CS229

Syllabus and Course Schedule

Time and Location: Monday, Wednesday 9:30am-10:50am, NVIDIA Auditorium
Class Videos: Current quarter's class videos are available here for SCPD students and here for non-SCPD students.
Note: This is being updated for Spring 2020. Please check back soon.

Event	Date	Description	Materials and Assignments
Lecture 1	9/23	Introduction and Basic Concepts	
Lecture 2	9/25	Supervised Learning Setup. Linear Regression.	**Class Notes** • Supervised Learning, Discriminative Algorithms [pdf]
Assignment	9/26	**Problem Set 0**. Due Wednesday, Oct 2 at 11:59pm	
Section 1	9/28	**Friday Lecture**: Linear Algebra.	**Notes** • Linear Algebra Review and Reference [pdf] • Linear Algebra, Multivariable Calculus, and Modern Applications (Stanford Math 51 course text) [pdf]
Lecture 3	9/30	Weighted Least Squares. Logistic Regression. Netwon's Method Perceptron. Exponential Family. Generalized Linear Models.	**Class Notes** • Generative Algorithms [pdf]
Lecture 4	10/2		
Assignment	10/2	**Problem Set 1**. Due Wednesday, Oct 16 at 11:59pm	

Event	Date	Description	Materials and Assignments
Section 2	10/4	**Friday Lecture**: Probability	**Notes** • Probability Theory Review [pdf] • The Multivariate Gaussian Distribution [pdf] • More on Gaussian Distribution [pdf]
Lecture 5	10/7	Gaussian Discriminant Analysis. Naive Bayes.	
Lecture 6	10/9	Laplace Smoothing. Support Vector Machines.	**Class Notes** • Support Vector Machines [pdf]
Section 3	10/11	**Friday Lecture**: Python and Numpy	**Notes** • Python Tutorial [pptx] [code]
Lecture 7	10/14	Support Vector Machines. Kernels.	
Lecture 8	10/16	Neural Networks - 1	**Class Notes** • Deep Learning [pdf] • Backpropagation [pdf]
Assignment	10/16	**Problem Set 2**. Due Wednesday, Oct 30 at 11:59pm	
Section 4	10/18	**Friday Lecture**: Evaluation Metrics	**Notes** • Evaluation Metrics [pdf]
Project	10/18	**Project proposal** due 10/18 at 11:59pm.	
Lecture 9	10/21	Neural Networks - 2	
Lecture 10	10/23	Bias - Variance. Regularization. Feature / Model selection.	**Class Notes** • Regularization and Model Selection [pdf]

Event	Date	Description	Materials and Assignments
Section 5	10/25	**Friday Lecture**: Deep Learning	**Notes** • Deep Learning [pdf]
Lecture 11	10/28	Practical Advice for ML projects.	**Class Notes** • ML Advice [pdf]
Assignment	10/30	**Problem Set 3**. Due Wednesday, Nov 13 at 11:59pm	
Lecture 12	10/30	K-Means. GMM (non EM). Expectation Maximization.	**Class Notes** • Unsupervised Learning, k-means clustering. [pdf] • Mixture of Gaussians [pdf] • The EM Algorithm [pdf]
Section 6	11/1	**Friday Lecture**: Midterm Review	**Class Notes** • Midterm review [pdf]
Lecture 13	11/4	Expectation Maximization. Factor Analysis.	**Class Notes** • Factor Analysis [pdf]
Midterm	11/5	The midterm details are posted on Piazza.	
Lecture 14	11/6	Principal and Independent Component Analysis.	**Class Notes** • Principal Components Analysis [pdf] • Independent Component Analysis [pdf]
Section 7	11/8	**Friday Lecture**: Decision Trees. Boosting. Bagging.	**Class Notes** • Decision trees [pdf] • Decision tree ipython demo [ipynb] • Boosting algorithms and weak learning [pdf]

Event	Date	Description	Materials and Assignments
Lecture 15	11/11	Weak Supervision	**Class Notes** • Weak Supervision [slides pdf] • Weak Supervision [notes pdf]
Lecture 16	11/13		
Assignment	11/13	**Problem Set 4. Due Wednesday, Dec 4 at 11:59pm**	
Section 8	11/15	**Friday Lecture**: On critiques of Machine Learning	**Class Notes** • On critiques of ML [slides]
Project	11/15	**Project milestones** due 11/15 at 11:59pm.	
Lecture 17	11/18	Value Iteration and Policy Iteration	**Class Notes** • Reinforcement Learning and Control [pdf]
Lecture 18	11/20	Bias and Variance	**Class Notes** • Bias / Variance [pdf]
Lecture 19	12/2	Learning Theory	**Class Notes** • Learning Theory [pdf]
Lecture 20	12/4	Course wrap-up. Beyond CS229 Guest Lectures! Details [link]	
Project	12/11	**Poster submission** deadline, due 12/11 at 11:59pm (no late days).	
Project	12/12	**Poster presentations** from 8:30-11:30am. Venue and details to be announced.	
Project	12/13	**Project final report** due 12/13 at 11:59pm (no late days).	

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Supplementary Notes

1. Online Learning and the Perceptron Algorithm [pdf]
2. Binary classification with +/-1 labels [pdf]
3. The representer theorem [pdf]
4. Hoeffding's inequality [pdf]

Other Resources

1. Advice on applying machine learning: Slides from Andrew's lecture on getting machine learning algorithms to work in practice can be found here.
2. Previous projects: A list of last year's final projects can be found here.
3. Data: Here is the UCI Machine learning repository, which contains a large collection of standard datasets for testing learning algorithms. If you want to see examples of recent work in machine learning, start by taking a look at the conferences NIPS(all old NIPS papers are online) and ICML. Some other related conferences include UAI, AAAI, IJCAI.
4. Viewing PostScript and PDF files: Depending on the computer you are using, you may be able to download a PostScript viewer or PDF viewer for it if you don't already have one.
5. Machine learning study guides tailored to CS 229 by Afshine Amidi and Shervine Amidi.