Syllabus

DS675 Machine Learning (Fall 2025)

General Information

Course Number: DS 675 001 CRN: 92416

Lecture Hours: 4:00 – 5:20 pm, Every Monday and Thursday

Lecture Location: KUPF 205

Instructor

Shuai Zhang, Assistant Professor

Email: sz457@njit.edu

Office Room: GITC 2117 or through zoom

https://njit-edu.zoom.us/j/95043957306?pwd=hU9R6rq39W3yo8AOVzQIcyLP7rJrCz.1
Meeting ID: 950 4395 7306
Passcode: 354053

Office Hour: 3:00-4:00 pm, Monday
5:30-6:30 pm, Thursday

Grader

TBA

Course Overview

This course is an introduction to machine learning and contains both theory and applications. Students will get exposure to a broad range of machine learning methods and hands-on practice on implementing classical machine learning algorithm. Topics include linear mode, perceptron, regression, classification, logistic regression, neural networks, support vector machines, dimensionality reduction, unsupervised learning and deep learning, and theory of generalization and overfitting, model selection and validation, and optimization in machine learning.

Prerequisites

Students are expected to have the following background:

- Calculus
- Linear algebra
- Probability
- Recommended but not required: functional/real analysis, Convex optimization, Matrix analysis

Schedule

DATE	CLASS	PARTIAL LIST OF LECTURE TOPICS	Lecture Notes #
9/4	1	Overview, Introduction to Machine Learning	L1
9/8	2	Mathematical Preliminary: Probability and Linear Algebra	L2
9/11	3		
9/15	4	Perceptron and Linear Model	L3
9/18	5		
9/22	6	Classification, Regression and Logistic Regression	L4
9/25	7		
9/29	8	Generalization Gap	L5
10/2	9		
10/6	10	Overfitting, Validation, and Regularization	L6
10/9	11		
10/13	12	Nearest Neighbor and RBF-Network	L7
10/16	13		
10/20	14	Selected Topics in Unsupervised Learning: k-means, GMM, graph clustering, Self-supervised learning	L8
10/23	15		
10/27	16	Neural Network	L9
10/30	17		
11/3	18	Support Vector Machine	L10
11/6	19		
11/10	20	Kernel Trick	L11
11/13	21		
11/17	22	Decision Trees and Ensemble Methods	L12
11/20	23		
11/24	24	Advanced Topics in Machine Learning	N/A
11/25	25	Reserved for Project Presentation	N/A
12/1	26		
12/4	27	Review of Machine Learning	L13
12/8	28		

Textbooks

There will be no required textbooks for the class. Some of the class material, however, will be based on content from the following books (none of which you are required to purchase).

- Hal Daumé, A Course in Machine Learning
- Abu-Mostafa, Magdon-Ismail, Lin: Learning From Data .

Assignments

There will be **4~8 assigments** throughout the semester. Each assignment consists of several small problems that need to be solved or proved. Each assignment has its own detailed instructions. Each assignment needs to be completed in two weeks and submitted via Canvas.

Paper Review and Project

- The project can be carried out by a group of at most 3 students.
- You can choose any topic as long as they are related to machine learning.
- Each group is required to submit a project proposal and a final report.
- Each group is required to give a Final Presentation (10 minutes).
- Final Report should include
    - Introduction, including a summary of the project, related work/methods, and the results of this project.
    - Problem description, including a detailed description of the problem you address in this project.
    - Methodology, including a detailed description of the methods you developed or used.
    - Experiments, including experiment setting, results, and your observations.
    - Conclusion and future work, including a summary of the main contributions of this project and potential future directions.
    - Contributions of each team member

Grading Policies

- Midterm (TBD)
- Project Presentation & Report (TBD)
- Final Exam (TBA)

Grading Scale

- **A**: 93-100,
- **B+**: 84-92,
- **B**: 76-83
- **C+**: 68-75
- **C**: 60-67
- **F**: 0-60.

You will receive an **F** if you miss three lectures without valid reasons, fail to submit any homework on time, do not submit the project, or do not complete the paper review. However, as long as you attend all the lectures, complete all the homework, the project, and the paper review, you will receive a grade of **B+** or **A**.

Grade Corrections

Check the grades in course work and report errors promptly. Please try and resolve any issue within one week of the grade notification.

Course Policies

Collaboration and External Resources for Assignments

Some homework problems will be challenging. You are advised to first try and solve all the problems on your own. You are also allowed to collaborate with your classmates and search for solutions online. But you should use such solutions only if you understand them completely (admitting that you do not understand something is way better than copying things you do not understand). Also, make sure to give the appropriate credit and citation.

Late Policy

- There will be a 10% penalty of total regular points for every day an assignment is late.
- **Max. late submission is 3 days late.**

Academic Support System

NJIT Academic Calendar:

https://www5.njit.edu/registrar/calendars/ This contains drop/add and other important dates.

Academic Integrity:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http:www5.njit.edu*policies*sites*policies*files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university**. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

Academic Support and Student Affairs:

"From questions about becoming a student at NJIT – to student engagement – to searching for information on career development, the Division of Academic Support and Student Affairs Staff is here to help."

Bookstore: NJIT has a bookstore. Please check its web page how COVID is affecting operations.

Canvas Help Page: Canvas support for students.

Center for Counseling and Psychological Services

"The NJIT Center for Counseling and Psychological Services (C-CAPS) is committed to assisting students in the achievement of their academic goals as well as benefiting from their personal experience on campus. College life can be personally challenging and stressful at times. We believe that the educational process is an important component of the development of the individual as a whole person. Our goal is to optimize the college experience and improve the quality of the lives of our students by promoting their mental health and facilitating students' personal, academic and professional growth."

The Learning Center

"Our mission is to assist students both in the classroom and beyond by providing tutorial services, academic coaching, academic and personal enrichment workshops and staff and peer support so students can meet the demands of their coursework and are prepared for life after graduation."

Robert W. Van Houten Library

“The Van Houten Library offers electronic and print resources essential to the mission of New Jersey's science and technology university, including a core collection of academic books, databases, and journals, as well as research and consultation services.”

Student Disability Services

“The Disability Support Services office works in partnership with administrators, faculty and staff to provide reasonable accommodations and support services for students with disabilities that have provided our office with documentation to receive services.”

Student Financial Aid Services

“Student Financial Aid Services (SFAS) at NJIT is committed to providing you with every opportunity to obtain funding to support your undergraduate educational costs at NJIT.”

Acknowledgement

A large portion of this course is adapted from machine learning courses by Dr. Malik Magdon-Ismail (RPI), Dr. Lijing Wang (NJIT), Dr. Yao Ma (RPI), as well as from CS229M by Prof. Tengyu Ma (Standford).