HP Tester, Xilinx, and several microcontrollers
- Executive MBA – to enhance and expand our college wide center and our product engineering consortium (comprised of centers at four universities).

Collaborators and Other Affiliations:

- Industrial: Jaime Borras, ex-VP and CTO, iDEN, Motorola, Plantation, FL, now President, MTC (mobile Technology Consortium), FL; Jerry Merckel, ex-Senior Manager, IBM, Boca Raton, FL.
- Academic: Fran McAfee, Michael Harris, and Don Ploger, Faculty members at FAU
- Biomedical: John G Webster, Professor Emeritus, University of Wisconsin, Madison, WI, and M. G. Bond, Professor Emeritus, Bowman Gray School of Medicine, Winston-Salem, NC

Dr. Mihaela Cardei

Associate Dean for Graduate Studies and Professor
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Web: www.cse.fau.edu/~mihaela

Research Interest

Wireless Networking, Wireless Sensor Networks, Combinatorial Optimization in Wireless Networks, Network Protocols and Algorithm Design.

Education

Ph.D. in Computer Science, University of Minnesota, Minneapolis, MN, 2003
M.S. in Computer Science, University of Minnesota, Minneapolis, MN, 1999
M.S. in Computer Science, Politehnica University of Bucharest, Romania, 1996
B.S. in Computer Science, Politehnica University of Bucharest, Romania, 1995

Honors and Awards

Researcher of the Year (Assistant Professor), Florida Atlantic University, 2006-2007.
Best paper award, The 35th IEEE International Performance Computing and Communications Conference (IEEE IPCCC), Dec. 2016.
Best paper award, The 10th IEEE International Conference on Mobile Ad-hoc and Sensor Networks (IEEE MSN), Dec. 2014.
Best paper award, The 2nd IEEE International Conference on Mobile Ad-hoc and Sensor Systems (IEEE MASS), Nov. 2005.
FAU Faculty Travel Award: Mar. 2005 and Aug. 2005.
Doctoral Dissertation Fellowship, Graduate School, University of Minnesota, 2002-2003.
Academic Merit Award, Dept. Computer Science & Engineering, University of Minnesota, 1999.

Professional Experience

Professor, FAU, Computer & Electrical Engineering and Computer Science, Aug. 2014 – present
Associate Professor, FAU, Computer Science & Engineering, Aug. 2008 – July 2014
Assistant Professor, FAU, Computer Science & Engineering, Aug. 2003 – July 2008
Intern, Honeywell Laboratories, Minneapolis, Apr. 1999 – Oct. 1999
Development Engineer, CoManage Corporation, Sep. 2000 – Jun. 2001

Grant Awards

- Equipment Grant: MSC-Mobile Switching Center, GSN-GPRS Support Node, GSM Base Station (1900 MHz) and OMCR, CDMA Base Station (850 MHz) and BSM Server, FAU NSF/IUCRC, co-PI, Jan 2012 – Dec 2014, $965,000.

- Efficient Protocols and Algorithms for Wireless Networks, FAU NSF/IUCRC, co-PI, Feb 2012 – May 2014, $17,359 (Total grant $100,000).

- Design and Evaluation of Wireless Networks Protocols, FAU Foundation/Tecore Networks, co-PI, Jan 2012 – May 2014, $15,156 (Total grant $100,000).

- Data Link and Communication Protocols for Underwater Laser Sensor Networks, FAU Division of Research (Seed Grant), co-PI, 2012-2013, $20,000.

- Campus-2020 project: Campus Driving and Directions Assistant, FAU NSF/IUCRC, investigator, 2012-2013, $20,240 (Total grant $300,000).

- **NSF CAREER Optimization Problems in Wireless Sensor Network Design and Applications, National Science Foundation (NSF), PI, 06/01/06-01/31/12, $400,000.**

- NSF Research Experiences for Undergraduates (REU), National Science Foundation (NSF), 05/15/09 – 12/15/09 PI, $15,750.

- NSF CISE Instrumentation: Wireless and Sensor Networking Laboratory, National Science Foundation (NSF) & Division of Research at FAU, PI, 09/01/04-09/01/07, $85,851.

- Secure Telecommunication Networks, Secure Routing Protocols for Ad Hoc Wireless Networks, DoD Defense-wide RTDE grant, investigator, 09/01/04-08/31/06, $37,000.

- New Project Development Program, Wireless Sensor Networks Design and Experimentation, FAU Division of Research, PI, 01/01/06-12/31/06, $15,000.

- NSF MRI: Acquisition of a NUMA-based Supercluster for High Performance Computing, National Science Foundation (NSF), co-PI, 08/01/05-07/31/09, $459,065.

- Secure Telecommunication Network, Global Information Grid Simulation, DoD Defense-wide RTDE grant, investigator, 01/09/08-01/09/09, $35,000.

Teaching

Graduate Courses:

- COT 6930: Wireless Networks
- COT 6405: Analysis of Algorithms

- COT 6930: Algorithms for Bioinformatics
- COT 6930: Wireless Networks Design and Optimization
- COT 6930: Distributed Algorithms
- COT 6930: Wireless Sensor Networks

Undergraduate Courses:
- CDA 4500: Introduction to Data Communications
- COT 4400: Design and Analysis of Algorithms
- COT 4420: Introduction to Forma Languages and Automata
- STA 4821: Stochastic Models for CS

Student Supervision

Ph.D. Dissertations Supervised (7)
Master's Theses Supervised (8)

Professional Organizations

Senior Member, Institute of Electrical and Electronics Engineers (IEEE)

Professional Activities

- Editor for *Ad Hoc & Sensor Wireless Networks* Journal, OCP Science, September 2009 – September 2012.
- Editor for *Computer Communications* Journal, Elsevier, February 2009 – February 2010.
- Panelist, National Science Foundation, 2003, 2005, 2008, 2012.
- Organizer of the *Wireless Networking Seminar* at the University of Minnesota, 2001-2003.
- One of the organizers of the *Doctoral Dissertation Fellows Seminar* (2002-2003), event conducted by the Graduate School at the University of Minnesota.
- Co-editor of *Theoretical and Algorithmic Aspects of Sensor, Ad Hoc Wireless, and Peer-to-Peer Networks*, special issue in the Journal of Parallel and Distributed Computing (JPDC), Vol 65, No 2, Feb. 2005.

Publications

- **7265 citations on Google Scholar**

Conference Papers

1. C. Aranzazu-Suescun and M. Cardei, UAV-aided Weak-Barrier Coverage with Adaptive Sensor Rotation, *The 13th Annual IEEE International Systems Conference (SysCon 2019)*, Apr. 2019.

2. I. Cardei, M. Cardei, and R. Papa, UAV-enabled Data Gathering in Wireless Sensor Networks, *37th IEEE International Performance Computing and Communications Conference*, Nov. 2018.

3. C. Aranzazu-Suescun and M. Cardei, Networking Protocols for Wireless Sensor Networks with Mobile Sink, *LACCEI International Multi-Conference for Engineering, Education, and Technology*, Jul. 2018.

4. C. Aranzazu-Suescun and M. Cardei, Weak-Barrier Coverage with Adaptive Sensor Rotation, *The 12th Annual International Conference on Combinatorial Optimization and Applications (COCOA 2018)*, Dec. 2018.

5. M. Cardei, I. Cardei, and A. Steinberg, UAS Trajectory Scheduling System, *IEEE Systems Conference*, Apr. 2018.

6. C. Aranzazu-Suescun and M. Cardei, Spatio-Temporal Event Detection and Reporting in Mobile-Sink Wireless Sensors Networks, *The 36th IEEE International Performance Computing and Communications Conference (IPCCC)*, Dec. 2017.

7. C. Aranzazu-Suescun and M. Cardei, Reactive Routing Protocol for Event Reporting in Mobile-Sink Wireless Sensor Networks, *The 13th ACM International Symposium on QoS and Security for Wireless and Mobile Networks*, Nov. 2017.

8. Y. Wu and M. Cardei, A Cognitive Radio Approach for Data Collection in Border Surveillance, *IEEE International Performance Computing and Communications Conference (IPCCC)*, Dec. 2016.

9. C. Aranzazu Suescun and M. Cardei, Event-based Clustering for Composite Event Detection in Wireless Sensor Networks, *IEEE International Performance Computing and Communications Conference (IPCCC)*, Dec. 2016 (***Best Paper Award***).

10. C. Aranzazu Suescun and M. Cardei, Unmanned Aerial Vehicle Networking Protocols, *LACCEI International Multi-Conference for Engineering, Education, and Technology*, Jul. 2016.

11. A. Mihnea and M. Cardei, Methods to Improve Capacity in Grid Networks, *The 29th International Conference on Computer Applications in Industry and Engineering (CAINE)*, Sept. 2016.

12. Y. Wu, D. Raviv, and M. Cardei, Campus Navigation System with Seamless Real-Time Information, *International Conference on Computers and Their Applications (CATA)*, Apr. 2016.

13. A. Mihnea and M. Cardei, Analysis of Interference for a Multi-Radio Channel Assignment Algorithm, *International Conference on Computers and Their Applications (CATA)*, Apr. 2016.

Journal Articles

1. C. Aranzazu-Suescun and M. Cardei, Distributed Algorithms for Event Reporting in Mobile-Sink WSNs for Internet of Things, *Tsinghua Science and Technology*, Vol. 22, No. 4, pp. 413 - 426, Aug. 2017.

2. Y. Wu and M.Cardei, Distributed Algorithms for Barrier Coverage via Sensor Rotation in Wireless Sensor Networks, *Journal of Combinatorial Optimization*, DOI: 10.1007/s10878-016-0055-3, 2016.

3. Y. Wu and M. Cardei, Multi-Channel Approaches for Wireless Sensor Networks, *Computer Communications Journal (Elsevier),* DOI: 10.1016/j.comcom.2016.08.010, Vol. 94, pp. 30 – 45, Nov. 2016.

4. Y. Wu and M. Cardei, Distributed Algorithms for a Robust Topology using Reconfigurable Radios Wireless Sensor Networks, *International Journal of Sensor Networks (IJSNet* , DOI: 10.1504/IJSNET.2016.10001264, 2016.

5. A. Mihnea and M. Cardei, Efficient Wireless Communication in Grid Networks, *International Journal of Interdisciplinary Telecommunications and Networking (IJITN)*, Vol. 7(3), pp. 57-79, 2015.

6. A. Mihnea and M. Cardei, Robustness to Multiple Primary Users and Balanced Channel Assignment in Cognitive Radio Networks, *International Journal of Computer and Communication System Engineering (IJCCSE)*, Vol. 2(3), pp. 553-560, 2015.

7. F. Dalgleish, J. Shirron, D. Rashkin, T. Giddings, A. Vuorenkoski, I. Cardei, B. Ouyang, F. Caimi, M. Cardei, A Physical Layer Simulator for Undersea Free Space Laser Communications, *Optical Engineering* 53(5), DOI: 10.1117/1.OE.53.5.051410, Apr. 2014.

8. A. Ambrose, M. Cardei, and I. Cardei, HEMS, a Hurricane Evacuation Management System, *Ad Hoc & Sensor Wireless Networks*, Old City Publishing, Vol. 17, No. 1-2, pp. 143 – 167, 2013.

9. A. Marcus, M. Cardei, I. Cardei, E. Fernandez, F. Frati, E. Damiani, A Pattern for Web-based WSN Monitoring, *Journal of Communications*, Vol. 6, No. 5, pp. 393-399, Aug. 2011.

10. Y. Yang, A. Ambrose, and M. Cardei, Coverage for Composite Event Detection in Wireless Sensor Networks, Wireless Communications and Mobile Computing, *Wireless Communications and Mobile Computing*, Wiley InterScience, Vol. 11, Issue 8, pp. 1168-1181, Aug. 2011.

EAB

MARKET RESEARCH BRIEF

Market Demand for a Master's-Level Artificial Intelligence Program

Analysis of Employer Demand

COE Forum

Sarah Conroy
Market Research Associate

Elizabeth Casey-Rutland
Market Research Manager

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1) Research Methodology

Project Challenge

Leadership at Florida Atlantic University approached the Forum as they considered the development of a master's-level artificial intelligence program. Through quantitative data analytics and secondary research, the Forum sought to assess the market viability of a master's-level artificial intelligence program.

EAB's market research function provides insights which guide strategic programmatic decisions at member institutions. The Forum combines qualitative and quantitative data to help administrators identify opportunities for new program development, assess job market trends, and align curriculum with employer and student demand.

EAB reports rely primarily on labor market data from the Emsi's Analyst and Alumni Insight™ tool (description below). Reports occasionally use data from the United States Census Bureau and United States Bureau of Labor Statistics data to explore occupation and job trends. Market research reports may also incorporate Integrated Postsecondary Education Data System (IPEDS) data to assess student enrollment, demographics, and completion rates across competitor programs.

Methodology and Definitions

Methodology: Unless stated otherwise, this report includes data from online job postings from January 2018 to December 2018. The Forum identified the top titles, employers, educational attainment, and reported earnings for master's-level artificial intelligence professionals in the profiled region and statewide. To identify relevant job postings, the Forum examined postings for master's-level professionals with relevant skills (e.g., 'deep learning,' 'natural language processing').

Definitions: "Regional data" and the "region" refer to the following states:

- Alabama,
- Florida,
- Georgia,
- Mississippi,
- North Carolina,
- South Carolina, and
- Tennessee.

"Master's-level artificial intelligence professionals" refers to professionals with a master's-level degree and relevant skills (e.g., 'deep learning,' 'natural language processing').

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Emsi's Analyst and Alumni Insight

EAB's Partner for Comprehensive Labor Market Data

This report includes data made available through EAB's partnership with Emsi (Economic Modeling Specialists International), a labor market analytics firm serving higher education, economic development, and industry leaders in the U.S., Canada and the United Kingdom.

Emsi curates and maintains the most comprehensive labor market data sets available for academic program planning, providing real-time job posting data, workforce and alumni outcomes data, and traditional government sources of data. Under this partnership, EAB may use Emsi's proprietary Analyst™ and Alumni Insight™ tools to answer member questions about employer demand, the competitive landscape, in-demand skills, postings versus actual hires, and skills gaps between job postings and professionals in the workforce. The Emsi tools also provide EAB with in-depth access to unsuppressed, zip-code-level government data for occupations, industries, programs, and demographics. For more complete descriptions of the Emsi tools, visit:

- http://www.economicmodeling.com/analyst/
- https://www.economicmodeling.com/alumni-insight/

To learn more about Emsi and its software and services, please contact Bob Hieronymus, Vice President of Business Development at bob.hieronymus@economicmodeling.com or (208) 883-3500.

Project Sources

The Forum consulted the following sources for this report:

- EAB's internal and online research libraries (eab.com)
- National Center for Education Statistics (nces.ed.gov)

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2) Executive Overview

Increased employer demand for master's-level artificial intelligence professionals and increased completions of relevant master's-level programs indicate an opportunity for program development. From September 2016 to December 2018, regional demand for master's-level artificial intelligence professionals increased 420 percent (i.e., from 327 to 1,700 postings) and statewide employer demand increased 423 percent (i.e., from 86 to 450 postings). Additionally, growth in nationwide completions of master's-level "artificial intelligence" programs suggests an increase in student demand for similar programs. Nationwide completions of master's-level "artificial intelligence" programs (i.e., classification of instructional programs (CIP) code 11.0102) increased 127 percent between the 2012-2013 academic year and the 2016-2017 academic year (i.e., completions increased from 81 to 184).

