**Course Description**

Machine learning studies ”how can we build computer programs that automatically improve their performance through experience?” This course introduces fundamentals of machine learning; it covers methods, theory and algorithms needed to do research in (and applications of) machine learning. Subjects are taken from machine learning, classic statistics, data mining and information theory. Topics include (but not limited to) regression, density estimation, classification, kernel methods, ensemble methods, dimensionality reduction, clustering, online learning and learning theory.

**Prerequisite**

Sufficient programming skills in Python are required to implement non-trivial algorithms from scratch. Working knowledge on linear algebra and probability are required to fully understand the presented subjects, and knowledge on statistics and convex optimization are desired; but we will briefly review these subjects so that students with strong numerate background or sufficient mathematical maturity could catch up and fully participate.

**Grading Policy**

- COSC4555: Assignment 60%, Midterm1 10%, Midterm2 15%, Final 15%
- COSC5555: Assignment 60%, Midterm1 10%, Midterm2 10%, Final 10%, Project 10%

**Reference**

- Additional reading materials will be available if appropriate.
Assignment Policy

- Students should hand in their own assignments. It is acceptable for students to collaborate in completing assignments, but participants should clarify with whom and on which problem they collaborated. Participants should also be ready to justify their own understandings on the submitted solutions.

- Some assigned problems may be similar to those in online materials. It is acceptable for students to borrow ideas from these materials, but practitioners should clarify the reference and be ready to justify their own understandings of the submitted solutions.

- Late assignment submission is acceptable upon approval of the instructor. However, assignment submitted one week later than the due date will not be graded.

Attendance

Attendance is not mandatory.

Auditing

Students are allowed to audit upon the approval of the instructor.