

STA4930/5934 Applied Machine Learning

Spring 2011

Course Information

Class Meeting Place: OSB 110

Class Meeting Time: Tuesday/Thursday 9:30-10:45

Instructor: Dr. Adrian Barbu

E-mail: abarbu@stat.fsu.edu

Office: 106C OSB

Phone: 850-290-5202

Office Hours: Wednesday 3:00-5:00pm or by appointment

Textbooks: Pattern Recognition and Machine Learning by Christopher M. Bishop (publisher: Springer)

Machine Learning by Tom M. Mitchell (publisher: McGraw-Hill)

The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. H. Friedman (publisher: Springer).

All textbooks are optional since the course will not follow any particular book.

Course Objectives: This course is a practical overview of statistical methods for supervised, unsupervised and weakly supervised learning. During the course many machine learning methods will be discussed, including

- Decision Trees, Random Forests
- Naive Bayes Classifiers
- Linear and Logistic Regression
- Generative and Discriminative Learning
- Neural Networks
- Large Margin Classifiers: Support Vector Machines, Kernel Methods
- Boosting: AdaBoost, LogitBoost, Probabilistic Boosting Tree
- Efficient Inference: Marginal Space Learning
- Graphical Models, Hidden Markov Models, Conditional Random Fields
- Dimensionality Reduction: PCA, ICA, Fisher LDA
- Nonlinear Dimensionality Reduction: Kernel PCA, Multi-dimensional scaling (MDS), Isometric mapping (ISOMAP), Local linear embedding (LLE)
- Maximum Entropy models
- Using Incomplete Data: MLE and EM
- Semi-supervised Learning
- Unsupervised learning: K-means, EM, Spectral clustering
- Reinforcement Learning

For each method, examples from different fields such as Natural Language Processing, Bioinformatics, Computer Vision, and Medical Imaging will be presented. Some of the most important methods will be accompanied by small projects for a better understanding of their advantages and limitations.

Grading: There will be 8 homework projects worth 10-20 points each, depending on each project's difficulty. One of the projects is a final project of the student's choice. The students can choose which projects they want to turn in to reach 100 points.

The following scheme will be used to convert the percentage points to letter grades

- 90-100 A range, 80-89 B range, 70-79 C range, 60-69 D range, 0-59 F range.

Prerequisites: STA 3032 and knowledge of Matlab, C++ or other programming language or consent of instructor.

Course Materials

- CMU Machine Learning Class: <http://www.cs.cmu.edu/~epxing/Class/10701/>
- Tom Michell's ML book website: <http://www.cs.cmu.edu/~tom/mlbook.html>
- Nillson's ML book: <http://ai.stanford.edu/~nilsson/mlbook.html>
- Blackboard class website: go to <http://campus.fsu.edu/> and login using you ACNS username and password. Homework, datasets, grades, course notes and other course material will be posted there.

Course Policy

- **Classroom policies:** The classroom environment is an important factor for effective learning. In order to not distract other students' attention please follow these classroom policies. The first one of these is the university policy.
 - Remember that no food or drinks are allowed in the classroom.
 - Turn off all audible alarms (cell phones, pagers, calculators, watches etc.)
 - Do not use cell phones in the class.
 - Come to the class on time. Opening and closing the classroom door in the middle of a class cause distraction to the students and the teacher.
 - Do not talk to other students without permission while the professor is teaching. More than one conversation creates noise and makes it difficult for the students to pay attention to the lecture.
- **Attendance:** You are required to attend all classes. The class activities will help you assimilate the lessons more easily, giving you an opportunity for active learning. Do not let this opportunity slip away. Any foreseen absence must be cleared with the instructor. If the absence is due to emergencies, it is the student's responsibility to notify the instructor at the earliest opportunity of the emergency.
- **Homework:** There will be 8 homework projects, typically due in two weeks from the date they are announced. No late homework is allowed.

	Project	Needs Programming	Points
1	Decision Trees	No	10
2	SVM	No	10
3	Weka	No	10
4	MRF	No	15
5	HMM	Yes	20
6	Clustering	Yes	10
7	PCA	Yes	15
8	Final Project	Yes/No	10-20

The homework must be neatly written, preferably typed. Computer output should be kept to a minimum. You are encouraged to submit the project code by email. The best code will be posted on Blackboard to be available for all students attending the class.

- **Code:** It is acceptable to use code downloaded from the internet for the homework as long as a reference to the code website or the appropriate paper is added to the bibliography of the homework.
- **Collecting returned homework:** It is the student's responsibility to retrieve his or her homework whenever they are returned and to check grades on the Blackboard class page. If you notice any mistake in recording grades on the Blackboard page, please inform the instructor about it as soon as possible.
- **Homework re-grade:** You have one week to request a re-grade of a homework from the date on which the graded homework is available to the students of the class. Submit a written request detailing the nature of the grading error to the instructor along with the relevant homework.
- **Contacting the instructor outside the class:** You are strongly encouraged to come to the instructor during his office hours. If your schedule conflicts with the office hours, you can make an appointment. You may ask the instructor brief questions by e-mail, but you may be asked to come to office hours if the instructor thinks that the questions are better answered in person.

When you send e-mails remember the following:

- Always e-mail from your FSU accounts. The e-mails from non-FSU accounts may not reach me due to filters.
- Always write your full name at the end of each e-mail message you send.
- Always write the course number at the beginning of the subject line.
- **Academic honor policy:** The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at <http://dof.fsu.edu/honorpolicy.htm>.)
- **Americans with Disabilities Act:**
Students with disabilities needing academic accommodation should:
1) register with and provide documentation to the Student Disability Resource center; and
2) bring a letter to the instructor indicating the need for accommodation and what type.
This should be done during the first week of class.
This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact:

Student Disability Resource Center
874 Traditions Way
108 Student Services Building
Florida State University
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
<http://www.disabilitycenter.fsu.edu/>