CS 539: Machine Learning

Syllabus, Worcester Polytechnic Institute, Spring 2024

1. **Credits**: 3
    a. Class Meets: **Tuesday and Friday 4:00pm - 5:20pm, Washburn 229**

2. **Instructor**: Kyumin Lee, kmlee@wpi.edu
    Office Hours: Friday 1-2pm, Unity Hall 363
    Teaching Assistant: Di You, dyou@wpi.edu
    Office Hours**:** Tuesday, Wednesday, and Thursday 11am-12pm (noon), Unity Hall 341
    Graduate Assistant: Naitik Zaveri, nrzaveri@wpi.edu
    The graduate assistant does not hold office hours but students can contact him via email

3. **Primary Textbook**:
    a. Machine Learning: The Art and Science of Algorithms That Make Sense of Data by Peter Flach, Cambridge University Press

4. **Additional Readings will be drawn from the following textbooks**:
    a. Learning From Data by Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.T. Lin., AML Book
    b. Machine Learning by Tom Mitchell, McGraw Hill
    c. Machine Learning Lecture Notes by Andrew Ng
    d. Reinforcement Learning: An Introduction by Sutton and Barto, MIT Press
    e. Deep Learning with Python by François Chollet, Manning Publications
    f. Selected research papers

5. **For a more advanced treatment of machine learning topics, you may read one of the following books:**
    a. Pattern Recognition and Machine Learning by Bishop, Springer.
    b. Machine Learning: A Probabilistic Perspective by Kevin P. Murphy, MIT Press.
    c. Deep Learning by Yoshua Bengio, Ian Goodfellow, and Aaron Courville.

6. **Specific Course Information**:
    a. Course Description: Machine learning deals with the design and study of computer programs that are able to improve their own performance with experience, or in other words, computer programs that learn. In this course, we investigate different machine learning paradigms including supervised, unsupervised, and reinforcement learning. We study multiple classification, regression, clustering, meta-learning and reinforcement learning techniques. Students gain extensive understanding of and experience with theoretical and practical aspects of machine learning. Students will conduct a team-based project.

b. Prerequisites: CS 534 Artificial Intelligence or equivalent, or permission of the instructor. I expect all students to have had some previous exposure to basic probability, statistics, algorithms, and data structures. You should be able to design and develop large programs and learn new software libraries on your own. **The primary programming language for assignments is Python. If you are not familiar with it, you should be able to learn it by yourself.**

Communication:

All course announcements will be posted via the Canvas course mailing list.

Grading Policy:

The course grading policy is as follows:

30%	Assignments
20%	Midterm
20%	Final
30%	Project

The grading scale for graduate students is A:100-90, B:89.9-80, C:79.9-70, D:69.9-60, F:59.9-0
The grading scale for undergraduate students is A:100-90, B:89.9-80, C: 79.9-70, NR:69.9-0

Assignments:

There are five assignments. Each assignment is proportion to 6% of your grade. We will use **Python 3** as the main programming language for the assignments. You will have total **4 late days** during the semester. You can use **up to 2 late days for each assignment** without penalty. After you consume the total 4 late days for an assignment, then you will get penalty proportion to extra late days (e.g., 10% off for the next late day, 20% for the next two late days).
For each assignment, we will **NOT accept** your solution **more than 2 days late**.

You may discuss an assignment with your colleague, but you should write a program and a report by yourself and should NOT copy and paste your colleague's solution. If you discussed an assignment with your colleague, **explicitly** report the colleague's name and what you discussed in your submission. We will use Stanford MOSS to measure software similarity.

Exam:

The midterm and final exams are closed book and will be held in class.

Project:

In the final project, you will apply algorithms, methods and techniques that you learned from this course to your project. The project consists of three major components: 1) proposal, 2) project website development, and 3) final presentation. The detailed information regarding the project will be announced in class and posted to Canvas. You will present and may demonstrate your project in the end of the semester.

Add policy:

A student can add/drop through the 10th day of the semester without a fee. After day 10 of the semester, students can add courses (with instructor approval) with a $100 late fee. Students must be officially registered for this course. No assignments or tests of any kind will be graded for students whose names do not appear on the class list. Refer to https://www.wpi.edu/offices/registrar/course-registration/add-drop

Drop policy:

No drops are allowed after the 10th day of the semester.

Learning Aids:

Lecture notes and schedule will be available in the course web page. Your homework solution and project report is supposed to be submitted via Canvas.

Plagiarism and Cheating:

Unless explicitly noted, all work you submit must be your own work. You are encouraged to discuss with others about ideas and material in the course, in preparing for exams, in understanding homework problems, project statements, etc. However, all homework solutions, exams are to be written individually, and the solutions should be your own, unless otherwise specified. Projects encourage teamwork, that is, in that case you are expected to work closely with your partner/(s) to solve problems and prepare a common agreed-upon solution.

Note in particular that copying of any material, may it be a single sentence or a figure, from any location (including the internet) without proper acknowledgement of the source constitutes plagerism. If in doubt, please ask for clarification. Any violation of the WPI's guidelines for academic integrity will result in no credit for the course and referral to the Student Affairs Office for disciplinary action. You should be familiar with the WPI Policy on Academic Honesty.

Students with Disabilities:

If you need course adaptations or accommodations because of a disability, or if you have medical information to share with me, please make an appointment with me as soon as possible. If you have not already done so, students with disabilities who believe that they may need accommodations in this class are encouraged to contact the Office of Disability Services (ODS) as soon as possible to ensure that such accommodations are implemented in a timely fashion. This office in Daniels Hall has phone (508-831-4908) and can be reached by email at disabilityservices@wpi.edu.

Writing Center:

The Writing Center offers one-on-one consultations, both in-person (in SL 233) and over Zoom, to help you improve as a writer. Writing Center tutors will read your written work, give you feedback about your document's strengths and weaknesses, and help you chart a path forward as you revise. Consultations are free and open to all WPI students for all classes and projects, and tutors will happily work with you at any stage of the writing process (early brainstorming, revising a draft, polishing sentences in a final

draft). To see our appointment options for both in-person and synchronous online meetings, go to the Writing Center homepage: wpi.edu/+writing

Snow happens in New England:

Should the instructor be unable to attend class due to weather, illness or some other circumstance then the course will be held online via Zoom at the regular course time. Should this situation arise, a notification will be shared on the course Canvas site along with details on how to access the Zoom session.