

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 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
- Generative Adversarial Networks
- Transformers
- Support vector machines
- Decision trees and random forests

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