COMP 562: Introduction to Machine Learning

SYLLABUS

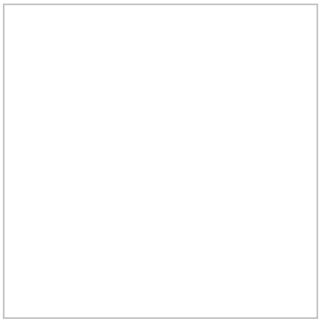
Bulletin Description

Machine learning as applied to speech recognition, tracking, collaborative filtering and recommendation systems. Classification, regression, support vector machines, hidden Markov models, principal component analysis, and deep learning.

General Course Info

Term: Fall 2018
Department: COMP
Course Number: 562
Section Number: 001
Time: MW 11:15-12:30 pm
Location: SN011
Website: https://comp562fall18.web.unc.edu/

Instructor Info



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Office hours: WF 12:30-1:30



Textbook and Resources

Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, 1st Edition (August 24, 2012), ISBN 9780262018029

The course website will be the primary means for distributing information including lecture notes and assignments. The material will be uploaded to Sakai as well and will be also used for reporting scores. We will use Piazza for questions and announcements. You will need to sign up for Piazza and monitor it regularly.

Course Description

This course provides a broad introduction to modern machine learning. Machine learning uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science in getting computers to make predictions or decisions without being explicitly programmed. Machine learning as a field is now incredibly pervasive, with applications spanning from energy management in intelligent buildings to autonomous navigation, and from analyzing medical data to book recommendation systems, etc. This course will cover casting such problems in a supervised (generative/discriminative learning, parametric/non-parametric learning, neural networks) or unsupervised (clustering, dimensionality reduction, kernel methods) learning frameworks. This course aims at the middle of the theoretical versus practical spectrum. We will learn the concepts behind several machine learning algorithms without going deeply into the mathematics and gain practical experience applying them. The course will consist of a combination of lectures, assignments, a midterm exam, and a final project.

Target Audience

This course is intended to be an introduction to machine learning and is therefore suitable for all undergraduate students who are comfortable with basic math (linear algebra and basic probability) and ready to endeavor into creating and programming machine learning algorithms (basic programming skills in either Python or MATLAB).

Prerequisite

COMP 410, MATH 233, STOR 435, or permission of instructor.

Credits

3 credits: the course has classroom lectures.

Goals and Key Learning Objectives

Develop an understanding of basic machine learning algorithms, their efficient implementations and their applicability to different tasks. Gain experience in implementing the algorithms and checking their correctness. Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Course Requirements

There will be written assignments that contain questions based on the material covered in the lectures. Some assignments may contain questions from the required textbook. Once posted, assignments will typically be due in 1 or 2 weeks as specified in the assignment document. There will be 4 assignments during the semester. In addition, each student will also do a course project as part of a team. There will also be a midterm and final exams.

Course Schedule

An initial schedule for this class is listed below; however, changes to this schedule is might occur depending on the progress achieved. All readings are in the Murphy textbook unless otherwise noted.

Week	Topics Covered	Readings	Key Dates
1			
	Introduction to the Course	Ch1	Classes Start
2	Probability Review	Ch2	
	Linear Regression – Part 1	Ch7	

3			Labor Day
	Linear Regression – Part 2	Ch7	
4	Logistic Regression – Part 1	Ch8	Project Groups Due
	Logistic Regression – Part 2	Ch8	Ass 1 Posted
5	Logistic Regression – Part 3	Ch8	
	Naïve Bayes + Model Evaluation	Ch3	
6	Bayesian Networks – Part 1	Ch10	Ass 1 Due
	Bayesian Networks – Part 2	Ch10	
7	Mixture Models – Part 1	Ch11	Ass 2 Posted
	Mixture Models – Part 2	Ch11	Project Proposals Due
8	Latent Linear Models – Part 1	Ch12	
	Mid-Term Review		Ass 2 Due
9	Mid-Term		Mid-Term
	Latent Linear Models – Part 2	Ch12	
10	Latent Linear Models – Part 3	Ch12	
	Sparse Linear Models – Part 1	Ch13	Ass 3 Posted
11	Sparse Linear Models – Part 2	Ch13	
	Sparse Linear Models – Part 3	Ch13	
12	Kernels Methods – Part 1	Ch14	Ass 3 Due
	Kernels Methods – Part 2	Ch14	
13	Deep Learning – Part 1	Ch16	Project Progress Report Due
	Deep Learning – Part 2	Ch16	

14			Thanksgiving
	Deep Learning – Part 3	Ch28	Ass 4 Posted
15	Deep Learning – Part 4	Ch28	
	Deep Learning – Part 5	Ch28	Ass 4 Due
16	Final Review		
	Final Projects Poster Session		Final Project Report Due

Note : The final exam will be as per the registrar's calendar (Dec 11 at 12 PM).

Grading Criteria

The final grade will be based on the following:

Homework: Maximum of 35% (4 assignments each 10%)
Midterm Exam: 20%
Final Exam: 30%
Final Project: 15%

The project grade will be broken down further in the Project Description.

The course final is given in compliance with UNC final exam regulations and according to the UNC Final Exam calendar.

All graded work will receive a percentage grade between 0% and 100%. Here are how the percentage grades will map to final letter grades; percentages are not rounded:

Percentage	Letter grade	Percentage	Letter grade
93% <=	A	73% <=	C
90% <=	A-	70% <=	C-
87% <=	B+	67% <=	D+
83% <=	B	60% <=	D
80% <=	B-	< 60%	F
77% <=	C+		

The instructor reserves the right to adjust the percentage ranges for each letter grade upward in your favor.

Attendance and Participation

Students are expected to attend lectures and participate in class discussions of algorithm implementation, performance, and suitability to different machine learning problems. Some of the discussions will draw on material in homework problems. Participation on Piazza discussion board by posting questions and answers is also encouraged.

Course Policies

Late submissions of assignments will be accepted with a late penalty.

Homework Late Policy: Homework assignments must be submitted in class on the day they are due. Work that is submitted after the end of that class and up to one class late will be assessed a 25% late penalty. After then, work submitted by the beginning of the second class after it was due will be assessed a 50% late penalty. Work submitted later than that will not be graded.

Exams and are closed-book unless otherwise stated.

Honor Code

You are allowed to (actually, encouraged to) discuss basic concepts as well as assigned tasks with other students. However, you are required to write the solutions and code assignments individually: i.e., what you hand in must be your own work. The instructor reserves the right to allow teaming on assignments and final projects; in that case, what you hand in must be that team's work. Also, you cannot use solutions from previous offerings of the course. Not following these rules is a violation of the honor code.

Disclaimer

The professor reserves to right to make changes to the syllabus, including due dates. These changes will be announced as early as possible.