Emphasize high reported earnings in relevant occupations to attract prospective students interested in career advancement. The median hourly regional and statewide earnings in the five most common occupations for master's-level artificial intelligence professionals exceeds the median hourly earnings across all occupations in Florida. For example, 'computer and information research scientists' earn a median of $51.25 an hour regionally, and $46.05 an hour statewide. Comparatively, workers in Florida earn a median hourly income of $16.07 per hour across all occupations. A focus on the high potential earnings of program graduates can attract prospective students who seek a degree with a high return on investment. A marketing approach that focuses on student outcomes can effectively attract prospective students because it allows them to envision program outcomes.[1]

1) Competing on Student Outcomes to Attract Today's Career Changer

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3) Market Demand Trends

Employer Demand over Time

Growth in Regional and Statewide Employer Demand Indicates Potential for Program Development

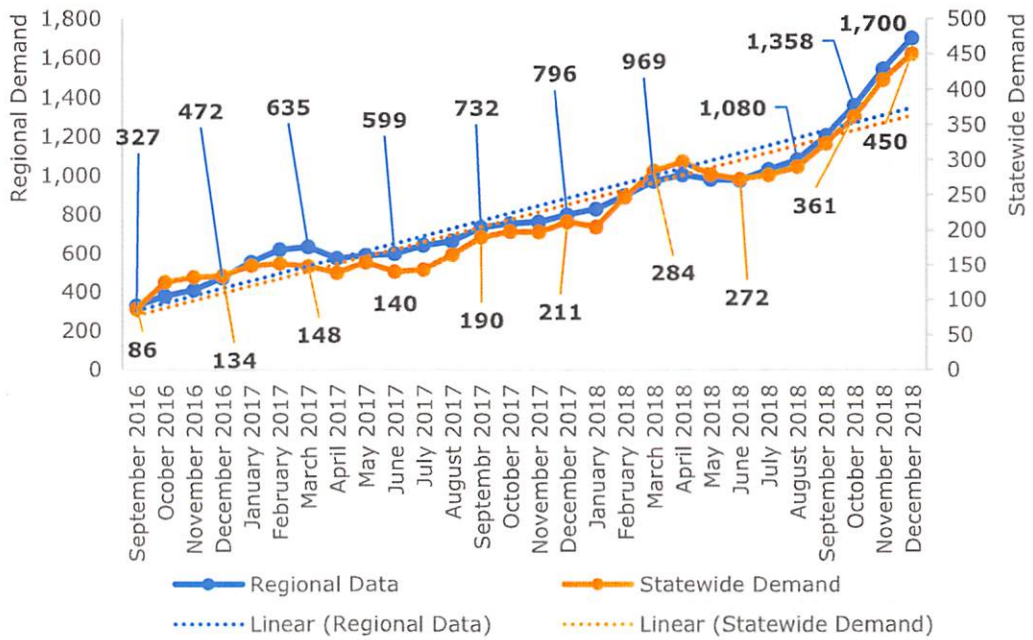
Overall positive employer demand trends indicate potential for program development. Statewide employers post 423 percent more openings for master's-level artificial intelligence professionals in December 2018 than in September 2016 (i.e., demand grew from 86 to 450 postings). Similarly, regional employer demand for master's-level artificial intelligence professionals grew 420 percent from September 2016 to December 2018 (i.e., from 327 to 1,700 postings). Notably, statewide and regional employer demand exhibited a consistent upward trend over the last two years, with no significant declines in demand. Between September 2016 and December 2018, statewide demand for master's-level artificial intelligence professionals increased approximately nine postings per month on average and regional demand increased by an average of approximately 33 postings per month.

Additionally, the Bureau of Labor Statistics (BLS) projects nationwide employment of "software developers, applications" (e.g., "application integration engineer," "software applications architect") will increase about 30 percent from 2016 to 2026, above the average projected growth in employment for all occupations during the period (i.e., 7.4 percent).[2] Emsi Analyst™ projects a 29 percent growth in regional employment of "software developers, applications" during the same period. The BLS also projects nationwide employment of "computer and information research scientists" to increase about 19 percent from 2016 to 2026. Emsi Analyst™ projects a 43 percent growth in regional employment of "computer and information research scientists" from 2016 to 2026, higher than national occupational growth projections.

Linear trend lines represent the average monthly change in statewide and regional employer demand for master's-level artificial intelligence professionals.

Historical Employer Demand for Master's-Level Artificial Intelligence Professionals

September 2016-October 2018, Statewide and Regional Data[3]



2) Bureau of Labor Statistics
3) Emsi Analyst™

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Prepare Students for Analytics and Research Roles to Align with Employer Demand

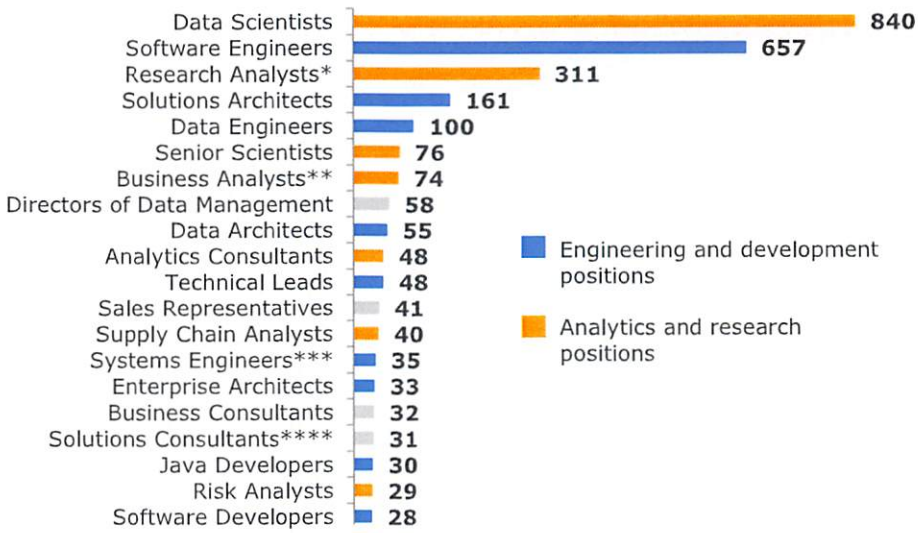
Analytics and research positions (e.g., 'research analysts,' 'business analysts') account for seven of the top 20 roles for which regional employers seek master's-level artificial intelligence professionals in the last 12 months, and 10 of the top 20 positions statewide employers specify over the same period. Graduates of a prospective master's-level artificial intelligence program can qualify for analytics and research roles across multiple areas (e.g., finance, computer and information). Prospective students interested in analytics across various fields can enroll in a prospective master's-level artificial intelligence program to gain relevant skills.

Regional and statewide employers also request master's-level artificial intelligence professionals for engineering and development roles (e.g., 'software engineers,' 'business intelligence developers'). Engineering and development roles account for nine of the top 20 titles regional employers most frequently post for master's-level artificial intelligence professionals. Similarly, engineering and development positions compose five of the top 20 titles statewide employers most frequently post for master's-level artificial intelligence professionals in the last 12 months.

Top Regional Titles for Master's-Level Artificial Intelligence Professionals

January 2018-December 2018, Regional Data[4]

n = 4,697 job postings



* Research Analysts (Life, Physical, and Social Science)
** Business Analysts (Business and Financial Operations)
*** Systems Engineers (Computer and Mathematical)
****Solutions Consultants (Business and Financial Operations)

4) Emsi Analyst™

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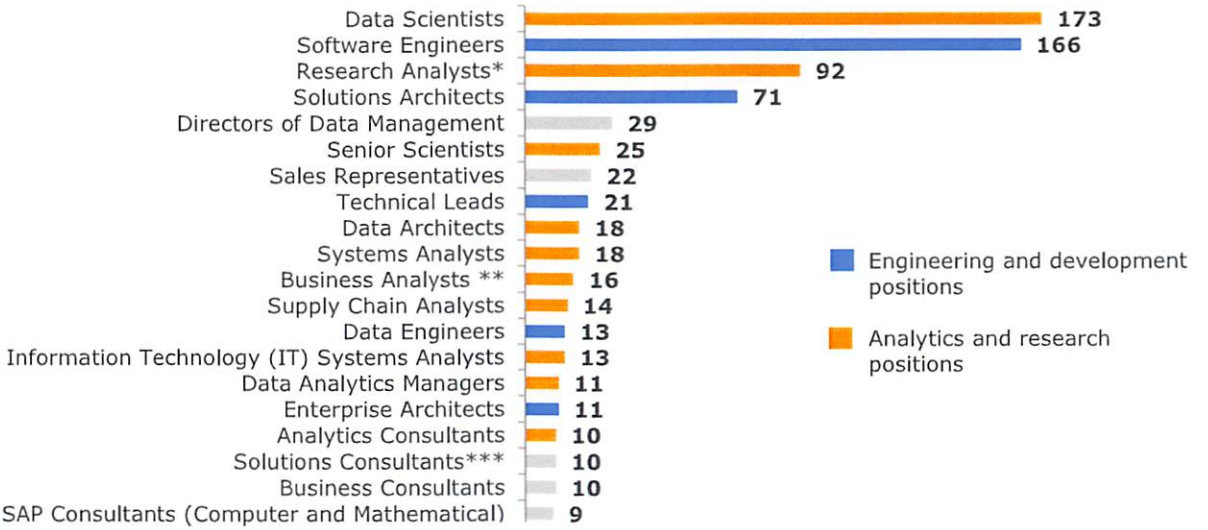
Top Statewide Titles for Master's-Level Artificial Intelligence Professionals

January 2018-December 2018, Statewide Data[5]

n = 1,214 job postings



* Market Research Analysts and Marketing Specialists
** Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
*** Solutions Consultants (Business and Financial Operations)

Employers with High Demand

Partner with Consulting and Technical Companies with High Relevant Demand to Recruit Students for a Master's-Level Artificial Intelligence Program

Partner with consulting firms, banks and financial organizations, and technology companies with high demand for master's-level artificial intelligence professionals to recruit prospective students. EAB research indicates institutions should consider partnerships with employers in industries that express high levels of demand for program graduates. Develop these partnerships through meetings with local employers to discuss industry needs. Employer feedback allows administrators to define distinct, sector-specific employment shortages for professionals and customize partnerships to meet those needs. Consulting companies represent five of the top 20 regional employers and three of the top 20 statewide employers that seek master's-level artificial intelligence professionals in the last year (e.g., Deloitte, LLP, KPMG, LLP). Emphasize demand among consulting firms to attract prospective students who seek career advancement and students interested in work in this industry. Additionally, banks and financial organizations (e.g., Wells Fargo & Company, American Express Company) account for three of the top 20 regional and statewide employers that seek master's-level artificial intelligence professionals. As expected, technology companies (e.g., IBM, Inc., Boeing Co.) account for four of the top 20 regional and statewide employers for master's-level artificial intelligence professionals.

Additionally, highlight diverse employment opportunities for master's-level artificial intelligence professionals to attract prospective students with wide-ranging career interests. Other top regional and statewide employers for master's-level artificial

5) Emsi Analyst™

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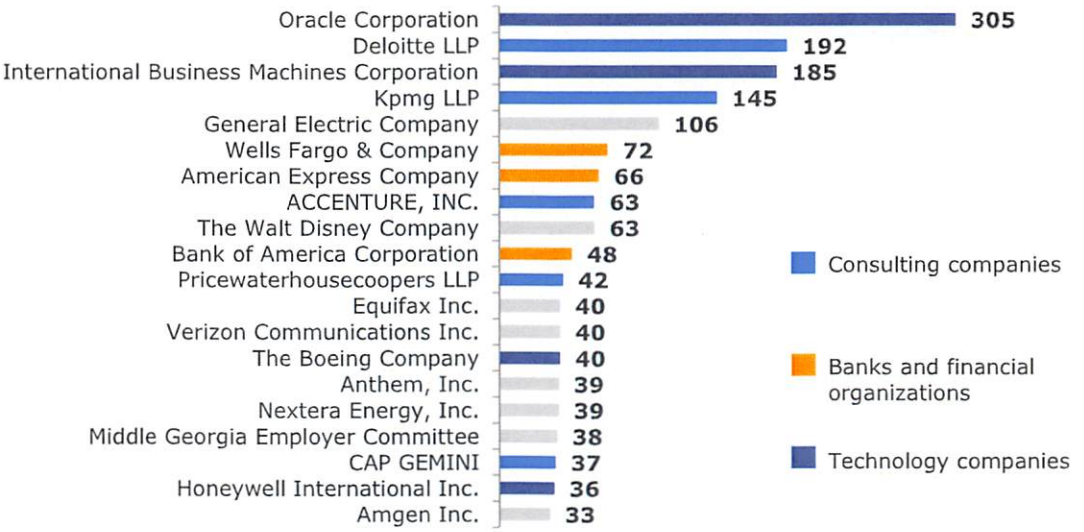
intelligence professionals span many industries including health care (e.g., Anthem, Inc.) and energy companies (e.g., Nextera Energy, Inc.).

Top Regional Employers for Master's-Level Artificial Intelligence Professionals

January 2018-December 2018, Regional Data[6]

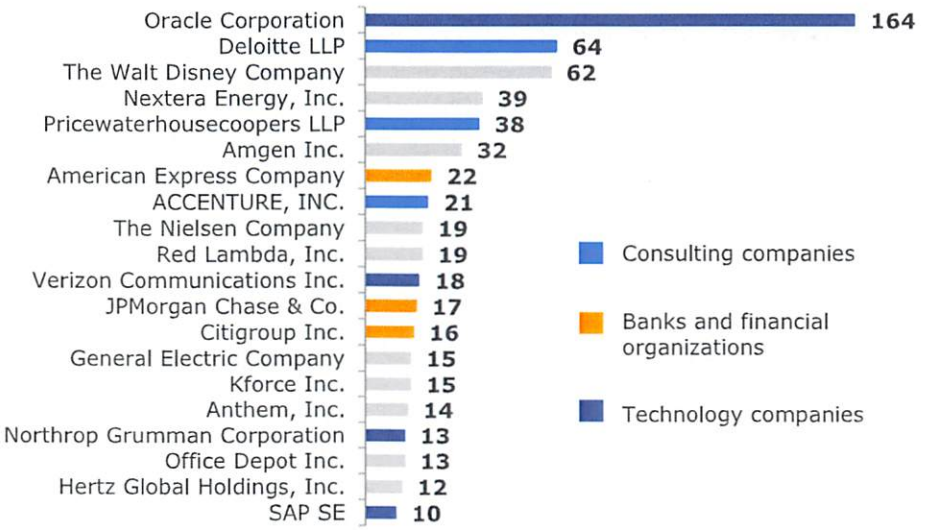
n = 4,697 job postings



Top Statewide Employers for Master's-Level Artificial Intelligence Professionals

January 2018-December 2018, Statewide Data[7]

n = 1,214 job postings



6) Emsi Analyst™
7) Emsi Analyst™

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Advertised Education Requirements

Advertise a Master's-Level Artificial Intelligence Program as a Pathway to Career Advancement to Attract Outcomes Focused Prospective Students

Regional employers specify for a bachelor's-level degree in 86 percent of postings for artificial intelligence professionals in the last 12 months (i.e., 10,433 of 12,108 postings). Comparatively, regional employers specify for a master's-level degree in 39 percent of job openings for artificial intelligence professionals in the last 12 months (i.e., 4,697 of 12,108 job postings). Similarly, statewide employers specify for a bachelor's-level degree in 91 percent of postings for artificial intelligence professionals (i.e., 3,257 of 3,572 job postings) and a master's-level degree in 34 percent of postings (i.e., 1,214 of 3,572 job postings). Professionals who seek to advance to positions that require a master's-level degree can enroll in the proposed program to obtain an additional credential to gain an advantage in the job market.

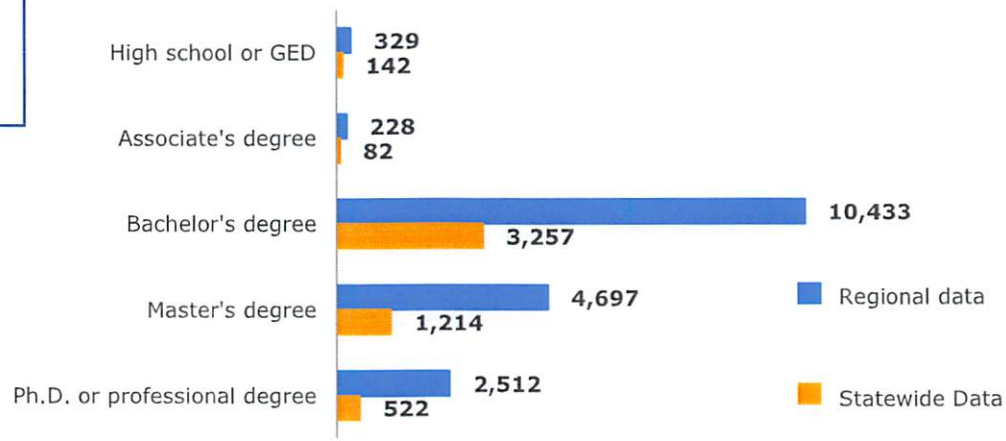
Employers may specify multiple levels of education in a single job posting, so employers may prefer a candidate with a master's-level degree in postings that also specify a bachelor's-level degree. For example, job postings for professionals with a bachelor's-level degree may identify a bachelor's-level degree as a requirement for employment but employers may prefer professionals with master's-level degrees. Additionally, artificial intelligence professionals who seek to move into more advanced roles can enroll in the artificial intelligence program to gain an additional credential and further training necessary for advancement. According to the BLS, professionals typically require a master's-level degree for employment as "computer and information research scientists."[8]

Administrators should note employers may specify multiple levels of education in one job posting, therefore, a single job posting may appear multiple times.

