

Washington State University
School of Electrical Engineering and Computer Science
Fall 2011

CptS 580 Advanced Topics in Machine Learning
Course Syllabus

Professors

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Class Lectures

Tuesday, Thursday 10:35am – 11:50am, EME 130

Class Web Page

<http://eecs.wsu.edu/~cook/ml>

Office Hours

Tuesday, Thursday 11:50am-12:30pm

Introduction

This is a seminar-style class in which we will explore challenges in machine learning research and use and will learn about advanced techniques to handle these challenges. Classes will be very discussion-oriented and all class materials will be drawn from research papers and book chapters.

The class is open to all graduate students who have completed the Machine Learning course. The class will consist of lectures as well as student-led paper presentations and discussions.

Grades

The grade distribution for the class is shown below. The actual homework assignments, with due dates, are available on the class web page..

Class participation and critiques	15%
Homework #1	10%
Homework #2	10%
Homework #3	10%
Homework #4	10%
Presentation / Discussion	20%
Class project	25%

Class participation and critiques. You are all advanced researchers, so this class will be heavily focused on class participation. To prepare for class discussion and to help the presenters lead discussions, you will be asked to submit a one-page critique of the paper that will be presented. The critique is due the class period **BEFORE** the paper will be presented. This is because the presenter will both grade your critique and incorporate your questions into the discussion. The critique should include

- A short (2-4 sentence) summary of the highlights of the paper.
- A discussion of the strengths, weaknesses, and next steps of the approach.
- A set of at least 3 questions that would be appropriate for discussion during class. These questions can focus on the paper itself or on the general topic area being addressed by the paper.

All critiques should be in text or pdf format and should be mailed to acrandal@wsu.edu AND to the student who will be leading discussion of the paper.

Homeworks. All of the homework assignments are available on the class web page. These assignments primarily allow you to experiment with a machine learning tool that applies a technique we discussed in class to a particular dataset. Homework solutions should be mailed to cook@eecs.wsu.edu and are due by 9:00am on the due date. No late submissions will be accepted.

Class Presentation. Each of you will be asked to present a paper (or a set of papers on a focused topic) and lead a class discussion on the topic. There are many topics in machine learning and only a small subset of these will be covered in lectures. Topics you may choose from include, but are not limited to, active learning, mixture models and expectation maximization, high-performance machine learning, semi-supervised learning, sparse learning, collaborative filtering, link prediction, collective inference, cost sensitive learning, and relational machine learning.

I will ask that you select you top 2 choices of presentation topics and dates and send them to cook@eecs.wsu.edu by August 25, 2011. You will need to mail the paper you are presenting to the entire class at least two class periods before your presentation to give everyone time to write a critique. If your talk will include more than one paper, just select one of them to mail to the class. Mail your presentation materials to cook@eecs.wsu.edu by 9:00am on the day that you are presenting. Because there are a large number of students in this class, each student presentation/discussion class will be shared by two students. Once I assign dates, coordinate with the other student on how to divide the time. You can present together on one topic or split the time into two topics. Please plan to present material related to the paper(s) for the first half of your time and lead a discussion on the topic for the second half.

Class Project. As part of the class, I will ask you to each complete a class project. The project should involve implementation and testing of an advanced machine learning technique that addresses a specific machine learning challenge. To ensure that the projects are complete and well evaluated, the project proposal is due fairly early in the semester. A one-paragraph project proposal should be mailed to cook@eecs.wsu.edu by 9:00am on October 25, 2011. The proposal should include a problem statement, hypothesis, and a plan for implementation and evaluation.

The second phase of the project is to complete a literature review and a *working* prototype that should be mailed to cook@eecs.wsu.edu by 9:00am on November 17, 2011. This two-page writeup should include a description of the implementation and an initial demonstration of results together with plans for enhancement and evaluation.

The last phase of the project is to provide a complete writeup of your project. The format of the writeup is similar to a conference paper and should be between 8 and 10 pages in length. The paper should be mailed in pdf format to cook@eecs.wsu.edu by 4:00pm on Wednesday, December 14, 2011. This is the date and time of the class final exam. There will be no exam, the project report will take the place of an exam.

Tentative Semester Schedule

<i>Date</i>	<i>Lecture topic</i>	<i>Assignment Due</i>
Aug 23	Introduction, ML review	
25	ML review, Orange	Selection of presentation topic/date due
30	Association rule mining, Sequence mining	
Sep 1	Dimensionality reduction	
6	Dimensionality reduction	HW #1 due
8	Feature selection	
13	Experiment design and analysis	
15	Experiment design and analysis	Critique due
20	Student-led presentation/discussion	Critique due
22	Student-led presentation/discussion	
27	Neural networks	
29	Neural networks	
Oct 4	Probabilistic graphs	HW #2 due
6	Probabilistic graphs	Critique due
11	Student-led presentation/discussion	Critique due
12	Student-led presentation/discussion	Critique due
18	Student-led presentation/discussion	
20	Clustering and SOMs	
25	Evolutionary algorithms	Critique due
27	Student-led presentation/discussion	Project proposal due, Critique due
Nov 1	Student-led presentation/discussion	Critique due
3	Student-led presentation/discussion	Critique due
8	Student-led presentation/discussion	HW #3 due
10	Trend analysis and forecasting	
15	Trend analysis and forecasting, RapidMiner	Critique due
17	Student-led presentation/discussion	Project summary due
22	Thanksgiving	
24	Thanksgiving	
29	Rare class learning, multiclass learning	HW #4 due
Dec 1	Online learning	
6	Grand challenge problems	
8	Project presentations	
14	Project report due	