Course program and reading list

Semester 2 Year 2024

School: Efi Arazi School of Computer Science B.Sc

Machine Learning from Data

Lecturer:

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Course No.:	Course Type :	Weekly Hours :	Credit:
3141	Lecture	4	4

Course Requirements :	Group Code :	Language:
Final Exam	242314101	Hebrew

Prerequisites

Equivalent:

53 – Calculus II

Prerequisite:

52 – Calculus I
53 – Calculus II
54 – Linear Algebra I
55 – Linear Algebra II
77 – Algorithms
109 – Introduction to Probability

Students who took one of the courses listed below will not be allowed to register to the course Machine Learning from Data (3141):

3566 – Introduction to Machine Learning

Course Description

An introductory level machine learning course. We will present the main principles of data-driven learning algorithms. We will provide the theoretical basis for learning algorithms and learn about the pros and cons of different approaches, from both a mathematical and a practical point of view.

Students will implement and use algorithms and will practice their application in real-life data contexts. Homework and examples will be based on Python code developed by the students as well as, in special cases, on using Python/sklearn packages.

Subjects covered include:

1. Linear models: regression, logistic regression, feature selection

2. Decision trees, including different approaches to splitting nodes and

pruning techniques

3. Bayesian learning, including the advantages and disadvantages of naive vs full Bayes approaches

4. The perceptron – both primal and dual

5. kNN

6. Density estimation and EM

7. SVMs, including hinge/slack variables and how they affect results

8. Unsupervised learning – clustering techniques

9. PAC learning and sample complexity

10. VC dimension

11. Statistical estimates of error rates

📋 Course Goals

Algorithms and examples will be discussed and analyzed.

Homework assignments will include practical tasks and the development of python methods and classes to address specific learning tasks.

Successful students will have knowledge of several important machine learning algorithms.

They will have experience in applying these methods in simple datasets and learning tasks and in the process of evaluating and criticizing the results.

A+ Grading

0.5*HW + 0.5*Exam.

Must pass the exam as well as the HW.

HW assignments are in pairs. Only exceptional cases will be considered for submission in singles.

There will be 1 mandatory HW assignment.

The HW grade will be calculated by averaging grades from n–1 submitted assignments.

That is – students can opt not to submit one assignment (the mandatory assignment must be submitted).

Learning Outcomes

Successful students will have knowledge of several important machine learning algorithms and experience in applying them in simple datasets and learning tasks.

Successful students will have experience in working with python and sklearn

Teaching Assistant

Guy Assa, Yinnon Meshi, Rotem Shalev, Yarden Rachamim, Saar Buchnik

Contact details will be included in the slides for the first class

Reading List

1. Duda, Hart and Stork: Pattern Classification

2. Mitchel: Machine Learning

3. Bishop: Pattern Recognition and Machine Learning

4. James, Witten, Hastie, Tibshirani: An introduction to statistical learning

5. Online courses: Andrew Ng, Pedro Domingos