College of Engineering and Computer Science
Office of the Dean
777 Glades Road, EE96, Room 308
Boca Raton, FL 33431
561.297.3400

FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Mostapha Al Saidi

for the degree of Doctor of Philosophy (Ph.D.)

Deep Learning for Computer Vision Applications in Medical Diagnostics and Wildlife Monitoring: Challenges in Classification, Class Imbalance, and Object Tracking

4/11/2025, 11:30 am
Engineering East, Room 320
777 Glades Road
Boca Raton, FL

Join Zoom Meeting
https://fau-edu.zoom.us/j/84307770303?pwd=xARSkpsHVA9MNDYrplumCW9FuUhDni.1

Meeting ID: 843 0777 0303
Passcode: saE20M

DEPARTMENT:
Computer and Electrical Engineering and Computer Science

ADVISOR:
Professor Hanqi Zhuang, Ph.D.

PH.D. SUPERVISORY COMMITTEE:
Professor Hanqi Zhuang, Ph.D., Chair
Professor Xingquan (Hill) Zhu, Ph.D.
Professor Michael DeGiorgio, Ph.D.
Professor Borko Furht, Ph.D.

ABSTRACT OF DISSERTATION

This dissertation explores innovative applications of deep learning and computer vision techniques across three distinct domains: medical imaging, dermatological diagnostics, and wildlife monitoring. The research addresses critical challenges in each field through the development and optimization of convolutional neural networks and other deep learning architectures.

College of Engineering and Computer Science
Office of the Dean
777 Glades Road, EE96, Room 308
Boca Raton, FL 33431
561.297.3400

The first study examines COVID-19 classification from X-ray images, comparing one-shot versus two-stage classification approaches using transfer learning with pre-trained models such as VGG16 and VGG19. The initial hypothesis was that breaking down the classification task into two optimized tasks would yield better results than one-shot classification. Results demonstrated that the single-stage approach achieved superior performance with 95\% accuracy, contrary to initial hypotheses.
The second study tackles the pervasive problem of class imbalance in dermoscopic image classification for skin cancer detection. Two approaches were systematically compared: traditional data augmentation techniques and Generative Adversarial Networks (GANs) for synthetic image generation. Fine-tuned deep learning models, including EfficientNet, ResNet50, Vision Transformers, and ConvNeXt, were evaluated on the augmented dataset and the synthetic dataset. Data augmentation proved more effective than GAN-generated synthetic images, with EfficientNet achieving 97.7\% accuracy.
The third study extends deep learning techniques to wildlife monitoring and conservation, developing a system for detecting and tracking beluga whales in aerial drone footage. The YOLOv7 object detection model achieved high precision and recall (92\%–92\% for adult belugas, 94\%–89\% for calves), while a novel post-processing algorithm improved multiple objects tracking accuracy from approximately 30\% to 70\%.

The collective findings advance the state of the art in applying deep learning to visual data across diverse domains, demonstrating effective solutions to key challenges in classification, class imbalance, and object tracking. This research contributes practical approaches that enhance diagnostic capabilities in healthcare, improve dermatological screenings, and support wildlife conservation efforts through more efficient monitoring techniques.

BIOGRAPHICAL SKETCH

B.Sc., Florida Atlantic University, Boca Raton, Florida, 2018
M.Sc., Florida Atlantic University, Boca Raton, Florida, 2019
Ph.D., Florida Atlantic University, Boca Raton, Florida, 2025
Senior Data Scientist, Verisk Analytics, Jersey City, New Jersey, 2024-Present
President and Co-founder, Data Science and Machine Learning Club, Florida Atlantic University, Boca Raton, Florida, 2021-2022

CONCERNING PERIOD OF PREPARATION & QUALIFYING EXAMINATION

Time in Preparation: 2020-2025
Qualifying Examination Passed: Spring 2020

Selected Published Papers:

1. Alsaidi, M., Al-Jassani, M. G., Bang, C., O'Corry-Crowe, G., Watt, C., Ghazal, M., & Zhuang, H. (2024). Localization and tracking of beluga whales in aerial video using deep learning. Frontiers in Marine Science, 11, 1445698.
2. Alsaidi, M., Jan, M. T., Altaher, A., Zhuang, H., & Zhu, X. (2024). Tackling the class imbalanced dermoscopic image classification using data augmentation and GAN. Multimedia Tools and Applications, 83(16), 49121-49147.
3. Alsaidi, M., Altaher, A. S., Jan, M. T., Altaher, A., & Salekshahrezaee, Z. (2022). Covid-19 classification using deep learning two-stage approach. arXiv preprint arXiv:2211.15817.
4. Abd, M. A., Al-Saidi, M., Lin, M., Liddle, G., Mondal, K., & Engeberg, E. D. (2020, November). Surface feature recognition and grasped object slip prevention with a liquid metal tactile sensor for a prosthetic hand. In 2020 8th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob) (pp. 1174-1179). IEEE.
5. Al-Saidi, M. (2019). Semi-Autonomous Control of Robotic Arm with Haptic Feedback and Closed Loop Force Controller (Master's thesis, Florida Atlantic University).