ELEC4240 Deep Learning in Computer Vision

Course Description

Deep learning has significantly advanced the performance of computer vision system from object recognition to image processing. This course covers the basics and various applications of deep learning in computer vision. Students will study the details of convolutional neural networks as well as recurrent neural networks and train deep networks with end-to-end optimization, and learn deep learning based approaches for both high-level and low-level computer vision tasks such as image recognition and image enhancement. Through programming projects, students will implement, train, and test deep neural networks on cutting-edge computer vision research. Students would be required to study or do research in a final course project related to deep learning and computer vision and present their work by the end of the course. *Prerequisite(s):* (COMP 2011 OR COMP 2012 OR COMP 2012H) AND (MATH 2111 OR MATH 2121 OR MATH 2350)

List of Topics

1. Image classification
2. Loss function and optimization
3. Introduction to neural networks
4. Convolutional neural networks
5. Training neural networks
6. Deep learning hardware & software
7. CNN architectures
8. Recurrent neural networks
9. Detection and segmentation
10. Visualizing and understanding
11. Generative models
12. Deep reinforcement learning
13. Image/Video Processing & Synthesis
14. 3D Vision
15. Graph Neural Networks
16. Video Models

Statement of Objectives/Outcomes:

On completion of this course, students will be able to:

CO1 - Understand the basics of deep neural networks.

CO2 - Train deep neural networks on several computer vision tasks.

CO3 - Use deep learning as a tool to solve a research problem of their interests in a group.

Textbook(s):

Ian Goodfellow, Yoshua Bengio and Aaron Courville. *Deep Learning*, MIT Press, 2016.

Reference Books/Materials:
N/A

Grading Scheme:

Homework or laboratory assignments	36%
Final term project	29%
Midterm Exam	35%
Final Exam	N/A