Advertised Education Level for Artificial Intelligence Professionals

January 2018-December 2018, Regional and Statewide Data[9]

n (regional)= 12,108 job postings, n (statewide)= 3,572 job postings



8) BLS-Occupational Outlook Handbook
9) Emsi Analyst™

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Advertised Earnings

Feature Reported Earnings for Relevant Occupations in Marketing Materials to Convey Return on Investment to Prospective Students

Include information on the median hourly earnings and regional growth in employment for common occupations for master's-level artificial intelligence professionals to attract outcomes-focused students. The median earnings for the top five regional and statewide occupations for master's-level artificial intelligence professionals exceeds the median hourly income across all occupations in Florida. According to the BLS, Florida workers earn a median hourly income of $16.07 per hour across all occupations.[10] 'Computer and information research scientists' represents the top occupation for which regional employers seek master's-level artificial intelligence professionals and the second most common occupation for which statewide employers seek master's-level artificial intelligence professionals. 'Computer and information research scientists' earn a median of $51.25 an hour in the region, and $46.05 an hour statewide, approximately 3.2 and 2.9 times the median hourly statewide income for all occupations, respectively.[11]

Earnings and Growth Projections in Top Regional and Statewide Occupations for Master's-Level Artificial Intelligence Professionals

Regional and Statewide Data[12]

Occupation	Sample Job Titles	Regional Median Hourly Earnings	Employment Growth 2016-2026
Computer and Information Research Scientists	Computer Scientist, Control System Computer Scientist, Computational Theory Scientist	$51.25 (regional) $46.05 (state	+ 28.8% (regional) + 44.8% (state)
Software Developers, Applications	Application Integration Engineer, Applications Developer, Database Developer	$44.65 (regional) $42.32 (state)	+42.5% (regional) +45.1% (state)
Computer Occupations, All Other	Solutions Architect, Data Architect, Computer Laboratory Technician	$39.18 (regional) $36.36 (state)	+ 28.9% (regional) + 34.7% (state)
Management Analysts	Research Analysts, Analytics Consultants, Business Consultants	$34.96 (regional) $31.29 (state)	+ 22.7% (regional) + 23.4% (state)
Market Research Analysts and Marketing Specialists	Data Scientists, Senior Scientists, Business Analysts	$27.76 (regional) $27.89 (state)	+ 36.5% (regional) + 35.9% (state)

10) Occupational Employment Statistics
11) Emsi Analyst™
12) Emsi Analyst™

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Growth in Nationwide Completions of Master's-Level Artificial Intelligence Programs Indicates Increased Student Interest and Potential for Program Development

Administrators should note **no statewide institution** reports completions of master's-level "artificial intelligence" programs (i.e., CIP code 11.0102) between the 2012-2013 and 2016-2017 academic years.

Nationwide completions of master's-level "artificial intelligence" programs (i.e., classification of instructional programs (CIP) code 11.0102) increased 127 percent between the 2012-2013 academic year and the 2016-2017 academic year (i.e., from 81 to 184). While reported completions of master's-level "artificial intelligence" programs decreased slightly between the 2014-2015 academic year and the 2015-2016 academic year (i.e., from 140 completions to 128 completions), the overall growth in completions over the last five years of available data indicates increased student interest. Further, relevant master's-level completions increased 44 percent between the 2015-2016 and 2016-2017 academic years (i.e., from 128 to 184 completions).

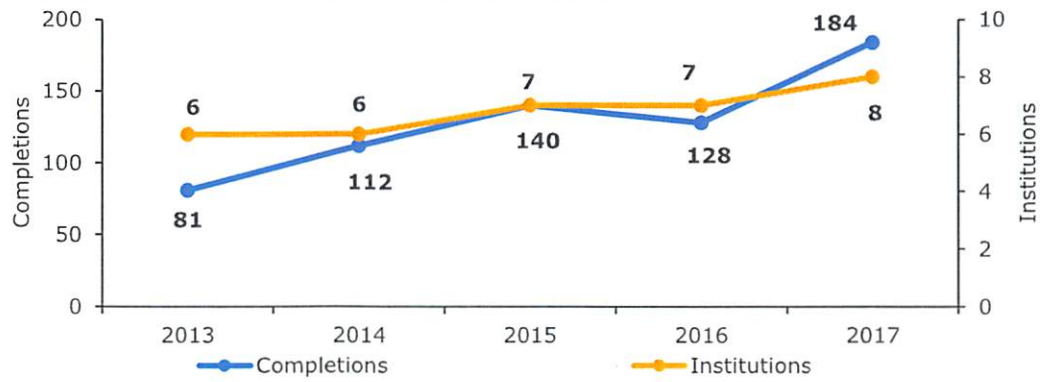
Statewide Undergraduate Completions of "Engineering" and "Computer and Information Science and Support Services" Programs

Statewide institutions reported 3,755 completions of bachelor's-level "computer and information science and support services" (i.e., CIP code 11) programs and 5,066 completions of bachelor's-level "engineering" (i.e., CIP code 14) programs for the 2016-2017 academic year. The total reported statewide completions with both CIP codes (i.e., 8,821 completions) indicates a large prospective student population in Florida. Target marketing efforts to students in these undergraduate programs to attract enrollments for a prospective master's-level artificial intelligence program.

Additionally, the number of nationwide institutions that report master's-level degree completions with the CIP code for "artificial intelligence" increased 33 percent between the 2012-2013 academic year and the 2016-2017 academic year (i.e., from six to eight institutions). However, no statewide institutions report completions of master's-level "artificial intelligence" programs during this period. This indicates a master's-level artificial intelligence program at **Florida Atlantic University** will face limited in-state competition. National completions of "artificial intelligence" programs at any degree level grew 104 percent from the 2012-2013 to 2016-2017 academic year (i.e., from 104 to 212 completions). For detailed information on national completions of "artificial intelligence" programs at all academic levels, see the Appendix.

Number of Nationwide Institutions that Report Completions of Master's-Level "Artificial Intelligence" Programs versus Number of Reported Degree Completions

2012-2013 – 2016-2017 Academic Years, Nationwide Data[13]



13) Integrated Postsecondary Education Data System

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Appendix: Nationwide Completions

2017 represents the most recent year of available completions data.

Reported Nationwide Completions of "Artificial Intelligence" Programs at All Degree Levels

2012-2013 – 2016-2017 Academic Years, Nationwide Data[14]

Institution	Distance Learning Offered	Reported Degree Completions				
		2013	2014	2015	2016	2017
Carnegie Mellon University	No	48	85	64	72	83
University of Pennsylvania	No	34	34	44	40	50
University of Georgia	No	9	4	9	3	5
University of Pittsburgh-Pittsburgh Campus	No	4	9	4	8	6
Georgia Institute of Technology-Main Campus	No	3	8	7	8	1
University of Southern California	No	3	6	12	11	9
South Dakota School of Mines and Technology	No	3	5	N/A	N/A	N/A
University of Washington-Seattle Campus	No	N/A	N/A	27	19	28
Eastern Michigan University	No	N/A	N/A	1	N/A	N/A
Syracuse University	No	N/A	N/A	1	2	N/A
Brandeis University	No	N/A	N/A	N/A	N/A	16
Full Sail University	No	N/A	N/A	N/A	N/A	11
Indiana University-Bloomington	No	N/A	N/A	N/A	N/A	3
Total Completions	No	104	151	169	163	212

14) Emsi Analyst™: CIP code 09.0100 (Communication, General)

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DATA SNAPSHOT

Market Demand for a Master's-Level Artificial Intelligence Program

Analysis of Competitor Programs

COE Forum

COE Forum

Sarah Conroy
Market Research Associate

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Market Research Manager

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1) Research Methodology

Project Challenge

Leadership at Florida Atlantic University approached the Forum as they considered the development of a master's-level artificial intelligence program. Through interviews with administrators of comparable programs and secondary research, the Forum sought to assess the market viability of a master's-level artificial intelligence program.

EAB's market research function provides insights which guide strategic programmatic decisions at member institutions. The Forum combines qualitative and quantitative data to help administrators identify opportunities for new program development, assess job market trends, and align curriculum with employer and student demand.

EAB reports rely primarily on labor market data from the Emsi's Analyst and Alumni Insight™ tool (description below). Reports occasionally use data from the United States Census Bureau and United States Bureau of Labor Statistics data to explore occupation and job trends. Market research reports may also incorporate Integrated Postsecondary Education Data System (IPEDS) data to assess student enrollment, demographics, and completion rates across competitor programs.

Methodology and Definitions

Definitions: "Master's-level artificial intelligence professionals" refers to professionals with a master's-level degree and relevant skills (e.g., 'deep learning,' 'natural language processing').

Project Sources

The Forum consulted the following sources for this report:

- EAB's internal and online research libraries (eab.com)
- Bureau of Labor Statistics (bls.gov)
- Profiled program websites:
  - Carnegie Mellon University, "Master of Science in Artificial Intelligence and Innovation," accessed January 2019, https://msaii.cs.cmu.edu/.
  - Georgia Institute of Technology, "Master of Science in Computer Science with a concentration in Interactive Intelligence," accessed January 2019, https://www.cc.gatech.edu/academics/degree-programs/masters/computer-science/specializations.
  - Northwestern University, "Master of Science in Artificial Intelligence," accessed January 2019, https://www.mccormick.northwestern.edu/artificial-intelligence/.
  - Stevens Institute of Technology, "Applied Artificial intelligence Master's Program," accessed January 2019, https://www.stevens.edu/schaefer-school-engineering-science/departments/electrical-computer-engineering/graduate-programs/applied-artificial-intelligence-masters-program.
  - University of Pittsburg, "Master of Science in Intelligent Systems," accessed January 2019, http://sci.pitt.edu/academics/masters/isp/.

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Profiled Institutions

The Forum profiled graduate-level artificial intelligence programs at the following institutions:

A Guide to Institutions Profiled in this Brief[1]

Institution	Location	Approximate Institutional Enrollment (Undergraduate/Total)	Carnegie Classification
Carnegie Mellon University	Mid-Atlantic	6,500 / 13,500	Doctoral Universities: Highest Research Activity
Georgia Institute of Technology	South	15,500 / 27,000	Doctoral Universities: Highest Research Activity
Northwestern University	Midwest	9,000 / 22,000	Doctoral Universities: Highest Research Activity
Stevens Institute of Technology	Mid-Atlantic	3,000 / 6,500	Doctoral Universities: Higher Research Activity
University of Pittsburg	Mid-Atlantic	19,000 / 28,500	Doctoral Universities: Highest Research Activity
Institution A	*	*	*
Institution B	*	*	*

The Forum does not provide information on **Institution A or Institution B** so the institutions may remain anonymous.

1) National Center for Education Statistic

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2) Executive Overview

Develop an online or hybrid option in program delivery to compete with profiled programs and serve a broader student audience. Of profiled institutions, **Stevens Institute of Technology** and **Georgia Institute of Technology** offer master's-level artificial intelligence programs in both an online and on-campus format. Additionally, **Institution B** offers the graduate-level artificial intelligence certificate program online and via hybrid delivery, and **Institution A** offers the certificate program exclusively in a hybrid format. Other profiled institutions offer master's-level artificial intelligence programs exclusively on-campus. An online program can compete with profiled institutions and accommodate students with personal and professional commitments which make them unable to attend regular on-campus courses.

Form partnerships with employers with high demand for master's-level artificial intelligence professionals for collaborative projects and internship placement. Carnegie Mellon University, Georgia Institute of Technology, and **Northwestern University** highlight industry partnerships on master's-level artificial intelligence program webpages to attract potential students. Industry partners may offer collaborative project opportunities and internship placement opportunities for students enrolled in a master's-level artificial intelligence program. Industry partners highlighted on profiled program webpages include Amazon Web Services, Deloitte, and Microsoft. EAB research indicates administrators should form advisory boards with industry partners to advise program administrators in curriculum development and offer mentoring and capstone project opportunities for students.

Focus recruitment efforts on undergraduate engineering and computer science students to secure enrollments. Northwestern University primarily enrolls students with undergraduate degrees in engineering and computer science (i.e., 58 percent of the 2018 cohort) and no post-undergraduate work experience (i.e., 47 percent of the 2018 cohort). Students with post-undergraduate work experience typically enroll with two years' work experience (i.e., 21 percent of the 2018 cohort).

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3) Competitive Landscape

Program Modality

Offer an On-Campus and Online Master's-Level Artificial Intelligence Program to Compete with Profiled Programs

Consider a master's-level artificial intelligence program with online and on-campus options to compete with profiled programs and serve a broader student audience. Students who seek a more traditional, on-campus program can enroll in an on-campus master's-level artificial intelligence program, while an online program can accommodate students with personal and professional commitments which make them unable to attend regular on-campus courses. Students at **Stevens Institute of Technology** and **Georgia Institute of Technology** can complete the profiled master's-level artificial intelligence program both online and on-campus, and both **Institution B** and **Institution A** offer the profiled graduate certificate programs in a hybrid format. However, other profiled institutions offer programs exclusively on-campus.

Artificial Intelligence at Florida International University

Florida International University does not advertise a program in artificial intelligence at any degree level. However, the University's webpage for research and industry highlights research in artificial intelligence and big data. The list of relevant research topics include new machine learning and language processing, neural networks, and social media analytics. Additionally, artificial intelligence is listed as an "area of study" within the doctoral-level computer science program at Florida International University.

Modality of Profiled Master's-Level Artificial Intelligence Programs

Profiled Institutions

On-Campus

- Carnegie Mellon University
- Northwestern University
- University of Pittsburg

Online/Hybrid

- Stevens Institute of Technology
- Georgia Institute of Technology
- Institution B
- Institution A

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Program Characteristics

Partner with Private Companies that Work in Artificial Intelligence for Project Collaboration and Internship Placement

Profiled programs at **Carnegie Mellon University** and **Northwestern University** highlight industry partnerships, collaborative projects, and internship opportunities on program webpages. The webpage for the profiled program at Northwestern University includes a list of partners (e.g., Amazon Web Services, Deloitte, IBM, Microsoft) and information for companies interested in partnerships with the master's-level artificial intelligence program. Program administrators encourage prospective partners to hire master's-level artificial intelligence students for summer internships and collaborate on capstone projects to use new technologies in future business strategy. Further, the profiled program webpage at Carnegie Mellon University highlight four ways in which private companies can become involved with the master's-level artificial intelligence program. Private companies can sponsor a capstone project, offer an internship to master's-level artificial intelligence students, recruit students for jobs after graduation, and stay in touch with the program to increase awareness of developments in the field of artificial intelligence. Additionally, **Georgia Institute of Technology** advertises an optional internship with employers of artificial intelligence professionals. The graduate co-op/internship requires students to identify employers for internships and submit an application to a graduate program committee for approval. The profiled program website does not indicate whether the Institute maintains partnerships with employers or assists in internship placement.

EAB research indicates program administrators should encourage regional employers with the most demand for program graduates (e.g., master's-level artificial intelligence professionals) to join a program advisory board. [1] An advisory board allows employers to advise administrators on curriculum development and offer mentoring and capstone project opportunities for students. Partnerships through an advisory board encourage interactions with employers who may hire or promote program graduates, as administrators can demonstrate the program's alignment with industry expectations. Share labor market data with participating employers to demonstrate administrators' intent to prepare graduates for employer expectations and confirm an understanding of employers' unique needs. The Forum could not determine the extent to which profiled programs or employers provide funding to students who pursue internships.

