

Course Outline

CSE-475: Machine Learning

Department of Comp. Sci. & Eng., East West University

Semester	: Summer 2015
Section	: 1
Credit Title	: Machine Learning
Credit Hour	: Theory (3)
Theory Class	: Reading Course
Instructor	: Md. Shamsujjoha (MSJ)
Office	: 5 th Floor, Room 644
Office Hours	: SMTWR: 8.30-to-10.10, R: 12.30-to-04.30
E-mail	: dishacse@yahoo.com and msj@ewubd.edu

Course Description: This introductory course gives an overview of many concepts, techniques, and algorithms in machine learning, beginning with topics such as classification and linear regression and ending up with more recent topics such as boosting, support vector machines, hidden Markov models, and Bayesian networks. The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work. The underlying theme in the course is statistical inference as it provides the foundation for most of the methods covered.

Syllabus:

- ❖ Introduction to machine learning, linear classification, perceptron update rule.
- ❖ Classification, Classification errors, regularization, logistic regression
- ❖ Clustering
- ❖ Linear regression, estimator bias and variance, active learning
- ❖ Active learning (cont.), non-linear predictions, kernels
- ❖ Kernel regression, kernels
- ❖ Support vector machine (SVM) and kernels, kernel optimization
- ❖ Genetic Algorithm
- ❖ Model selection
- ❖ Model selection criteria
- ❖ Midterm
- ❖ Description length, feature selection
- ❖ Combining classifiers, boosting
- ❖ Boosting, margin, and complexity
- ❖ Margin and generalization, mixture models
- ❖ Mixtures and the expectation maximization (EM) algorithm
- ❖ EM, regularization, clustering
- ❖ Clustering
- ❖ Spectral clustering, Markov models
- ❖ Hidden Markov models (HMMs)
- ❖ HMMs (cont.)
- ❖ Bayesian networks
- ❖ Learning Bayesian networks
- ❖ Probabilistic inference
- ❖ Guest lecture on collaborative filtering
- ❖ Final
- ❖ Current problems in machine learning, wrap up

Text Book:

- ❖ Ethem Alpaydin, Introduction to Machine Learning, Second Edition

Reference Books:

- ❖ Articles from recent journals and conferences will be assigned throughout the semester. Relevant chapters from other textbooks will also be made available, as necessary.
- ❖ There are a number of useful references for this course but each covers only some part of the class material. You are responsible for the material covered in lectures (most of which will appear in lecture notes in some form), problem sets, as well as material specifically made available and indicated for this purpose. The weekly recitations/tutorials will be helpful in understanding the material and solving the homework problems.
- ❖ Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
- ❖ Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
- ❖ Hastie, T., R. Tibshirani, and J. H. Friedman. The Elements of Statistical Learning: Data Mining, Inference and Prediction. New York, NY: Springer, 2001. ISBN: 9780387952840.
- ❖ MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989. Available on-line here.
- ❖ Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.

Course Website:

- ❖ http://groups.yahoo.com/group/cse_msj
 - CSE-475

Exam Dates:

- ❖ Midterm I : 8th June 2015 (Monday).
- ❖ Midterm II : 6th July 2015 (Monday).
- ❖ Final Exam : 17th August 2015 (Monday).

Mark Distribution:

- ❖ Midterm I 25%
- ❖ Midterm II 25%
- ❖ Final Exam 30%
- ❖ Assignments 20%

Special Instructions:

- ❖ There is zero tolerance for cheating at EWU. Students caught with cheat sheets in their possession, whether used or not used, &/or copying from cheat sheets, writing on the palm of hand, back of calculators, chairs or nearby walls and copying of codes, assignments would be treated as cheating in the exam hall and/or labs. The only penalty for cheating in exam hall is expulsion from EWU. For plagiarism, the grade will be automatically become zero for that lab or assignment.
- ❖ There will be **NO make-up examinations for Quiz & Lab Exam in any case**. Make up exam can only be considered for the midterms in case of emergency, you **MUST** either inform me or the department Chair within 24 hours of the exam time. Failure to do so will mean that you are trying to take UNFAIR advantage and you will be automatically disqualified