Course Code	Course Title
COMP 4211	**Machine Learning**

Course Description

Machine learning is the science of making computer artifacts improve their performance by learning from data without requiring humans to program their behavior explicitly. This is an undergraduate-level introductory machine learning course designed for students with a solid computational and mathematical background. Students will learn the mathematical and computational principles underlying a variety of machine learning models and algorithms and will also gain hands-on experience by applying some of them to learn from data. Prerequisite(s): (COMP 2012 OR COMP 2012H) AND (ELEC 2600 OR IEDA 2510 (prior to 2018-19) OR IEDA 2520 OR IEDA 2540 OR ISOM 2500 OR LIFS 3150 OR MATH 2411 OR MATH 2421 OR MATH 2431). Exclusion(s): COMP 4331, COMP 5212, ISOM 3360

List of Topics

- Linear regression
- Logistic regression
- Feedforward neural networks
- Deep neural networks
- Convolutional neural networks
- Recurrent neural networks
- Principal component analysis
- Autoencoders
- Clustering
- Support vector machines
- Decision trees and random forests
- Reinforcement learning

Textbooks

N/A

Reference books

- Ethem Alpaydin (2020). *Introduction to Machine Learning*. Fourth Edition. MIT Press.
- Ian Goodfellow, Yoshua Bengio, and Aaron Courville (2016). *Deep Learning*. MIT Press.
- Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola (2021). *Dive into Deep Learning*.

Grading Scheme

- In-class quizzes (10%)
- Programming assignments (25%)
- Problem set (10%)
- Project (20%)
- Final exam (35%)

Course Intended Learning Outcomes

By the end of this course, students are expected to demonstrate competence in the following:

- Understanding of issues involved in learning from data and the major types of machine learning tasks;
- Ability to explain the principles underlying a variety of machine learning algorithms;
- Ability to apply a variety of machine learning algorithms to data;
- Ability to evaluate and compare the performance of different machine learning algorithms according to common performance criteria.

Assessment Rubrics

N/A