CMPE 462 Machine Learning

Spring 2020

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Textbooks:

- Learning from Data, Yaser S. Abu-Mostafa, Malik Magdon-Ismail, and Hsuan-Tien Lin, 2012. (**Primary**)
- Introduction to Machine Learning, Ethem Alpaydin, 3e, The MIT Press, 2014.
- Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006.

Course Description: An introduction to machine learning, including perceptron, linear regression, logistic regression, naive Bayes, decision tree, support vector machine, unsupervised learning, and neural networks. This class covers both the theory and the applications of machine learning.

Objectives and Learning Outcomes: The objective of this course is to provide the foundations of machine learning and its practical use. Upon successful completion of this course, students will have gained the necessary understanding on:

- introductory level optimization,
- linear supervised learning algorithms and their implementations,
- non-linear feature transformations and kernel trick,
- popular unsupervised learning algorithms and their implementations,
- introductory level neural networks as non-linear supervised learning models.

Class Participation: Class participation is a must.

Course Announcements: Announcements and course material will be shared over Moodle.

Grading:

- Midterms (2) 30%
- Mini-Projects (2) 20%
- Quiz (10) 20 %
- Final 30%

Final grades will be assigned as follows:

Absolute Percentage	**Grade**
$[100, 90]$	4.0
$(90, 80]$	3.5
$(80, 75]$	3.0
$(75, 70]$	2.5
$(70, 65]$	2.0
$(65, 60]$	1.5
$(60, 50]$	1.0
$(50, 0]$	0.0

Mini-Projects: Mini-projects will include both programming and theoretical questions. These will not be group projects. They will be done individually. No handwritten or scanned reports will be accepted. A zip file including code and pdf report should be uploaded to Moodle.

Quiz: There will be regular quizzes in the first or last 15 minutes of the class. Students should always be prepared since date and time of the quiz will not be announced beforehand. If a student isn't present in the classroom that day, he/she will get zero for that day's quiz.

Tentative Class Schedule:

Week	Date	Topic
1	February 10	Introduction
1	February 11	Linear Algebra Review
2	February 17	Perceptron Learning I
2	February 18	Perceptron Learning II + code
3	February 24	Probability Review
3	February 25	Linear Regression I
4	March 2	Linear Regression II
4	March 3	Linear Regression Implementation
5	March 9	Logistic Regression I
5	March 10	Logistic Regression II
6	March 16	Midterm I
6	March 17	Naive Bayes
7	March 23	Naive Bayes in-class + Decision Tree I
7	March 24	Decision Tree II
8	March 30	Decision Tree in-class + Support Vector Machine I
8	March 31	Support Vector Machine II + Kernel Trick
9	April 6	Support Vector Machine III
9	April 7	Clustering I
10	April 13	Clustering II
10	April 14	K-means implementation
11	April 20	Spring Break
11	April 21	Spring Break
12	April 27	Midterm II
12	April 28	Dimensionality Reduction
13	May 4	Reinforcement Learning I
13	May 5	Reinforcement Learning II
14	May 11	Neural Networks I
14	May 12	Neural Networks II

Late Submission and Extensions: Late submissions will not be accepted. Projects will be submitted to Moodle before the deadline. Projects sent over email due to any excuse will not be accepted. A student may ask for only one extension throughout the semester. Extension requests should be sent to the instructor via email before the original deadline. Extension requests after the deadline will not be accepted and the grade will be 0. Late submission rule also applies to extensions. A student cannot ask for more than **3 days** of extensions starting from the original deadline.

Makeup Exams: There will not be separate makeup exams for the midterms. There will be only one makeup exam after the finals. To be able to take the final exam makeup for one of the midterms, student needs to have a valid excuse (e.g., illness, military service) with a formal proof submitted to instructor right after the actual

midterm date. The students cannot take the final makeup to increase their midterm grades. There will not be any makeup for quizzes.

Academic Integrity: Students are expected to complete all projects, quiz, and exams on their own. If any source is used to do a project, student needs to cite the reference. Cheating in homework and exams is extremely forbidden. Cheating includes copying answers from internet, a friend, or from notes in a closed-book exam. If the instructor detects any cheating in a project, the grade of the students who are involved in cheating for that project will be -100. If a student attempts to cheat during an exam, student will fail the class and will be sent to disciplinary commission.

Acknowledgement: In preparation of this course, course material of CSE 404 by Jiayu Zhou at Michigan State University and the course textbooks were used.