Characteristics of Profiled Master's-Level Artificial Intelligence Programs

Profiled Institutions

Profiled Institution	Program Title	Admission Requirements	Tuition	Modality	Internship Opportunities	Department Housing
Carnegie Mellon University	Master of Science in Artificial Intelligence and Innovation	• GPA of 3.0 or higher • GRE score • TOEFL score • Official transcripts • Current resume • Statement of Purpose • Three letters of recommendation	$47,470/ year	On-campus	Administrators encourage students to complete an internship between their first and second year. Companies perform on-campus interviews for internships (e.g., Apple).	School of Computer Science

!) **EAB Research,** "Critical Disciplines to Grow Employer Partnerships"

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Profiled Institution	Program Title	Admission Requirements	Tuition	Modality	Internship Opportunities	Department Housing
Georgia Institute of Technology	Master of Science in Computer Science with a concentration in Interactive Intelligence	• GPA of 3.0 or higher • GRE score: at least 153 in Verbal, 155 in the Quantitative section, 3.0 in Analytical sections • TOEFL score: minimum of 100 • Three letters of recommendation	On-campus: $575/credit (1-11 credits, in-state) $6,894/ semester (12 or more credits, in-state) $1,191/credit (1-11 credits, out-of-state) $14,284/ semester (12 or more credits, out-of-state) Online: $510/three credit course	On-campus, online	Graduate Co-op/Internship Program	College of Computing
Northwestern University	Master of Science in Artificial Intelligence	• BA/BS in Computer Science or related field • Two years' work experience preferred • Three letters of recommendation • GRE score • TOEFL or IEFTS • Resume • Personal statement	$18,040/ quarter	On-campus	• Summer Internships • Capstone project	McCormick School of Engineering and Applied Science
Stevens Institute of Technology	Master of Science in Artificial Intelligence	• GPA of 3.0 or higher • Competitive GRE/GMAT score • TOEFL/IELTS scores	$17,980/ semester (full-time) $1,620/credit (part-time)	On-campus, online	No internship required	Department of Electrical and Computer Engineering
University of Pittsburg	Master of Science in Intelligent Systems	• Three letters of recommendation • GRE scores • Resume • Statement of Intent For international students: • 90 or higher on the TOEFL • Band 7.0 on the IELTS	$24,224/ year (full-time) $977/credit (part-time)	On-campus	• No internship required • Research project	School of Computing and Information
Institution A	Artificial Intelligence Graduate Certificate	• Bachelor's degree • Open-enrollment program, no application required	$3,000 total	Hybrid	• No internship required	School of Continuing Studies

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Profiled Institution	Program Title	Admission Requirements	Tuition	Modality	Internship Opportunities	Department Housing
Institution B	Artificial Intelligence Graduate Certificate	• Programming experience • Bachelor's degree • GPA of 3.0 or higher • Recommended: statistics and probability, linear algebra	$16,000 - $19,000 total	Online, hybrid	• No internship required	Center for Professional Development

Research Partnerships

Seek Partnerships with Government Agencies and Private Companies for Artificial Intelligence Research Funding

Carnegie Mellon University, **Institution B**, and **Northwestern University** identify public and private partnerships for research into artificial intelligence on program webpages. Carnegie Mellon University lists research partnerships on the Artificial Intelligence homepage with many private companies and government agencies, including NASA, the Department of Defense (DoD), Amazon, and Google. Collaborative research areas with partners include computer vision, human-computer interaction, and machine learning. However, the artificial intelligence webpage does not specify the extent to which partners provide funding for research on artificial intelligence. Institution B's webpage indicates members provide a pre-determined amount of unrestricted funding for three years to support research into artificial intelligence, but does not identify government agency funding for artificial intelligence research. Northwestern University reports Nvidia Corporation as the current sponsor of the Northwestern University Deep Learning Lab, which focuses on research into the application of artificial intelligence to address societal problems. The research webpage for the McCormick School of Engineering and Applied Science at Northwestern University indicates 90 percent of research funding comes from government agencies and 10 percent from private companies, but does not specify funding by research project or identify sources of government funding.

The National Science Foundation (NSF) offers many programs that provide funding for artificial intelligence research (e.g., EArly-concept Grants for Exploratory Research on Artificial Intelligence and Society, Information and Intelligent Systems (IIS): Core Program). For example, the Information and Intelligent Systems (IIS) program provides funds for three project classes. Small projects may receive up to $500,000 total for up to three years, medium projects may receive between $500,001 and $1,200,000 total for up to four years, and large projects may receive between 1,200,001 to $3,000,000 total for up to five years. Previous recipients of this funding include the University of Colorado at Boulder, Johns Hopkins University, and the University of Maryland College Park. Administrators at **Florida Atlantic University** should consider applying to the available NSF programs to fund artificial intelligence research projects.

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4) Student Recruitment

Student Enrollment and Demographics

Profiled Institutions Typically Enroll Students with Little or No Post-Undergraduate Work Experience

Career Opportunities in Artificial Intelligence

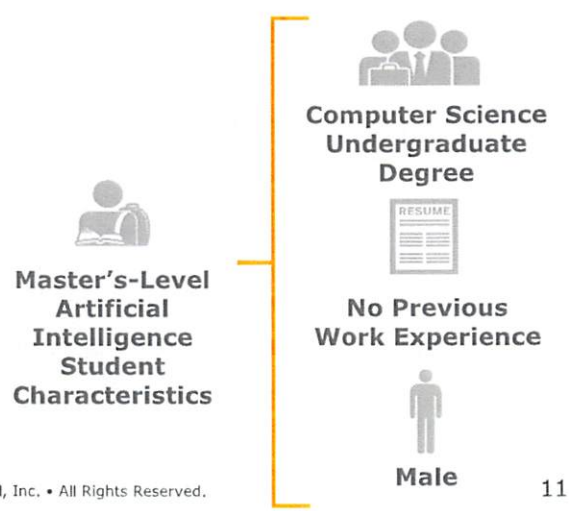
The profiled program webpage at **Stevens Institute of Technology** highlights the following potential careers for master's-level artificial intelligence program graduates:

- Artificial Intelligence Engineer
- Data Scientist
- R&D Engineer
- Machine Learning Engineer
- Data Engineer
- Analyst Engineer for Intelligent Networks

In the 2018 cohort of the master's-level artificial intelligence program at **Northwestern University**, 47 percent of enrolled students reported no previous work experience. However, students with prior work experience typically enroll with two years or less of post-undergraduate experience. Students that report one to two years of previous work experience comprise 21 percent of enrolled students. Additionally, 16 percent of enrolled students report three to five years of experience, and 16 percent report more than five years of post-undergraduate work experience. Most students in the 2018 cohort at Northwestern University enrolled with an undergraduate degree in engineering and computer science (i.e., 58 percent). Other top majors include mathematics and statistics (i.e., 16 percent) and liberal arts degrees (i.e., 11 percent). Additionally, Northwestern University reports an average gender breakdown of approximately 90 percent men and 10 percent women. Similarly, Data USA reports men account for 79.1 percent of all national completions of artificial intelligence programs at any degree level from 2014 to 2016.[2] Additionally India, China, and the Philippines constitute the most common countries of origin for non-US students earning degrees in artificial intelligence.[3] For additional demographic information for the top two occupations for artificial intelligence professionals refer to the Appendix. The profiled program at Northwestern University enrolls approximately 40 students per cohort. The Forum did not receive enrollment data from any other profiled program.

Common Characteristics of Students Enrolled in Profiled Master's-Level Artificial Intelligence Programs

Profiled Institutions



2) Data USA.
3) Data USA.

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Appendix: Demographics in Top Occupations

This data reflects the age and gender distribution of professionals who currently work in two of the top occupations for master's-level artificial intelligence professionals nationwide.

Nationwide Age and Gender of Workers in Top Occupations for Master's-Level Artificial Intelligence Professionals

2018, Nationwide Data[4]

Occupation	Gender		Age						
	Male	Female	19-21	22-24	25-34	35-44	45-54	55-64	65+
Computer and Information Research Scientists	73%	27%	1%	3%	29%	25%	22%	15%	5%
Software Developers, Applications	80%	20%	0%	4%	32%	30%	21%	10%	2%

7) Emsi Analyst™: CIP code 09.0100 (Communication, General)

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Appendix E - Library Resources

Count

Subject General	Sub-Categories	Call Number Range	Total number of Print Volumes
Science	Artificial Intelligence, Cybernetics	Q300-Q390	744
Mathematics	Analysis, Statistics, Probability	QA248-QA439	8303
Mathematics	Computers, data mining, natural language processing, knowledge management	QA75.4-QA76	8081
Mathematics	Computer science, software	QA76.1-QA76.8	4834
Medicine	Computer applications to medicine, Medical informatics	R858-R859	51
Internal Medicine	Diagnosis, including radiography	RC78-RC78.7	65
Civil Engineering	Applied optics, Photonics	TA1632-TA1634	113
Civil Engineering	Engineering mathematics, engineering analysis	TA329-TA348	316
Mechanical engineering and machinery	Robots, Automartic machinery, control engineering systems	TJ210-TJ226	844
Electrical engineering.	Information Retreival, Telecommunication	TK5105	1389
			24740

Current Print Journal Subscriptions

Title
Florida Scientist
Scientific American

Database	Description
Abstracts in New Technology & Engineering (Proquest)	ANTE is an abstracting and indexing service monitoring publications from the U.K. and the U.S. Coverage includes new technologies such as information technology and computing, electronics, biotechnology, medical technology, as well as engineering (including construction, electrical and chemical engineering) and allied subject areas. Sources covered include periodicals, conference proceedings, technical reports, trade journal/newsletter items, patents, books, and press releases.
ACM Digital Library	The ACM Digital Library is a vast collection of citations and full text from ACM journal, magazine and newsletter articles. In addition, this resource provides access to transactions, conference proceedings and the ACM Guide to Computing Literature.
ACS (American Chemical Society) Journals	Articles relevant to chemistry and information in the life sciences.
American Institute of Physics (AIP) Journals	Provides access to full-text physics journal articles.
American Society for Mechanical Engineers (ASME) Journals	Provides access to mechanical engineering journals.
Applied Science & Business Periodicals Retrospective: 1913-1983	This resource contains citations to more than 4.5 million articles from nearly 1,700 periodicals. From the rise and fall of drugs to the business of oil to the emergence of the global economy, this resource offers a rich account of technological advances, business strategies, company profiles, iconic executives and scientists, and much more.
Applied Science & Technology Source	Includes Applied Science & Technology Full Text, Applied Science & Technology Index Retrospective and additional content. This database offers a diverse array of full-text and indexed content that covers the full spectrum of the applied sciences and computing disciplines from acoustics to aeronautics, and neural networks to nuclear engineering.
Biotechnology Research Abstracts	This database provides citations and abstracts to research articles on biotechnology (medical, agricultural, and environmental) and bioengineering.
Compendex (Engineering Village)	Compendex is the most comprehensive interdisciplinary engineering database in the world. It contains over 8 million records and references over 5,000 international engineering sources including journal, conference, and trade publications.
Computer and Information Systems Abstracts	Comprehensive database of the research and applications in the field.
Computer Database	This database provides access to computer-related product introductions, news, and reviews in areas such as hardware, software, electronics, engineering, communications, and the application of technology.
Electronics & Communications Abstracts	Research in the field of electronics and communications from over 600 different sources.
Emerald eJournals Premier	Emerald eJournals Premier provides access to all current content and selected archive material for all Emerald eJournals. Subjects include engineering, computing & technology, and management.
Engineered Materials Abstracts	Begun in 1986, Engineered Materials Abstracts is an electronic database containing Ceramics, Composites and Polymers subfiles. Sources covered include over 3,000 periodicals, conference proceedings, technical reports, trade journal/newsletter items, patents, books, and press releases.

History of Science, Technology, and Medicine	Contains records describing journal articles, conference proceedings, books, book reviews, and dissertations in the history of science, technology, medicine and allied historical fields. Citations reflect the contents of more than 1,000 journals, and partial contents of several hundred more.
IEEE Xplore:IEEE/IEL Electronic Library	Includes access to the abstract records and full text articles published since 1988 with select content published since 1893 from: IEEE journals, transactions, and magazines, including early access documents; IEEE conference proceedings; IET journals; IET conference proceedings; IEEE published standards and redline versions; and IEEE Standards Dictionary Online.
INSPEC	Includes Physics Abstracts, Computer and Control Abstracts, and Electrical and Electronics Abstracts. The largest English language file of bibliographic information and abstracts on the world's output of published works in physics, electrical engineering and electronics, computing, and information technology. Covers scientific and technical journals and conference proceedings. Includes some books, reports, and dissertations.
Inspec Archive	The Inspec Archive provides access to historical scientific records in the fields of physics, electrical engineering, electronics computing and control engineering. With the digitizing of the entire collection of Science Abstracts Journals, which are the precursors to the Inspec database, librarians, academics and students are provided access to over 873,000 abstract records spanning the years 1898 through 1968.
IOPscience	Provides access to scientific, medical and technical journals hosted by IOP (Institute of Physics)
Materials Business File	Materials Business File focuses on industry news, international trade data, government regulations and management issues related to the metals and materials industries.
Materials Science & Engineering Database (Proquest)	The ProQuest Engineering Collection contains engineering related full-text articles, granular access to millions of figures and tables within articles, and the entire range of bibliographic records from the CSA Engineering Research Database, a comprehensive index to world literature on technological and engineering innovations.
MathSciNet (AMS)	MathSciNet (EBSCOhost) |1940-present
METADEX	A comprehensive source for information on metals and alloys: their properties, manufacturing, applications, and development.
Morgan & Claypool Synthesis Digital Library of Engineering & Computer Science	SYNTHESIS is an information service for engineering and computer science. The basic component of the collection is the Lecture, an electronic book that synthesizes an important research or development topic, and is authored by a prominent contributor to the field.
Risk Abstracts	Risk Abstracts encompasses risk arising from industrial, technological, environmental, and other sources, with an emphasis on assessment and management of risk.
SciFinder	Provides comprehensive chemical and related scientific information including journal articles, patents, chemical reactions, and chemical regulatory data.
SciTech Collection (ProQuest)	This collection covers science and technology research, combining full-text journals with detailed indexing of global literature on natural sciences, engineering and technology.
Solid State and Superconductivity Abstracts	Presents global coverage on all aspects of solid state and superconductivity technology.

SPIE Digital Library	The SPIE Digital Library is an online database of scientific and technical publications representing the world's largest collection of research information in Optics and Photonics. The Digital Library contains the Proceedings of the Society and its journals.
Toxicology Abstracts	Toxicology Abstracts covers issues from social poisons and substance abuse to natural toxins, from legislation and recommended standards to environmental issues.
TOXLINE	Provides access to information in all areas of toxicology, including chemicals and pharmaceuticals, pesticides, environmental pollutants, and mutagens and teratogens.
Web of Science	Three unique citation databases which allow searching cited references as well as traditional searches independently or in combination: Science Citation Index Expanded, Social Sciences Citation Index, and Arts and Humanities Citation Index.

