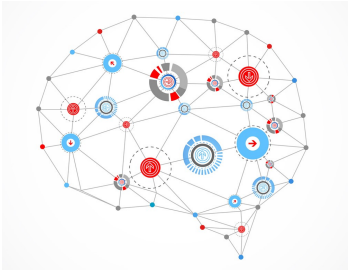

ELC 4396/5396: Introduction to Deep Learning

10:10–11:00 AM Monday, Wednesday, Friday

Rogers ECS Building 114

Course Materials on Canvas: 4396 and Canvas: 5396

Instructor: Dr. Leon (Liang) Dong
Rogers 301B
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Office Hours: MWF 11:00 AM - 2:00 PM; Other by appointment

Course Description:

This course introduces deep learning methods for implementing artificial intelligence. These methods include multilayer perceptrons, restricted Boltzmann machines, convolutional neural networks, recurrent neural networks, deep reinforcement learning, and deep generative models. Deep-learning-based AI has a wide range of applications, including audio and speech processing, image and video processing, natural language processing, data analysis, information synthesis, and automation.

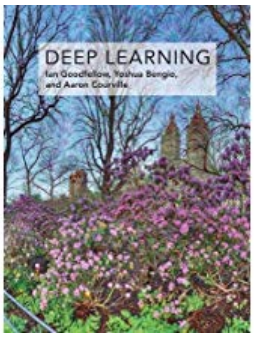
Deep learning is described as multi-layer abstraction, feature extraction, and non-linear processing. It can be classified as supervised learning and non-supervised learning. We will learn basic principles such as backpropagation, stochastic gradient descent, momentum algorithm, parameter initialization, and probability inference. We will learn regularization methods such as pruning, weight decay, and sparseness against overfitting. This course also discusses parameter sharing, sparse representation, bagging, dropout, and data augmentation.

Mathematics and statistics background is sufficient to understand deep learning fundamentals, data structure, and algorithm logic. Nevertheless, a programming background is needed to implement deep learning models to tackle real-world problems. We will program deep learning models in Python with the TensorFlow or PyTorch library.

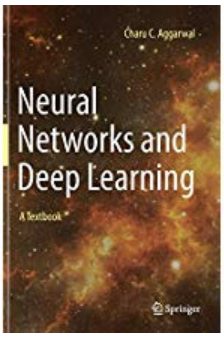


Credit Hours: 3

Textbook 1: *Deep Learning*
The MIT Press (November 18, 2016)
Author(s): Ian Goodfellow, Yoshua Bengio, and Aaron Courville
ISBN-13: 978-0262035613



Textbook 2: *Neural Networks and Deep Learning: A Textbook*
Springer; 1st ed. 2018 edition (August 26, 2018)
Author(s): Charu C. Aggarwal
ISBN-13: 978-3319944623



Note: Textbooks are recommended, not required. There will be presentation slides showing the latest developments in this scientific field. Before each class, you can download the corresponding lecture slide in Canvas.

Course Objectives:

At the completion of this course, you will learn:

1. Fundamentals of Deep Learning
2. Restricted Boltzmann Machines and Multilayer Perceptron
3. Convolutional Neural Networks
4. Recurrent Neural Networks
5. Deep Reinforcement Learning
6. Deep Generative Models

Moreover, you will start with deep learning programming and unleash the power of artificial intelligence to solve real-world problems.

Computer Usage:

Lectures will be held in Rogers Computer Lab 114. In the lab, you will learn how to build, train, and evaluate AI deep learning models. We will introduce you to today's most popular AI programming software, including Python, TensorFlow, Keras, PyTorch, etc.

I will post some programming samples in Canvas and some samples in
github (https://github.com/ProfessorDong/Deep-Learning-Course-Examples).

Evaluation:

There will be multiple lab programming exercises throughout the semester. Lab exercises are homework. As long as the results are submitted within the specified due time, you can complete an exercise through multiple class sessions or using your own computer.

There will be reading assignments. Reading assignments include reference book reading and technical paper reading. The outcome of your reading assignments will be evaluated through classroom discussions and programming exercises.

Final Project:

The final project will be a comprehensive project using deep learning methods. The completion date and time are according to the online Baylor University Final Exam Schedule.

I encourage you to apply the skills you have learned to your own research projects or some related projects on the Kaggle competition (https://www.kaggle.com).

Grade Distribution:

Reading Assignments	10%
Classroom Discussions	10%
Lab Programming Exercises	40%
Final Project	40%