Information Sheet

Lecturer
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Office hours: TBA

Hourly Course Assistant
Akanksha Agnihotri
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Office hours: TBA

Time and Place:

MTWR 9:50 AM -11:30 AM.

Snell Library 111

Prerequisites:

EECE 3468/MATH 3081 or equivalent for undergraduates, EECE 7204/DS5020 or equivalent for graduate students, knowledge of linear algebra

Programming Requirement:

C/C++/Python and Matlab

Course Objectives:

(a) This course is an introductory course on machine learning covering a range of algorithms, focusing on the underlying models behind each approach, to enable students to learn where and how to apply machine learning algorithms and why they work.

(b) The course also emphasizes on the foundations to prepare students for research in machine learning.

(c) Course will provide you with a deeper knowledge about a subtopic of your choosing.

(d) You will have improved and practiced the following research skills: (1) Writing a technical paper in your chosen area. (2) Giving a technical presentation.

Reference Texts:

(1) Kevin P. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press 2012.

(2) R. O. Duda, P. E. Hart, D. Stork, *Pattern Classification*, Second Edition, Wiley and Sons, 2001.

(3) Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer 2006.

(4) T. Hastie, R. Tibshirani, J. H. Friedman, *The Elements of Statistical Learning : Data Mining, Inference, and Prediction*, Springer, 2001.

Course Handouts:

Course notes and handouts will be posted on Canvas.

Office Hours:

You are encouraged to attend office hours (TBA)

Problem Sets:

There will be 4 problem sets. You are expected to do all the assigned problems.

Problem sets must be handed in by the end of the class in which they are due. Problem set solutions will be available at the end of the due date lecture. Consequently, it is difficult and unfair to seriously evaluate late problem sets.

All submissions must be your own work. Identical, or semi-identical assignments will not be accepted. Scholastic dishonesty (e.g., cheating, plagiarism, collusion, record falsification, etc.) on homework, quizzes and other assignments will be penalized according to NU policies and standards (`http://www.northeastern.edu/osccr/academicintegrity/`).

Course Grade:

The final grade in the course is based upon our best assessment of your understanding of the material. This assessment is based on 5 measurements: the homework assignments, and the final project. The final grade will be a weighted average, roughly according to the following rule:

Each of 4 homeworks:	20%
Final project:	20%

Main Topics:

(1) Review of Linear Algebra and Probability Theory

(2) Bayesian Decision Theory

(3) Maximum-Likelihood (ML), MAP, and Bayesian Estimation, Naive Bayes

(4) Regression, Logistic Regression

(5) Neural Networks

(6) Support Vector Machines

(7) EM Algorithm, Application to Gaussian Mixture Models

(8) Model Selection

(9) Unsupervised Learning: k-means, hierarchical clustering, spectral clustering

(10) Dimensionality Reduction (PCA, LDA)

(11) Decision Trees

(12) Combining Classifiers: Bagging and Boosting

(13) Graphical Models*