Print Volume Count

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Mathematics	Analysis, Statistics, Probability	QA248-QA439	8303
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Mathematics	Computer science, software	QA76.1-QA76.8	4834
Medicine	Computer applications to medicine, Medical informatics	R858-R859	51
Internal Medicine	Diagnosis, including radiography	RC78-RC78.7	65
Civil Engineering	Applied optics, Photonics	TA1632-TA1634	113
Civil Engineering	Engineering mathematics, engineering analysis	TA329-TA348	316
Mechanical engineering and machinery	Robots, Automartic machinery, control engineering systems	TJ210-TJ226	844
Electrical engineering.	Information Retreival, Telecommunication	TK5105	1389
			24740

Title	Subject	Reviewed	Package Type	Package Name	Start Date	End Date	URL with Proxy
Academic and Library Computing	Internet	N	Subscription	Emerald eJournals Premier	4/1/1991	12/31/1992	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/alc
ACM Computing Surveys	Computer Science	Y	Subscription	Business Source Premier	3/1/2004	Present	/search.ebscohost.com/direct.asp?db=buh&jid=UTE&scope=site
ACM transactions on database systems	Databases & Database Management	N	Subscription	Business Source Premier	12/1/1996	Present	/search.ebscohost.com/direct.asp?db=buh&jid=TDA&scope=site
Acta biomaterialia	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/2005	Present	//www.sciencedirect.com/journal/acta-biomaterialia
Acta Biotechnologica	Biological Engineering	N	Subscription	Wiley Online Library Database Model 2019	1/1/2001	12/31/2003	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15213846
Acta Informatica	Data Processing	Y	Subscription	Springer Nature Journals	1/1/1997	Present	//link.springer.com/journal/volumesAndIssues/236
Acta Mechanica	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	//link.springer.com/journal/volumesAndIssues/707
Ad hoc networks	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	7/1/2003	Present	//www.sciencedirect.com/journal/ad-hoc-networks
Advanced engineering informatics	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	1/1/2002	Present	//www.sciencedirect.com/journal/advanced-engineering-informatics
Advanced Robotics	Robotics	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tadr20
Advances in Bioscience and Biotechnology	Biological Engineering	Y	Subscription	Scientific Research Publishing Journals	4/1/2010	Present	https://www.scirp.org/journal/abb
Advances in Data Analysis and Classification	Data Analysis	Y	Subscription	Springer Nature Journals	3/1/2007	Present	//link.springer.com/journal/volumesAndIssues/11634
Advances in engineering software	Computer Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	//www.sciencedirect.com/journal/advances-in-engineering-software
Advances in Internet of Things	Internet	N	Subscription	Scientific Research Publishing Journals	4/1/2011	Present	https://www.scirp.org/journal/ait
Adweek Magazine's Technology Marketing	Computer Science	N	Subscription	Business Source Premier	5/1/2001	12/1/2004	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=KTW&scope=site
AI & Society	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/146
AI Communications: The European Journal on Artificial Intelligence	Artificial Intelligence	Y	Subscription	Business Source Premier	3/1/1997	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=0RI&scope=site
Algorithmica	Data Processing	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/453
American Journal of Analytical Chemistry	Analytical Chemistry	Y	Subscription	Scientific Research Publishing Journals	5/1/2010	Present	https://www.scirp.org/journal/ajac
American Journal of Computational Mathematics	Computer Engineering	N	Subscription	Scientific Research Publishing Journals	3/1/2011	Present	https://www.scirp.org/journal/ajcm
American Journal of Operations Research	Industrial Engineering	N	Subscription	Scientific Research Publishing Journals	3/1/2011	Present	https://www.scirp.org/journal/ajor
American machinist	Mechanical Engineering	N	Subscription	Business Source Premier	9/1/1999	12/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1OP&scope=site
Analytica chimica acta	Analytical Chemistry	Y	Subscription	ScienceDirect Freedom Collection	1/10/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/analytica-chimica-acta
Analytical Abstracts	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1980	Present	http://ezproxy.fau.edu/login?url=https://pubs.rsc.org/lus/analytical-abstracts
Analytical and bioanalytical chemistry	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/2002	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/216
Analytical chemistry	Analytical Chemistry	Y	Subscription	ACS Publications	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://pubs.acs.org/loi/ancham

Analytical chemistry insights	Analytical Chemistry	Y	Subscription	SAGE Premier 2019	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/aci
Analytical Chemistry Letters	Analytical Chemistry	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2011	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tacl20
Analytical Communications	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1996	12/31/1999	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/1364-5536/1996
Analytical letters	Analytical Chemistry	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lanl20
Analytical Proceedings	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1980	12/31/1993	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/0144-557X/1980
Analytical Proceedings including Analytical Communications	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1994	12/31/1995	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/0144-557X/1994
Animal biotechnology	Biological Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=labt20
Annals of biomedical engineering	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10439
Annals of Mathematics and Artificial Intelligence	Artificial Intelligence	N	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10472
Annual Reports on Analytical Atomic Spectroscopy	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1971	12/31/1984	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/0306-1353/1971
Annual Review of analytical chemistry	Analytical Chemistry	Y	Subscription	Annual Reviews Biomedical/Life Sciences Collection	1/1/2012	12/31/2016	http://ezproxy.fau.edu/login?url=https://www.annualreviews.org/loi/anchem
Annual review of biomedical engineering	Biological Engineering	Y	Subscription	Annual Reviews Biomedical/Life Sciences Collection	1/1/2012	12/31/2016	http://ezproxy.fau.edu/login?url=https://www.annualreviews.org/loi/bioeng
Annual review of biophysics and bioengineering	Biological Engineering	N	Subscription	Annual Reviews Biomedical/Life Sciences Collection	1/1/1972	12/31/1984	http://ezproxy.fau.edu/login?url=https://www.annualreviews.org/loi/biophys
Annual reviews in control	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/annual-reviews-in-control
Applied Artificial Intelligence	Artificial Intelligence	Y	Subscription	Business Source Premier	2/1/1996	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=B6M&scope=site
				Taylor & Francis Science & Technology Library	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=uaai20
Applied ergonomics	Industrial Engineering	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/applied-ergonomics
Applied Intelligence	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10489
Applied mathematics and computation	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/applied-mathematics-and-computation
Applied Microbiology and Biotechnology	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/253
Archive of Applied Mechanics	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/419
Archives of computational methods in engineering	Computational Sciences	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11831

Artificial intelligence	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/artificial-intelligence
Artificial Intelligence and Law	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10506
Artificial Intelligence For Engineering Design Analysis & Manufacturing : AI EDAM	Artificial Intelligence	Y	Subscription	Cambridge Journals Online (CRKN)	1/1/1998	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/AIE/type/JOURNAL
Artificial intelligence in engineering	Artificial Intelligence	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	10/31/2001	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/artificial-intelligence-in-engineering
Artificial intelligence in medicine	Artificial Intelligence	Y	Subscription	ClinicalKey eJournals	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/09333657
				ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/artificial-intelligence-in-medicine
Artificial Intelligence Review	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10462
Artificial life and robotics	Artificial Intelligence	Y	Subscription	Springer Nature Journals	3/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10015
Asian journal of management cases	Industrial Engineering	Y	Subscription	SAGE Premier 2019	1/1/2004	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/ajc
Assembly automation	Automation	Y	Subscription	Emerald eJournals Premier	1/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/aa
Australian Journal of Mechanical Engineering	Mechanical Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2003	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tmec20
Automated Software Engineering	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10515
Automatic Control and Computer Sciences	Computer Science	Y	Subscription	Springer Nature Journals	2/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11950
Automatic Documentation and Mathematical Linguistics	Computer Science	Y	Subscription	Springer Nature Journals	2/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11952
Automatic I.D. News	Automation	N	Subscription	Business Source Premier	1/1/1995	12/1/1999	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=ADN&scope=site
Automatica: A journal of IFAC the International Federation of Automatic Control	Automation	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/automatica
Automation and Remote Control	Automation	Y	Subscription	Springer Nature Journals	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10513
Automation in construction	Computer Graphics	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/automation-in-construction
AutomationView	Automation	N	Subscription	Business Source Premier	8/1/2000	11/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6UW&scope=site
Automotive Design and Production	Mechanical Engineering	N	Subscription	Business Source Premier	10/1/2001	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=I03&scope=site
Automotive Manufacturing and Production	Mechanical Engineering	N	Subscription	Business Source Premier	7/1/1997	7/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1SA&scope=site
Automotive Production	Mechanical Engineering	N	Subscription	Business Source Premier	9/1/1996	12/1/1996	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=AUP&scope=site

Autonomous Agents and Multi-Agent Systems	Computer Software	N	Subscription	Springer Nature Journals	3/1/1998	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10458
Autonomous Robots	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10514
Baseline	Information Technology	N	Subscription	Business Source Premier	8/1/2002	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=KXP&scope=site
Behavior Research Methods	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/13428
Behaviour & information technology	Data Processing	Y	Subscription	Business Source Premier	1/1/1996	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=B6Q&scope=site
				Taylor & Francis Science & Technology Library	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tbit20
Bioinformatics	Bioinformatics	Y	Subscription	Oxford University Press Full Collection (JISC)	2/1/1998	Present	http://ezproxy.fau.edu/login?url=https://academic.oup.com/bioinformatics
Biological cybernetics	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/422
Biomaterials	Biological Engineering	Y	Subscription	ClinicalKey eJournals	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/01429612
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/biomaterials
Biomechanics and Modeling in Mechanobiology	Mechanical Engineering	Y	Subscription	Springer Nature Journals	6/1/2002	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10237
Biomedical Chromatography	Analytical Chemistry	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10990801
Biomedical engineering	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10527
Biomedical Engineering and Computational Biology	Biological Engineering	Y	Subscription	SAGE Premier 2019	1/1/2009	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/bec
Biomedicine & pharmacotherapy	Biological Engineering	Y	Subscription	ClinicalKey eJournals	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/07533322
				ScienceDirect	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/biomedicine-and-pharmacotherapy
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/biomedicine-and-pharmacotherapy
Biomolecular engineering	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	12/31/1999	12/31/2007	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/biomolecular-engineering
Bioprocess and Biosystems Engineering	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/449
Bioprocess Engineering	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	12/31/2000	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/449
Biosensors and bioelectronics	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/biosensors-and-bioelectronics
Biotech Business	Biological Engineering	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1NX&scope=site

Biotechnic & Histochemistry	Biological Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ibih20
Biotechnology & Bioengineering	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10970290
Biotechnology advances	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/biotechnology-advances
Biotechnology and genetic engineering reviews	Biological Engineering	N	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tbgr20
Biotechnology and molecular biology reviews	Biological Engineering	Y	Subscription	Academic Journals	1/1/2006	Present	http://ezproxy.fau.edu/login?url=http://www.academicjournals.org/journal/BMBR/archive
Biotechnology progress	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15206033
BIT Numerical Mathematics	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10543
Bulletin of Mathematical Biology	Computer Programming	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11538
Business 2.0	Computer Networks & Networking	N	Subscription	Business Source Premier	11/1/2002	10/1/2007	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5VU&scope=site
CAD/CAM Update	Computer Industry	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5YO&scope=site
CD Computing News	Computer Industry	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1NZ&scope=site
CD-ROM Professional	Computer Information Storage	Y	Subscription	Business Source Premier	1/1/1995	12/1/1996	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=CDM&scope=site
Celebrex.com & Levistra.com Case Studies: Developing Health Information Websites with a Focus on Pharmaceutical Products	Computer Science	N	Subscription	Business Source Premier	3/1/2004	3/31/2004	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1702&scope=site
Cell death and differentiation	Databases & Database Management	Y	Subscription	Nature Journals Online	1/1/2014	Present	http://ezproxy.fau.edu/login?url=https://www.nature.com/cdd/volumes
Certification magazine	Computer Science	N	Subscription	Business Source Premier	1/1/2003	12/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=QET&scope=site
Chilton's Product Design and Development	Mechanical Engineering	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1EI&scope=site
Chinese Journal of Analytical Chemistry	Analytical Chemistry	N	Subscription	ScienceDirect Freedom Collection	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/chinese-journal-of-analytical-chemistry
Chromatographia	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10337
CIO Insight	Internet	N	Subscription	Business Source Premier	6/1/2002	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=KXQ&scope=site
CIRP Annals - Manufacturing Technology	Mechanical Engineering	Y	Subscription	ScienceDirect	1/1/1980	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/cirp-annals
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/cirp-annals

Clinical data management	Medical Informatics	Y	Subscription	Business Source Premier	1/1/1999	3/1/2000	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IIA&scope=site
Clinical Mass Spectrometry	Analytical Chemistry	N	Subscription	ScienceDirect Freedom Collection	11/1/2016	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/clinical-mass-spectrometry
Clinical Physics and Physiological Measurement	Biological Engineering	N	Subscription	IOPscience extra	1/1/1980	12/31/1992	http://ezproxy.fau.edu/login?url=https://iopscience.iop.org/journal/0143-0815
Cluster Computing	Computer Networks & Networking	Y	Subscription	Springer Nature Journals	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10586
Cognitive Science - A Multidisciplinary Journal	Artificial Intelligence	Y	Subscription	ScienceDirect	1/1/1995	12/31/2004	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/cognitive-science
				Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15516709
Combinatorics, Probability & Computing : CPC	Computer Science	Y	Subscription	Cambridge Journals Online (CRKN)	1/3/1997	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/CPC/type/JOURNAL
Communications in Applied Mathematics and Computational Science	Computer Science	N	Subscription	Mathematical Sciences Publishers	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://msp.org/camcos/2017/12-1/index.xhtml
Communications in Statistics: Simulation and Computation	Computer Simulation	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lssp20
Communications of the ACM	Computer Science	Y	Subscription	Business Source Premier	1/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=ACM&scope=site
COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering	Computer Engineering	Y	Subscription	Emerald eJournals Premier	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/compel
Computational and theoretical polymer science	Computational Sciences	N	Subscription	ScienceDirect Freedom Collection	1/1/1997	12/31/2001	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computational-and-theoretical-polymer-science
Computational biology and chemistry	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	2/1/2003	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computational-biology-and-chemistry
Computational Complexity	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/37
Computational Economics	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10614
Computational Intelligence	Artificial Intelligence	N	Subscription	Business Source Premier	1/1/1998	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=BNR&scope=site
				Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/14678640
Computational methods and function theory	Computational Sciences	Y	Subscription	Springer Nature Journals	9/1/2001	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/40315
Compute	Data Processing	N	Subscription	Business Source Premier	1/1/1991	9/1/1994	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=COM&scope=site
Computer and Internet Lawyer	Computer Science	N	Subscription	Business Source Premier	9/1/2000	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=8RM&scope=site
Computer Animation & Virtual Worlds	Computer Science	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2004	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/1546427X

Computer Applications in Engineering Education	Computer Science	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10990542
Computer Artist	Computer Graphics	N	Subscription	Business Source Premier	2/1/1995	7/1/1997	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=CUT&scope=site
Computer audit update	Data Processing	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	12/31/1997	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-audit-update
Computer communications	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-communications
Computer fraud & security	Computer & Data Security	N	Subscription	ScienceDirect Freedom Collection	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-fraud-and-security
Computer Fraud & Security Bulletin	Computer & Data Security	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	12/31/1995	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-fraud-and-security-bulletin
Computer Graphics Forum	Computer Graphics	Y	Subscription	Business Source Premier	3/1/1998	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=BNX&scope=site
				Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/14678659
Computer Graphics World	Computer Graphics	N	Subscription	Business Source Premier	1/1/1995	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=OMP&scope=site
Computer Journal	Computer Science	Y	Subscription	Oxford University Press Full Collection (JISC)	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://academic.oup.com/comjnl
Computer languages	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	4/1/1995	12/31/2001	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-languages
Computer Languages, Systems & Structures	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	4/1/2002	12/31/2018	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-languages-systems-and-structures
Computer Law & Security Review: The International Journal of Technology Law and Practice	Computer & Data Security	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-law-and-security-review
Computer methods and programs in biomedicine	Computer Programming	Y	Subscription	ClinicalKey eJournals	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/01692607
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-methods-and-programs-in-biomedicine
Computer methods in applied mechanics and engineering	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-methods-in-applied-mechanics-and-engineering
Computer methods in biomechanics and biomedical engineering	Biological Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=gcmb20
Computer networks (Elsevier)	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	1/14/1999	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-networks
Computer networks and ISDN systems	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	12/14/1998	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-networks-and-isdn-systems
Computer physics communications	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-physics-communications

Computer Protocols	Computer Science	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1O1&scope=site
Computer Science - Research and Development	Computer Science	Y	Subscription	Springer Nature Journals	3/1/2009	8/30/2018	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/450
Computer science education	Computer Science	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ncse20
Computer Science Review	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	8/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-science-review
Computer speech & language	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-speech-and-language
Computer standards & interfaces	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-standards-and-interfaces
Computer Supported Cooperative Work: CSCW: An International Journal	Computer Networks & Networking	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10606
Computer vision and image understanding	Computer Simulation	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-vision-and-image-understanding
Computer Weekly	Computer Science	N	Subscription	Business Source Premier	1/10/2002	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=3BM&scope=site
Computer workstations	Computer Science	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5YP&scope=site
Computer-Aided Design	Computer Graphics	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computer-aided-design
Computers & chemistry	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	3/1/1995	11/30/2002	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-chemistry
Computers & education	Computer-Assisted Instruction	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-education
Computers & electrical engineering	Computer Engineering	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-electrical-engineering
Computers & geosciences	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-geosciences
Computers & graphics	Computer Graphics	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-graphics
Computers & industrial engineering	Industrial Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-industrial-engineering
Computers & Mathematics with Applications	Data Processing	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-mathematics-with-applications
Computers & operations research	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-operations-research
Computers & security	Computer & Data Security	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-security
Computers & Structures	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/3/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-structures

