In the name of God, the Merciful, the Compassionate

Machine Learning - CE 717
Computer Engineering Department
Sharif University of Technology
Spring 2021

Instructors

Mohammad Hossein Rohban, Ph.D.
Office: CE-806
Email: rohban@sharif.edu

Office hours: by appointment and through email
Course webpage:
Course Quera page:

Teaching Assistants

Head TA: Mohammad Akbartajari email: m.akbartajari@gmail.com

Course Objective

This course includes an introduction to the Machine Learning concepts and the type of problems that could be approached through ML. We will explain what ML is; whether learning is possible; and how we can do it (efficiently). Next, we will explore various techniques and algorithms that are developed in ML to tackle problems with different inductive biases. We also discuss some standard metrics and evaluation schemes to determine how much an algorithm is able to learn in a given problem. At the end of this course, the students are expected to gain insights and skills that are necessary to design intelligent data driven solutions to solve real world problems.

Course Textbooks

1. Y. Abu-Mostafa, M. Magdon-Ismail, H. T. Lin. *Learning From Data*. AMLBook, 2012.
2. T. Hastie, R. Tibshirani, and J. Friedman. *The elements of statistical learning*. 2nd Edition, 2008.
3. C. Bishop. *Pattern Recognition and Machine Learning*. Springer, 2006.
4. T. Mitchell. *Machine Learning*. MIT Press, 1998.
5. K. Murphy. *Machine Learning: A Probabilistic Perspective*. MIT Press, 2012.

Prerequisites

Probability and Statistics, Linear Algebra, and Introduction to Programming (Python)

Grading Policy

Homework	30%
Final Project	10%
Midterm exam	30%
Final exam	30%

Final Project

Determined by the students at most by the date of midterm. 3 options for the title of project should be provided by the students, and then one would be selected by the TAs. The title could be taken from the published papers, and the students are expected to implement and reproduce the results from scratch. Improving the original results leads to the extra credit.

Homework Grading Policy

You have a maximum of 12 days of delay. You can use 3 days of delay for each exercise, in the 4-th day of delay, a 20% penalty on the total grade of the exercise would be applied. Any further delays would incur 20% penalty for each day of delay.

Course Schedule (tentative)

	Session	Topic	HW
1	99/11/26 Sun.	The Learning Problem	
2	99/11/28 Tue.	Prerequisites: Probability and Statistics, Linear Algebra	
3	99/12/03 Sun.	Is Learning Feasible?	

4	99/12/05 Tue.	The Linear Model I	HW 1
5	99/12/10 Sun.	Error and Noise	
6	99/12/12 Tue.	Training vs. Testing	
7	99/12/17 Sun.	Theory of Generalization	HW 2
8	99/12/19 Tue.	The VC Dimension	
9	99/12/24 Sun.	Bias-Variance Tradeoff	
10	99/12/26 Tue.	The Linear Model II	HW 3
11	00/01/15 Sun.	Neural Networks	
12	00/01/17 Tue.	Overfitting	
13	00/01/22 Sun.	Regularization	
14	00/01/24 Tue.	Validation	HW 4
15	00/01/29 Sun.	Support Vector Machines	
16	00/01/31 Tue.	Kernel Methods	
17	00/02/05 Sun.	Radial Basis Functions	HW 5
18	00/02/07 Tue.	Three Learning Principles	
	00/02/09 Thr.	Midterm Exam: Covering sessions 1 up to and including 13.	
19	00/02/12 Sun.	Other Classification Methods I	
20	00/02/14 Tue.		
21	00/02/19 Sun.	Other Classification Methods II	HW 6
22	00/02/21 Tue.	Ensemble Learning I	
23	00/02/26 Sun.	Ensemble Learning II	
24	00/02/28 Tue.	Nonparametric Methods	
25	00/03/02 Sun.	Regression	HW 7
26	00/03/04 Tue.	Dimensionality Reduction	
27	00/03/09 Sun.	Clustering I	
28	00/03/11 Tue.	Clustering II	

29	00/03/16 Sun.		
30	00/03/18 Tue.	Reinforcement Learning I	
31	00/03/23 Sun.	Reinforcement Learning II	HW 8
		Final Exam: Covering sessions 14 up to the end	

Statement on Collaboration, Academic Honesty, and Plagiarism

Please check out the Education Committee statement on course assignment ethics.