

CAP 6619 Deep Learning

Credits: 3 credits

1. **Textbook, title, author, and year:** Deep Learning, Goodfellow, Bengio and Courville, MIR Press, in print (PDF is available for free download.)
2. Deep Learning with R, Francois Chollet, J.J. Allaire, Manning, ISBN 9781617295546, Jan. 2018

1. **Reference materials:** Neural Networks for Pattern Recognition , Christopher M. Bishop, Clarendon Press, 1996 (Online version available)
2. Pattern Recognition and Machine Learning Christopher M. Bishop, Springer, October, 2007, (Online version available)
3. Various research monographs, forums, and papers.

Specific course information

Catalog description: This course teaches students basic concepts of deep learning, with an application in engineering, business and other areas. The class will cover three major topics including neural network and deep learning theory, implementation of deep learning algorithms, and applications of deep learning. Topics include math preliminaries, machine learning basics, deep feedforward networks, convolution networks, auto-encoders, representation learning networks, and their implementations and applications.

Prerequisites: COP3530 Data Structures and algorithm analysis

Specific goals for the course: The goal of this class is for students to gain theoretical foundation and hands-on experiences on deep learning. At the end of the class, students should be able to understand the fundamentals of deep learning, algorithmic and implementation details and should be able to apply popular deep learning models to study their research problems.

Brief list of topics to be covered:

- **Introduction to Neural Network Learning**
 1. Introduction to machine learning
 2. Perceptron Learning
 3. Feedforward Neural Network
- **Deep Learning Framework**
 4. Convolutional Neural Network
 5. Auto-encoder learning
 6. Word-Embedding
- **Applications and Programming**
 7. Introduction to R programming
 8. R for Deep Learning
 9. Deep learning for image recognition and text classification