Computers and biomedical research	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	12/31/2000	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-biomedical-research
Computers and composition	Computer-Assisted Instruction	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-composition
Computers and electronics in agriculture	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-and-electronics-in-agriculture
Computers and the Humanities	Computer Science	Y	Subscription	Springer Nature Journals	1997-01-01|1997-01-01	2004-11-30|2004-12-31	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10579
Computers in human behavior	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	12/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-in-human-behavior
Computers in human services	Computer Science	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1997	12/31/1999	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=wzch20
Computers in industry	Information Technology	Y	Subscription	ScienceDirect Freedom Collection	3/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/computers-in-industry
Computers in the Schools	Computer-Assisted Instruction	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=wcis20
Computerworld	Computer Industry	N	Subscription	Business Source Premier	7/5/1999	6/23/2014	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=CWD&scope=site
Computing	Data Processing	Y	Subscription	Business Source Premier	1/1/1999	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=CQX&scope=site
				Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/607
Computing and Visualization in Science	Computer Science	Y	Subscription	Springer Nature Journals	7/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/791
Computing Japan	Computer Science	N	Subscription	Business Source Premier	1/1/1997	10/1/1999	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1DJ&scope=site
Concurrency and Computation: Practice & Experience	Computer Science	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15320634
Concurrency, Practice & Experience	Computer Science	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	12/31/2000	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10969128
Conference Analysis	Computer Industry	N	Subscription	Business Source Premier	9/6/1996	5/20/1998	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=2IC&scope=site
Connection science	Artificial Intelligence	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ccos20
Connector specifier	Computer Science	N	Subscription	Business Source Premier	4/1/2003	9/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=9C9&scope=site
Constraints	Computer Science	N	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10601
Critical Reviews in Analytical Chemistry	Analytical Chemistry	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=batc20
Critical reviews in biotechnology	Biological Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ibty20
Cryptologia	Computer & Data Security	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1977	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ucry20

Current opinion in biotechnology	Biological Engineering	Y	Subscription	ClinicalKey eJournals	2/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/09581669
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/current-opinion-in-biotechnology
Cybernetics & Systems	Artificial Intelligence	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ucbs20
Cybernetics and Systems Analysis	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10559
Cytotechnology	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10616
Data & knowledge engineering	Data Processing	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/data-and-knowledge-engineering
Data Mining and Knowledge Discovery	Computer Science	Y	Subscription	Springer Nature Journals	3/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10618
Database	Databases & Database Management	N	Subscription	Business Source Premier	8/1/1993	6/1/1999	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=DBS&scope=site
Defense AT&L	Computer Science	N	Subscription	Business Source Premier	1/1/2004	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=W5T&scope=site
Dell, Hewlett-Packard & Holt, Rinehart & Winston Case Studies: Selling Technology in the Education Market	Computer Industry	N	Subscription	Business Source Premier	8/1/2005	8/31/2005	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=2428&scope=site
Design automation for embedded systems	Computer Science	N	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10617
Design Management Journal	Industrial Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2008	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19487177
Design Management Journal (Former Series)	Industrial Engineering	N	Subscription	Wiley Online Library Database Model 2019	1/1/1997	12/31/2003	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19487169
Design Management Review	Industrial Engineering	N	Subscription	Wiley Online Library Database Model 2019	1/1/2004	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19487169
Design studies	Industrial Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/design-studies
Digital Creativity	Computer Science	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ndcr20
Digital investigation	Data Processing	Y	Subscription	ScienceDirect Freedom Collection	2/1/2004	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/digital-investigation
Digital Scholarship in the Humanities	Computational Linguistics	N	Subscription	Oxford University Press Full Collection (JISC)	4/1/2015	Present	http://ezproxy.fau.edu/login?url=https://academic.oup.com/dsh
Digital signal processing	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/digital-signal-processing
Discrete Event Dynamic Systems	Computer Simulation	N	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10626
Displays	Computer Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/displays
Distributed and Parallel Databases	Databases & Database Management	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10619

Distributed Computing	Computer Networks & Networking	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/446
Distributed Systems Engineering	Data Processing	Y	Subscription	IOPscience extra	9/1/1993	12/31/1999	http://ezproxy.fau.edu/login?url=https://iopscience.iop.org/journal/0967-1846
DM Review	Databases & Database Management	N	Subscription	Business Source Premier	3/1/2004	12/1/2008	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5GU&scope=site
Dynamical Systems: An International Journal	Computer Science	Y	Subscription	Business Source Premier	3/1/2001	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=HZI&scope=site
				Taylor & Francis Science & Technology Library	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=cdss20
Dynamics and Stability of Systems	Computer Science	Y	Subscription	Business Source Premier	3/1/1999	12/1/2000	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=57X&scope=site
				Taylor & Francis Science & Technology Library	1/1/1997	12/31/2000	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=cdss19
e & i Elektrotechnik und Informationstechnik	Data Processing	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/502
e.learning age	Knowledge Management	N	Subscription	Business Source Premier	2/1/2003	2/1/2017	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=QRX&scope=site
EContent	Databases & Database Management	N	Subscription	Business Source Premier	8/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6FU&scope=site
EDPACS: The EDP Audit, Control, and Security Newsletter	Computer & Data Security	N	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=uedp20
Electronic commerce research and applications	Internet	Y	Subscription	ScienceDirect Freedom Collection	3/1/2002	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/electronic-commerce-research-and-applications
Electronic notes in discrete mathematics	Computer Information Storage	Y	Subscription	ScienceDirect Freedom Collection	3/1/1999	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/electronic-notes-in-discrete-mathematics
Electronic notes in theoretical computer science	Computer Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/electronic-notes-in-theoretical-computer-science
Electrophoresis	Analytical Chemistry	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15222683
Emedia	Computer Networks & Networking	Y	Subscription	Business Source Premier	9/1/1999	5/1/2000	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6VF&scope=site
EMedia Professional	Computer Information Storage	Y	Subscription	Business Source Premier	1/1/1997	8/1/1999	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1QW&scope=site
Empirical Software Engineering	Computer Software	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10664
Engineering applications of artificial intelligence	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/engineering-applications-of-artificial-intelligence
Engineering Computations	Computer Engineering	Y	Subscription	Emerald eJournals Premier	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/ec
Engineering with Computers	Computer Graphics	N	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/366

Enterprise Information Systems	Computer Software	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=teis20
Entertainment Computing	Computer Industry	Y	Subscription	ScienceDirect Freedom Collection	1/1/2009	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/entertainment-computing
Environmental Modelling & Software	Computer Simulation	Y	Subscription	ScienceDirect Freedom Collection	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/environmental-modelling-and-software
Environmental software	Computer Simulation	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	12/31/1996	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/environmental-software
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Euronet	Computer Networks & Networking	N	Subscription	Business Source Premier	5/1/2000	12/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=9UD&scope=site
European Journal of Control	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/european-journal-of-control
European Journal of Information Systems	Computer Science	Y	Subscription	Palgrave Macmillan Journals	1/1/2004	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/41303
				Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tjis20
European journal of mass spectrometry	Analytical Chemistry	N	Subscription	SAGE Premier 2019	2/1/2000	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/ems
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EventDV: The Authority for Event Videographers	Computer Information Storage	N	Subscription	Business Source Premier	1/1/2005	12/1/2011	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=147G&scope=site
eWeek	Information Technology	N	Subscription	Business Source Premier	5/8/2000	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=9HE&scope=site
Expert Systems	Artificial Intelligence	Y	Subscription	Business Source Premier	2/1/1998	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=BPI&scope=site
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Expert systems with applications	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/expert-systems-with-applications
Faraday Special Discussions of the Chemical Society	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1972	12/31/1972	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/0370-9302/1972
Filtration industry analyst	Industrial Engineering	Y	Subscription	ScienceDirect	4/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/filtration-industry-analyst
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Food biotechnology	Biological Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lfbt20
Formal Aspects of Computing	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/165

Formal Methods in System Design	Computer Hardware	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10703
Fresenius' Journal of Analytical Chemistry	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	12/31/2001	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/216
Fresenius' Zeitschrift für analytische Chemie	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1862-01-01	12/31/1989	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/216
Frontiers of Computer Science in China	Computer Science	Y	Subscription	Springer Nature Journals	2/1/2007	12/31/2011	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11704
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Frontiers of Mechanical Engineering	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11465
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Frontline Solutions: Technologies for Extending Information Management	Automation	N	Subscription	Business Source Premier	1/1/2000	9/1/2005	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=70C&scope=site
Future Generation Computer Systems	Computer Hardware	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/future-generation-computer-systems
Genetic analysis: biomolecular engineering	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	3/1/1995	12/15/1999	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/genetic-analysis-biomolecular-engineering
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Health informatics journal	Medical Informatics	Y	Subscription	SAGE Premier 2019	3/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/jhi
Health Management Technology	Computer Science	N	Subscription	Business Source Premier	1/1/1998	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=EHT&scope=site
Health Systems	Medical Informatics	Y	Subscription	Palgrave Macmillan Journals	6/1/2012	11/30/2017	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/41306
				Taylor & Francis Science & Technology Library	1/1/2012	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=thss20
Helvetica chimica acta	Analytical Chemistry	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15222675

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Home Office	Computer Software	N	Subscription	Business Source Premier	3/1/1995	3/31/1995	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=HOF&scope=site
Human Factors: The Journal of the Human Factors and Ergonomics Society	Industrial Engineering	Y	Subscription	SAGE Premier 2019	3/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/hfs
Human-Computer Interaction	Computer Science	Y	Subscription	Business Source Premier	3/1/1985	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=7LY&scope=site
				Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=hhci20
I-Business	Computer Networks & Networking	Y	Subscription	Scientific Research Publishing Journals	9/1/2009	Present	https://www.scirp.org/journal/ib
IEEE Annals of the History of Computing	Data Processing	Y	Subscription	Project MUSE - Premium Collection	1/1/2008	Present	http://ezproxy.fau.edu/login?url=https://muse.jhu.edu/journal/393
IEICE Transactions on Information and Systems	Computer Science	Y	Subscription	IEICE	1/1/1991	Present	http://ezproxy.fau.edu/login?url=http://search.ieice.org/bin/archive.php?category=D&lang=E&a_listcnt=1
IIE solutions	Industrial Engineering	Y	Subscription	Business Source Premier	1/1/1996	12/1/2002	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IEL&scope=site
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Image and vision computing	Computer Graphics	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/image-and-vision-computing
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Industrial Lubrication and Tribology	Mechanical Engineering	Y	Subscription	Emerald eJournals Premier	1/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/ilt
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Informatik-Spektrum	Data Processing	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/287
Information & Communications Technology Law	Artificial Intelligence	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=cict20
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Information and Computer Security	Industrial Engineering	Y	Subscription	Emerald eJournals Premier	3/9/2015	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/ics
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Information Executive	Computer Science	N	Subscription	Business Source Premier	9/1/2002	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=4ZS&scope=site
Information fusion	Computer Graphics	Y	Subscription	ScienceDirect Freedom Collection	7/1/2000	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/information-fusion
Information Infrastructure and Policy	Computer Science	Y	Subscription	Business Source Premier	7/1/1996	6/1/2000	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IFP&scope=site
Information Knowledge Systems Management	Databases & Database Management	N	Subscription	Business Source Premier	3/1/1999	6/1/2013	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5RG&scope=site
Information Management	Databases & Database Management	N	Subscription	Business Source Premier	1/1/2009	11/1/2011	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=8X6I&scope=site
Information Management & Computer Security	Information Management	Y	Subscription	Emerald eJournals Premier	1/1/1994	11/10/2014	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/imcs
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Information Security Journal: A Global Perspective	Computer Science	N	Subscription	Business Source Premier	1/1/2008	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6MR3&scope=site
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				Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/13652575
Information Systems Management	Computer Science	Y	Subscription	Business Source Premier	6/1/1991	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IFM&scope=site
				Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=uism20
Information Systems Research	Data Processing	Y	Subscription	Business Source Premier	3/1/1990	5 years ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1LD&scope=site

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Information Systems Security	Computer & Data Security	N	Subscription	Business Source Premier	1/1/1995	11/1/2007	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IFC&scope=site
				Taylor & Francis Science & Technology Library	1/1/1997	12/31/2007	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=uiss19
Information Technology & People	Automation	Y	Subscription	Emerald eJournals Premier	1/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/itp
Information Technology for Development	Information Technology	Y	Subscription	Business Source Premier	10/1/1996	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IFD&scope=site
				Taylor & Francis Science & Technology Library	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=titd20
Information Today	Information Systems	N	Subscription	Business Source Premier	7/1/1996	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=IFT&scope=site
Information World Review - BizMedia	Computer Industry	Y	Subscription	Business Source Premier	1/1/2000	1/16/2013	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=0JO&scope=site
Information, Communication & Society: ICS	Computer Science	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=rics20
INFORMS Journal on Computing	Computer Science	Y	Subscription	Business Source Premier	1/1/1996	5 years ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=7EE&scope=site
InfoWorld	Computer Industry	N	Subscription	Business Source Premier	3/3/1997	4/2/2007	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=INW&scope=site
Innovations in Systems and Software Engineering	Computer Software	Y	Subscription	Springer Nature Journals	4/1/2005	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11334
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Intelligent Control and Automation	Automation	N	Subscription	Scientific Research Publishing Journals	8/1/2010	Present	https://www.scirp.org/journal/ica
Intelligent Data Analysis	Artificial Intelligence	N	Subscription	Business Source Premier	2/1/2000	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=FLP&scope=site
Intelligent Information Management	Internet	Y	Subscription	Scientific Research Publishing Journals	7/1/2009	Present	https://www.scirp.org/journal/iim
Intelligent Service Robotics	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/2008	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11370
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International Journal on Interactive Design and Manufacturing (IJIDeM)	Industrial Engineering	Y	Subscription	Springer Nature Journals	4/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/12008
International Journal on Semantic Web and Information Systems (IJSWIS)	Internet	Y	Subscription	InfoSci Journals	1/1/2008	12/31/2012	http://ezproxy.fau.edu/login?url=http://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/IJSWIS
International Journal on Software Tools for Technology Transfer	Computer Science	Y	Subscription	Springer Nature Journals	12/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10009
International Transactions in Operational Research	Computer Science	Y	Subscription	Business Source Premier	1/1/1994	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=D88&scope=site
				Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/14753995
Internet business	Computer Networks & Networking	N	Subscription	Business Source Premier	1/1/2002	5/1/2002	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=G2O&scope=site
Internet Reference Services Quarterly	Internet	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=wirs20
Internet Research: Electronic Networking Applications and Policy	Computer Networks & Networking	Y	Subscription	Emerald eJournals Premier	1/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/intr
Intertexts	Computer Science	Y	Subscription	Project MUSE - Premium Collection	1/1/2009	Present	http://ezproxy.fau.edu/login?url=https://muse.jhu.edu/journal/428
IT Training	Computer-Assisted Instruction	N	Subscription	Business Source Premier	11/1/2001	1/1/2007	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=G2P&scope=site
ITNOW	Computer Science	Y	Subscription	Oxford University Press Full Collection (JISC)	3/1/2005	Present	http://ezproxy.fau.edu/login?url=https://academic.oup.com/itnow

IUP Journal of Knowledge Management	Internet	Y	Subscription	Business Source Premier	9/1/2009	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=AUDE&scope=site
IUP Journal of Operations Management	Industrial Engineering	Y	Subscription	Business Source Premier	8/1/2009	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=AUDK&scope=site
I-Ways: Digest of the Global Information Infrastructure Commission	Information Technology	Y	Subscription	Business Source Premier	1/1/2003	10/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=Q1G&scope=site
J@pan Inc.	Computer Science	N	Subscription	Business Source Premier	11/1/1999	7/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6Z4&scope=site
JALA: Journal of the Association for Laboratory Automation	Automation	Y	Subscription	SAGE Premier 2019	2/1/1999	12/31/2011	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/jla
Journal in Computer Virology	Computer & Data Security	Y	Subscription	Springer Nature Journals	11/1/2005	12/31/2012	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11416
Journal of Access Services	Computer Networks & Networking	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/2002	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=wjas20
Journal of Algorithms	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	10/31/2009	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-algorithms
Journal of Algorithms & Computational Technology	Computer Engineering	Y	Subscription	SAGE Premier 2019	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/act
Journal of analytical and applied pyrolysis	Analytical Chemistry	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-analytical-and-applied-pyrolysis
Journal of analytical atomic spectrometry	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1986	Present	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/1364-5544/1986
Journal of Analytical Chemistry	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/2000	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10809
Journal of Analytical Methods in Chemistry	Analytical Chemistry	Y	Subscription	Business Source Premier	1/1/2012	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=EHOO&scope=site
Journal of Applied Mathematics and Decision Sciences	Industrial Engineering	Y	Subscription	Business Source Premier	3/1/2001	1/1/2008	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=K04&scope=site
Journal of Applied Spectroscopy	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10812
Journal of Automated Methods and Management in Chemistry	Analytical Chemistry	Y	Subscription	Business Source Premier	1/1/1999	1/1/2011	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=B9H&scope=site
Journal of Automated Reasoning	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10817
Journal of Biomaterials and Nanobiotechnology	Biological Engineering	Y	Subscription	Scientific Research Publishing Journals	10/1/2010	Present	https://www.scirp.org/journal/jbnb
Journal of Biomaterials Applications	Biological Engineering	Y	Subscription	SAGE Premier 2019	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/jba
Journal of Biomaterials Science, Polymer Edition	Biological Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tbsp20
Journal of biomedical informatics	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	2/1/2001	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-biomedical-informatics
Journal of Biomedical Materials Research	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	12/31/2002	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10974636

Journal of biomedical materials research Part A	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2003	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15524965
Journal of Biomedical Optics	Biological Engineering	Y	Subscription	SPIE Digital Library	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.spiedigitallibrary.org/journals/journal-of-biomedical-optics/issues
Journal of bioscience and bioengineering	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-bioscience-and-bioengineering
Journal of biotechnology	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/15/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-biotechnology
Journal of Chemical Information and Computer Sciences	Computer Science	Y	Subscription	ACS Publications	2/1/1975	11/1/2004	http://ezproxy.fau.edu/login?url=https://pubs.acs.org/loi/jcics1
Journal of Chemical Technology & Biotechnology	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10974660
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Journal of clinical monitoring and computing	Medical Informatics	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10877
Journal of Commercial Biotechnology	Biological Engineering	Y	Subscription	Business Source Premier	1/1/2001	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6V2&scope=site
Journal of Computational Neuroscience	Computer Simulation	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10827
Journal of Computational Science	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	5/1/2010	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-computational-science
Journal of computer and system sciences	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-computer-and-system-sciences
Journal of Computer and Systems Sciences International	Computer Science	Y	Subscription	Springer Nature Journals	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11488
Journal of Computer Assisted Learning	Computer-Assisted Instruction	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/13652729
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Journal of Computer-Aided Molecular Design	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10822

Journal of Computing in Civil Engineering	Computer Science	Y	Subscription	American Society of Civil Engineers (ASCE) Journals	1/1/1987	Present	http://ezproxy.fau.edu/login?url=https://ascelibrary.org/journal/jccee5
Journal of consumer health on the Internet	Internet	N	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/2003	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=wchi20
Journal of Database Management (JDM)	Databases & Database Management	Y	Subscription	InfoSci Journals	1/1/2008	12/31/2012	http://ezproxy.fau.edu/login?url=http://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/JDM
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Journal of Developmental Biology and Tissue Engineering	Biological Engineering	N	Subscription	Academic Journals	1/1/2009	Present	http://ezproxy.fau.edu/login?url=http://www.academicjournals.org/journal/JDBTE/archive
Journal of Dynamical and Control Systems	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10883
Journal of Educational Technology Systems	Computer-Assisted Instruction	Y	Subscription	SAGE Journals	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/ets
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Journal of Electronic Resources in Medical Libraries	Computer Science	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/2003	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=werm20
Journal of Energetic Materials	Industrial Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=uegm20
Journal of Engineering Design	Industrial Engineering	Y	Subscription	Business Source Premier	1/1/1994	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=GIN&scope=site
				Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=cjen20
Journal of Engineering Mechanics	Mechanical Engineering	Y	Subscription	American Society of Civil Engineers (ASCE) Journals	1/1/1983	Present	http://ezproxy.fau.edu/login?url=https://ascelibrary.org/journal/jenmdt
Journal of Environmental Monitoring	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1999	12/31/2012	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/1464-0333/1999
Journal of Experimental & Theoretical Artificial Intelligence	Artificial Intelligence	Y	Subscription	Business Source Premier	7/1/1998	18 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=B9N&scope=site
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Journal of fermentation and bioengineering	Biological Engineering	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	12/31/1998	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-fermentation-and-bioengineering
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Journal of Friction and Wear	Mechanical Engineering	N	Subscription	Springer Nature Journals	2/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11959
Journal of Functional Programming	Computer Programming	Y	Subscription	Cambridge Journals Online (CRKN)	1/1/1997	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/JFP/type/JOURNAL

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Journal of Grid Computing	Computer Programming	Y	Subscription	Springer Nature Journals	3/1/2003	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10723
Journal of Heuristics	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10732
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Journal of High Speed Networks	Computer Networks & Networking	Y	Subscription	Business Source Premier	6/1/1996	9 months ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=HSN&scope=site
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Journal of Information Security	Computer & Data Security	Y	Subscription	Scientific Research Publishing Journals	7/1/2010	Present	https://www.scirp.org/journal/jis
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Journal of Information Technology: JIT	Computer Science	N	Subscription	Business Source Premier	2/1/1986	12/1/2003	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5BO&scope=site
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Journal of Intelligent and Robotic Systems	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10846
Journal of Intelligent Information Systems	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10844
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Journal of Intelligent Material Systems and Structures	Artificial Intelligence	Y	Subscription	SAGE Premier 2019	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/jim

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Journal of Management Information Systems; JMIS	Data Processing	Y	Subscription	Business Source Premier	6/1/1984	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=JOU&scope=site
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Journal of nonlinear science	Computer Science	N	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/332

Journal of Organizational and End User Computing (JOEUC)	Data Processing	Y	Subscription	InfoSci Journals	1/1/2008	12/31/2012	http://ezproxy.fau.edu/login?url=http://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/JOEUC
Journal of parallel and distributed computing	Data Processing	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-parallel-and-distributed-computing
Journal of Pipeline Systems Engineering and Practice	Mechanical Engineering	Y	Subscription	American Society of Civil Engineers (ASCE) Journals	1/1/2010	Present	http://ezproxy.fau.edu/login?url=https://ascelibrary.org/journal/jpsea2
Journal of power sources	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-power-sources
Journal of Radioanalytical and Nuclear Chemistry	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10967
Journal of Radioanalytical Chemistry	Analytical Chemistry	N	Subscription	Springer Nature Journals	1/1/1968	12/31/1983	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10967
Journal of Research on Computing in Education	Computer-Assisted Instruction	Y	Subscription	Business Source Premier	3/1/1990	9/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=RCE&scope=site
Journal of Research on Technology in Education	Computer-Assisted Instruction	Y	Subscription	Business Source Premier	9/1/2001	12/1/2013	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=I02&scope=site
				Taylor & Francis Social Science and Humanities Library	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ujrt20
Journal of Robotic Systems	Artificial Intelligence	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	12/31/2005	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10974563
Journal of Scientific Computing	Computational Sciences	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10915
Journal of Software Engineering and Applications	Computer Software	Y	Subscription	Scientific Research Publishing Journals	12/1/2008	Present	https://www.scirp.org/journal/jsea
Journal of Software Maintenance & Evolution: Research & Practice	Computer Software	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2001	12/31/2011	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15320618
Journal of Software Maintenance: Research and Practice	Computer Software	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	12/31/2000	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/1096908X
Journal of statistical computation and simulation	Computer Simulation	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=gscs20
Journal of symbolic computation	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-symbolic-computation
Journal of Systems and Information Technology	Information Systems	Y	Subscription	Emerald eJournals Premier	3/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/jsit
Journal of Systems and Software	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-systems-and-software
Journal of systems architecture	Internet	Y	Subscription	ScienceDirect Freedom Collection	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-systems-architecture
Journal of the Academy of Management	Industrial Engineering	Y	Subscription	Business Source Premier	4/1/1958	12/1/1962	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1EFP&scope=site
Journal of the ACM (JACM)	Computer Science	Y	Subscription	Business Source Premier	3/1/2004	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1QT&scope=site

Journal of the American Medical Informatics Association: JAMIA	Medical Informatics	Y	Subscription	Journals@Ovid	1/1/2010	Present	http://ezproxy.fau.edu/login?url=http://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=n&CSC=Y&PAGE=toc&D=ovft&AN=00042637-000000000-00000
				Oxford University Press Full Collection (JISC)	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://academic.oup.com/jamia
Journal of the American Society for Mass Spectrometry	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/13361
Journal of the Association for Information Systems	Computer Science	Y	Subscription	Business Source Premier	1/1/2003	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=L5X&scope=site
Journal of Tissue Engineering and Regenerative Medicine	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19327005
Journal of trace and microprobe techniques	Analytical Chemistry	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ltma20
Journal of Turbulence	Mechanical Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2000	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tjot20
Journal of visual communication and image representation	Computer Graphics	Y	Subscription	ScienceDirect Freedom Collection	3/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-visual-communication-and-image-representation
Journal of Visual Languages & Computing	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	3/1/1995	12/31/2018	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-visual-languages-and-computing
KM World	Data Processing	N	Subscription	Business Source Premier	1/1/2004	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5OW&scope=site
Knowledge and Information Systems	Internet	Y	Subscription	Springer Nature Journals	2/1/1999	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10115
Knowledge Engineering Review	Artificial Intelligence	Y	Subscription	Cambridge Journals Online (CRKN)	1/1/1997	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/KER/type/JOURNAL
Knowledge-based systems	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/knowledge-based-systems
KSME International Journal	Mechanical Engineering	N	Subscription	Springer Nature Journals	1/1/1997	12/31/2004	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/12206
Kybernetes	Artificial Intelligence	Y	Subscription	Emerald eJournals Premier	1/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/k
LAN Product News	Computer Science	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5QC&scope=site
Language resources and evaluation	Computer-Assisted Instruction	Y	Subscription	Springer Nature Journals	1/1/2005	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10579
Link-Up	Computer Networks & Networking	N	Subscription	Business Source Premier	7/1/1997	7/1/2002	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=0JN&scope=site
Literary and Linguistic Computing/Digital Scholarship in the Humanities**	Computational Linguistics	Y	Subscription	Oxford University Press Full Collection (JISC)	1/1/1996	12/31/2014	http://ezproxy.fau.edu/login?url=https://academic.oup.com/llc
Machine Design	Mechanical Engineering	N	Subscription	Business Source Premier	6/19/1997	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=MDS&scope=site
Machine Learning	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10994

Machine translation	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10590
Machine Vision and Applications	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/138
Machining science and technology	Mechanical Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lmst20
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Marine Biotechnology	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10126
Marketing computers	Computer Science	N	Subscription	Business Source Premier	4/1/1994	9/1/1997	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=MKC&scope=site
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Material handling engineering	Industrial Engineering	N	Subscription	Business Source Premier	7/1/1997	12/1/1999	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=0MT&scope=site
Material handling management	Industrial Engineering	N	Subscription	Business Source Premier	1/1/2000	8/1/2010	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=7FL&scope=site
Materials & Design	Industrial Engineering	Y	Subscription	ScienceDirect	1/1/1995	9/15/2015	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/materials-and-design-1980-2015
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/materials-and-design-1980-2015
Mathematical and Computer Modelling of Dynamical Systems	Computer Software	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=nmcm20
Mathematical Structures in Computer Science	Computer Science	Y	Subscription	Cambridge Journals Online (CRKN)	1/2/1997	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/MSC/type/JOURNAL
Mathematical Systems Theory	Computer Engineering	Y	Subscription	Business Source Premier	1/1/1996	11/1/1996	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=2Q7T&scope=site
Mathematics and Computers in Simulation	Computer Simulation	Y	Subscription	ScienceDirect Freedom Collection	5/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/mathematics-and-computers-in-simulation
MC Technology Marketing Intelligence	Computer Science	N	Subscription	Business Source Premier	10/1/1997	4/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=3G0&scope=site
Measurement and Control	Mechanical Engineering	N	Subscription	SAGE Premier 2019	2/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/mac
Measurement Techniques	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11018
Mechanical Engineering : The Journal of the American Society of Mechanical Engineers (ASME)	Mechanical Engineering	Y	Subscription	Business Source Premier	7/1/1993	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=MEE&scope=site
Mechanical Systems and Signal Processing	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/mechanical-systems-and-signal-processing

Mechanics & Industry	Mechanical Engineering	Y	Subscription	Cambridge Journals Online	1/1/2012	12/31/2014	http://ezproxy.fau.edu/login?url=https://www.cambridge.org/core/product/9F3AA07D15FD266F04784D6691951441/all-issues
				Cambridge Journals Online (CRKN)	1/1/2012	12/31/2014	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/MIN/type/JOURNAL
Mechanics Based Design of Structures and Machines	Mechanical Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2003	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lmbd20
Mechanics of structures and machines	Mechanical Engineering	N	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	12/31/2002	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lmbd19
Mechanism and Machine Theory	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/mechanism-and-machine-theory
Mechatronics	Automation	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/mechatronics
Medical & Biological Engineering & Computing	Biological Engineering	Y	Subscription	Business Source Premier	1/1/2003	1 year ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PO0&scope=site
				Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11517
Medical Engineering & Physics	Biological Engineering	Y	Subscription	ClinicalKey eJournals	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/13504533
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/medical-engineering-and-physics
Mendeleev Communications	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/mendeleev-communications
Microchimica Acta	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/604
Microfluidics and Nanofluidics	Mechanical Engineering	Y	Subscription	Springer Nature Journals	11/1/2004	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10404
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Minds and Machines	Artificial Intelligence	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11023
Mining Technology	Data Mining	N	Subscription	Taylor & Francis Science & Technology Library	1/1/2018	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=ymnt21
MIS Quarterly	Computer Science	Y	Subscription	Business Source Premier	3/1/1977	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=MIS&scope=site
Mobile Networks and Applications	Computer Networks & Networking	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11036
Modem Users News	Computer Networks & Networking	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5YT&scope=site
Modern machine shop	Mechanical Engineering	N	Subscription	Business Source Premier	8/1/1996	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=MMS&scope=site

Modern Mechanical Engineering	Mechanical Engineering	Y	Subscription	Scientific Research Publishing Journals	8/1/2011	Present	https://www.scirp.org/journal/mme
Molecular biotechnology	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/12033
Molecular diversity	Analytical Chemistry	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11030
Moscow University Mechanics Bulletin	Mechanical Engineering	Y	Subscription	Springer Nature Journals	2/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11971
Multibody System Dynamics	Computer Science	Y	Subscription	Springer Nature Journals	3/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11044
Multidimensional Systems and Signal Processing	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11045
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Nanomedicine: Nanotechnology, Biology and Medicine	Biological Engineering	Y	Subscription	ClinicalKey eJournals	3/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/15499634
				ScienceDirect Freedom Collection	3/1/2005	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/nanomedicine-nanotechnology-biology-and-medicine
Natural Computing	Databases & Database Management	Y	Subscription	Springer Nature Journals	3/1/2002	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11047
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Network security	Computer & Data Security	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/network-security
Network World	Computer Networks & Networking	N	Subscription	Business Source Premier	1/7/2002	6/3/2013	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=0NA&scope=site
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Neural Networks	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/neural-networks
Neurocomputing	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/neurocomputing
New Equipment Digest	Mechanical Engineering	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1R4&scope=site
New Generation Computing	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/354
New Genetics & Society	Biological Engineering	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=cngs20
New Review of Hypermedia and Multimedia	Computer-Assisted Instruction	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tham20

New Review of Information Networking	Computer Networks & Networking	Y	Subscription	Taylor & Francis Social Science and Humanities Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=rinn20
NMR in Biomedicine	Biological Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10991492
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Offshore	Computer Engineering	N	Subscription	Business Source Premier	1/1/1995	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=OFS&scope=site
Online	Internet	N	Subscription	Business Source Premier	1/1/1994	11/1/2012	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=ONL&scope=site
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Online Product News	Computer Science	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5QF&scope=site
Online Review	Internet	Y	Subscription	Emerald eJournals Premier	1/1/1977	12/31/1992	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/or
Operations & Fulfillment	Computer Networks & Networking	N	Subscription	Business Source Premier	1/1/2002	4/1/2005	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=8JC&scope=site
Optical Memory & Neural Networks	Computer Information Storage	Y	Subscription	Springer Nature Journals	3/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/12005
Optimal Control Applications & Methods	Automation	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10991514
Optimization Methods and Software	Computer Science	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=goms20
ORSA Journal on Computing	Data Processing	Y	Subscription	Business Source Premier	1/1/1989	9/1/1995	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=2Q7K&scope=site
Parallel Algorithms and Applications	Computer Science	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	12/31/2004	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=gpaa19
Parallel Computing	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/parallel-computing
Pattern Analysis and Applications (PAA)	Pattern Recognition	Y	Subscription	Springer Nature Journals	3/1/1998	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10044
Pattern recognition letters	Artificial Intelligence	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/pattern-recognition-letters
Pattern Recognition: The Journal of the Pattern Recognition Society	Artificial Intelligence	N	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/pattern-recognition
PC Magazine : the independent guide to IBM-standard personal computers	Computer Hardware	N	Subscription	Business Source Premier	1/5/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PCM&scope=site
PC Week	Information Technology	N	Subscription	Business Source Premier	1/5/1998	4/17/2000	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PCK&scope=site
PC World	Computer Industry	N	Subscription	Business Source Premier	1/1/1996	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PCW&scope=site

PC/Computing	Computer Science	N	Subscription	Business Source Premier	1/1/1998	4/1/2000	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PCC&scope=site
Performance Evaluation: An International Journal	Data Processing	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/performance-evaluation
Personal and ubiquitous computing	Computer Science	Y	Subscription	Springer Nature Journals	3/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/779
Pervasive and mobile computing	Computer Engineering	Y	Subscription	ScienceDirect Freedom Collection	3/1/2005	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/pervasive-and-mobile-computing
Pipeline and utilities construction	Mechanical Engineering	N	Subscription	Business Source Premier	1/1/1995	12/1/1996	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PUC&scope=site
Plant biotechnology reports	Biological Engineering	Y	Subscription	Springer Nature Journals	4/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11816
Plastics news	Industrial Engineering	N	Subscription	Business Source Premier	7/1/1996	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=PAW&scope=site
Policy & Internet	Internet	Y	Subscription	Wiley Online Library Database Model 2019	1/1/2009	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19442866
Precision Engineering	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/precision-engineering
Problems of Information Transmission	Computer Science	Y	Subscription	Springer Nature Journals	1/1/2001	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11122
Proceedings of the Human Factors and Ergonomics Society Annual Meeting	Biological Engineering	Y	Subscription	SAGE Premier 2019	9/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/pro
Proceedings of the Society for Analytical Chemistry	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1964	12/31/1974	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/0037-9697/1964
Process biochemistry	Biological Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/process-biochemistry
Process Cooling & Equipment	Mechanical Engineering	N	Subscription	Business Source Premier	3/1/2002	7/1/2013	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=J6R&scope=site
Production Engineering	Industrial Engineering	N	Subscription	Springer Nature Journals	5/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11740
Productivity Software	Computer Software	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1OA&scope=site
Professional Engineering	Mechanical Engineering	N	Subscription	Business Source Premier	1/15/1997	12/1/2017	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1MC&scope=site
Program	Internet	N	Subscription	Emerald eJournals Premier	1/1/1997	11/7/2017	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/prog
Programming and Computer Software	Computer Programming	Y	Subscription	Springer Nature Journals	1/1/2000	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11086
Protein engineering	Biological Engineering	Y	Subscription	Oxford University Press Full Collection (JISC)	1/1/1996	12/31/2003	http://ezproxy.fau.edu/login?url=https://academic.oup.com/peds
Protein Engineering, Design, and Selection : PEDS	Biological Engineering	Y	Subscription	Oxford University Press Full Collection (JISC)	1/1/2004	Present	http://ezproxy.fau.edu/login?url=https://academic.oup.com/peds
Pump Industry Analyst	Mechanical Engineering	Y	Subscription	ScienceDirect	10/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/pump-industry-analyst

Quantum Information Processing	Artificial Intelligence	Y	Subscription	Springer Nature Journals	4/1/2002	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11128
RAIRO. Informatique Theorique et Applications = Theoretical Informatics and Applications	Data Processing	N	Subscription	Cambridge Journals Online	1/1/1999	12/31/2014	http://ezproxy.fau.edu/login?url=https://www.cambridge.org/core/product/E36807A85589C6CC76CCE73BF5B2C1B3/all-issues
Rapid Communications in Mass Spectrometry	Analytical Chemistry	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10970231
Rapid Prototyping Journal	Mechanical Engineering	Y	Subscription	Emerald eJournals Premier	3/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/rpj
Real-Time Imaging	Computer Science	Y	Subscription	ScienceDirect Freedom Collection	4/1/1995	12/31/2005	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/real-time-imaging
Real-Time Systems	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11241
Records Management Journal	Information Management	Y	Subscription	Emerald eJournals Premier	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/rmj
Red Herring	Computer Industry	N	Subscription	Business Source Premier	5/28/2007	11/16/2010	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1GVK&scope=site
Refrigerated Transporter	Computer Industry	N	Subscription	Business Source Premier	1/1/2002	5/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=6X7&scope=site
Renewable Energy Focus	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	7/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/renewable-energy-focus
Robotica	Artificial Intelligence	Y	Subscription	Cambridge Journals Online (CRKN)	1/1/1997	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/ROB/type/JOURNAL
Robotics and Autonomous Systems	Automation	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/robotics-and-autonomous-systems
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Russian Microelectronics	Computer Science	Y	Subscription	Springer Nature Journals	3/1/2000	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11180
Science in China Series F: Information Sciences	Data Processing	Y	Subscription	Springer Nature Journals	1/1/2001	12/31/2009	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11432
Science of Computer Programming	Computer Programming	Y	Subscription	ScienceDirect Freedom Collection	2/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/science-of-computer-programming
Scientific and Technical Information Processing	Data Processing	Y	Subscription	Springer Nature Journals	2/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11984
Searcher : The Magazine for Database Professionals	Internet	N	Subscription	Business Source Premier	7/1/1996	12/1/2012	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=SEH&scope=site
Security Journal	Computer & Data Security	Y	Subscription	Palgrave Macmillan Journals	1/1/2004	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/41284
Selected Annual Reviews of the Analytical Sciences	Analytical Chemistry	N	Subscription	Royal Society of Chemistry Gold	1/1/1971	12/31/1974	http://ezproxy.fau.edu/login?url=https://dx.doi.org/10.1039/0300-9963/1971
Sensor Review	Mechanical Engineering	Y	Subscription	Emerald eJournals Premier	1/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.emeraldinsight.com/loi/sr
Service oriented computing and applications	Computer Science	Y	Subscription	Springer Nature Journals	4/1/2007	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11761

SIAM Journal on Computing	Data Processing	Y	Subscription	Business Source Premier	2/1/1997	6/1/2011	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=2D9&scope=site
Siliconindia	Computer Science	N	Subscription	Business Source Premier	1/1/2000	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5MP&scope=site
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Simulation Practice and Theory	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	3/15/1995	5/15/2002	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/simulation-practice-and-theory
SIMULATION: Transactions of The Society for Modeling and Simulation International	Computer Simulation	Y	Subscription	SAGE Premier 2019	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/sim
Soft Computing	Computer Science	N	Subscription	Springer Nature Journals	4/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/500
Software and Systems Modeling (SoSyM)	Computer Software	Y	Subscription	Springer Nature Journals	9/1/2002	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10270
Software Quality Journal	Computer Software	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11219
Software testing, verification & reliability : STVR	Computer Software	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10991689
Software: Practice & Experience	Computer Programming	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/1097024X
Solvent extraction and ion exchange	Analytical Chemistry	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=lsei20
Statistical Analysis and Data Mining: The ASA Data Science Journal	Data Mining	N	Subscription	Wiley Online Library Database Model 2019	1/1/2008	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19321872
Statistics and Computing	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11222
Stochastics and Stochastics Reports	Computer Science	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	12/31/2004	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=gssr19
Stochastics: An International Journal of Probability and Stochastic Processes	Computer Science	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2005	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=gssr20
Strain	Mechanical Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/14751305
Structural and Multidisciplinary Optimization	Computer Graphics	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/158
Supply Chain Europe	Automation	N	Subscription	Business Source Premier	2/1/2004	11/1/2012	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=V0U&scope=site
Swarm and Evolutionary Computation	Computational Sciences	Y	Subscription	ScienceDirect Freedom Collection	3/1/2011	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/swarm-and-evolutionary-computation
System Dynamics Review	Computer Simulation	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10991727

Systemic Practice and Action Research	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11213
Systems analysis modelling simulation	Computer Simulation	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2002	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=gsam20
Systems Engineering - Theory & Practice	Computer Engineering	Y	Subscription	ScienceDirect	1/1/2007	12/31/2009	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/systems-engineering-theory-and-practice
				ScienceDirect Freedom Collection	1/1/2007	12/31/2009	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/systems-engineering-theory-and-practice
Talanta	Analytical Chemistry	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/talanta
Target: On the Web	Computer Networks & Networking	N	Subscription	Business Source Premier	1/1/2001	10/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=BYV&scope=site
Technology Meetings	Computer Engineering	N	Subscription	Business Source Premier	1/1/2002	5/1/2002	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=JYX&scope=site
TechTrends: For Leaders in Education & Training	Computer-Assisted Instruction	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11528
Telematics and Informatics	Computer Networks & Networking	Y	Subscription	ScienceDirect Freedom Collection	12/1/1994	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/telematics-and-informatics
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The Computer Bulletin	Data Processing	Y	Subscription	Oxford University Press Full Collection (JISC)	2/1/1996	1/1/2005	http://ezproxy.fau.edu/login?url=https://academic.oup.com/itnow
The Computer Conference Analysis Newsletter	Computer Industry	N	Subscription	Business Source Premier	1/23/1995	8/19/1996	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=NEW&scope=site
The electronic journal of information systems in developing countries	Computer Science	Y	Subscription	Wiley Online Library	1/1/2000	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/16814835
				Wiley Online Library Database Model 2019	1/1/2000	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/16814835
The International Journal of Advanced Manufacturing Technology	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/170
The International Journal of Human Factors in Manufacturing	Automation	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	12/31/1996	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/15227111
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The Journal of Machine Learning Research	Computer Engineering	Y	Subscription	Business Source Premier	1/1/2001	7/1/2005	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=HZR&scope=site

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The Visual Computer	Computer Graphics	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/371
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Theoretical Computer Science (Elsevier)	Computer Science	N	Subscription	ScienceDirect Freedom Collection	1/9/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/theoretical-computer-science
Theory and Practice of Logic Programming	Computer Science	Y	Subscription	Cambridge Journals Online (CRKN)	1/1/2001	Present	http://ezproxy.fau.edu/login?url=http://www.cambridge.org/core/product/identifier/TLP/type/JOURNAL
Thermal Engineering	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11509
Tooling & Production	Mechanical Engineering	N	Subscription	Business Source Premier	1/1/2001	5/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=L31&scope=site
TrAC Trends in Analytical Chemistry	Analytical Chemistry	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/trac-trends-in-analytical-chemistry
Transactions of the Institute of Measurement & Control	Mechanical Engineering	N	Subscription	SAGE Premier 2019	1/1/1999	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/tim
Trends in biotechnology	Biological Engineering	Y	Subscription	ClinicalKey eJournals	1/1/2007	Present	http://ezproxy.fau.edu/login?url=https://www.clinicalkey.com/dura/browse/journalIssue/01677799
				ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/trends-in-biotechnology
Trends in Environmental Analytical Chemistry	Analytical Chemistry	N	Subscription	ScienceDirect Freedom Collection	2/1/2014	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/trends-in-environmental-analytical-chemistry
Tribology Letters	Mechanical Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11249
Tribology Transactions : A Publication of the Society of Tribology and Lubrication Engineers	Mechanical Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=utrb20
Tribotest	Mechanical Engineering	N	Subscription	Wiley Online Library Database Model 2019	1/1/2006	12/31/2008	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/1557685X
Underground Construction	Mechanical Engineering	N	Subscription	Business Source Premier	1/1/1997	1 month ago	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=1QZ&scope=site
UNIX Update	Computer Software	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5QI&scope=site
User Modeling and User-Adapted Interaction	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11257
Utility Automation & Engineering T&D	Automation	N	Subscription	Business Source Premier	11/1/2003	8/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=V21&scope=site

Virtual Reality	Computer Graphics	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/10055
Web semantics: science, services and agents on the world wide web	Computer Information Storage	Y	Subscription	ScienceDirect Freedom Collection	12/1/2003	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/journal-of-web-semantics
Welding Design & Fabrication (21512663)	Mechanical Engineering	N	Subscription	Business Source Premier	9/1/2009	11/1/2009	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=B0MM&scope=site
Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery	Data Mining	N	Subscription	Wiley Online Library Database Model 2019	1/1/2011	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/19424795
Wind Energy	Mechanical Engineering	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1998	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10991824
Wind Engineering	Mechanical Engineering	Y	Subscription	SAGE Premier 2019	1/1/2000	Present	http://ezproxy.fau.edu/login?url=https://journals.sagepub.com/loi/wie
Wood Material Science & Engineering	Industrial Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/2006	Present	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=swoo20
World journal of microbiology and biotechnology	Biological Engineering	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11274
World pumps	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	1/1/1995	Present	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/world-pumps
World Wide Web	Internet	Y	Subscription	Springer Nature Journals	3/1/1998	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11280
Worldwide Databases	Computer Networks & Networking	N	Subscription	Business Source Premier	7/1/1999	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=5QK&scope=site
X-Ray Spectrometry	Analytical Chemistry	Y	Subscription	Wiley Online Library Database Model 2019	1/1/1996	Present	http://ezproxy.fau.edu/login?url=https://onlinelibrary.wiley.com/loi/10974539
Yahoo! Internet Life	Computer Networks & Networking	N	Subscription	Business Source Premier	12/1/2000	8/1/2002	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=7KB&scope=site
Year 2000 Practitioner	Computer Software	N	Subscription	Business Source Premier	1/1/1999	9/1/1999	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=3SE&scope=site
Ziff Davis Smart Business	Computer Science	N	Subscription	Business Source Premier	5/1/2001	6/1/2002	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=FUX&scope=site
Ziff Davis smart business for the new economy	Computer Science	N	Subscription	Business Source Premier	5/1/2000	4/1/2001	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=8R8&scope=site
인터넷정보학회논문지 = Journal of Korean Society for Internet Information	Internet	N	Subscription	Business Source Premier	12/1/2014	Present	http://ezproxy.fau.edu/login?url=http://search.ebscohost.com/direct.asp?db=buh&jid=H906&scope=site
固体力学学报英文版 = Acta Mechanica Solida Sinica	Mechanical Engineering	Y	Subscription	ScienceDirect Freedom Collection	3/1/2006	12/31/2017	http://ezproxy.fau.edu/login?url=https://www.sciencedirect.com/journal/acta-mechanica-solida-sinica
工業工程學刊=Journal of the Chinese Institute of Industrial Engineers	Industrial Engineering	Y	Subscription	Taylor & Francis Science & Technology Library	1/1/1997	12/31/2012	http://ezproxy.fau.edu/login?url=https://www.tandfonline.com/openurl?genre=journal&stitle=tjci20
控制理论与技术英文版 = Control Theory and Technology	Mechanical Engineering	Y	Subscription	Springer Nature Journals	11/1/2003	12/31/2013	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11768
系统科学与系统工程学报英文版 = Journal of Systems Science and Systems Engineering	Industrial Engineering	N	Subscription	Springer Nature Journals	3/1/2003	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11518
计算机科学技术学报英文版 = Journal of Computer Science & Technology	Computer Science	Y	Subscription	Springer Nature Journals	1/1/1997	Present	http://ezproxy.fau.edu/login?url=https://link.springer.com/journal/volumesAndIssues/11390