CMPS 242 Syllabus, Fall 2016

Instructor: S V N Vishwanathan

Webpage: https://users.soe.ucsc.edu/~vishy/fall2016

This is a tentative syllabus. Additional topics may be added and/or some topics may be skipped as the quarter progresses.

Textbook: Pattern Recognition and Machine Learning by Christopher Bishop.

Pre-Requisites: Solid background in probability, linear algebra, and analysis of algorithms. Fluency in Python.

Planned Topics:

1. Introduction and overview of machine learning and key concepts (ch 1), including probability, decision theory, and generative models/discriminative models/discriminants.
2. Bayesian learning and parameter estimation (ch 2)
3. Instance based learning (nearest neighbor) (ch 2.5)
4. Linear Regression (ch 3)
5. Linear classification and the Perceptron algorithm (ch 4)
6. Batch learning: Decision Trees (ch 14.4) and Artificial Neural Networks (ch 5)
7. Graphical Models (ch 8)
8. Kernels and Support vector machines (ch 6-7)
9. Clustering, EM Algorithm and K-means (ch 9)
10. Boosting (AdaBoost) (ch 14.3)
11. On-line learning
12. Deep neural networks (if time permits)

Evaluation:

- 4 homework assignments x 10 pts
- project x 20 pts
- midterm x 20 pts
- finals x 20 pts

There are many additional sources of information, including:

- *The Elements of Statistical Learning* by Hastie, Tibshirani, Friedman (research standard, available on-line for free)
- *Pattern Classification* by Duda, Hart and Stork, or the earlier *Pattern Classification and Scene Analysis* by Duda and Hart
- *Machine Learning* by Mitchell (a much older standard)
- *Introduction to Machine Learning* by Alpaydin (more elementary)
- *Machine Learning, an Algorithmic Perspective* by Marsland (more elementary)
- *Machine Learning a probabilistic perspective* by Murphy

---

1 Adapted from David Helmbold’s syllabus for the Fall 2015 offering of the same class
• *Artificial Intelligence A Modern Approach* by Russell and Norvig has some very pertinent chapters

Many other recent books.

**Other Points:**

• See and make yourself aware of the other course policies from the course home page.

• Students are responsible for their own understanding. If anything is unclear, ask questions in lecture, sections, office hours, or the class forum.

• Students should check Piazza regularly (daily or at least every other day) for announcements and clarifications.

• Both lectures and the TA led discussion sessions are important. It is important to keep up with the reading, and reading ahead is often helpful. Lectures are mandatory, and students are responsible for the material covered there.

• Due dates are firm, and it is each student’s responsibility to manage their time and complete the assignments on time. Students should read and think about the assignments the day they are assigned so they can ask questions and get the help they need well before the due date. No late submissions will be accepted.

• Written homework assignments will be done in groups of 2 and each group should turn in a single set of solutions with the member’s names and email accounts. Individual submissions are accepted by they will incur a penalty of two points (this is waived for the first homework). Use Piazza to find partners if you don’t already have one. All members of the group must attempt each problem and fully understand the group’s solution. It is inappropriate to simply split up the assigned problems among the group members. **All help from outside the group (including from the web, books other than text, or people other than the TA or instructor) must be clearly acknowledged.** Presenting other’s work as your own is dishonest and is called plagiarism. If a group is not functioning well, inform the TA or instructor early.

• Academic Honesty violations, such as submitting the un-attributed work of others, are serious issues and will result in a zero on the assignment, a lowered grade in the course, and a report to the department, and Dean of Graduate Studies. Improperly borrowed work can be as large as an entire solution or as small as a single sentence, figure, or idea. See also [http://www.ucsc.edu/academics/academic_integrity](http://www.ucsc.edu/academics/academic_integrity)

• If you qualify for classroom accommodations because of a disability, please get an accommodation Authorization from the Disability Resource Center (DRC) and submit it to the instructor within the first two weeks of the quarter. Contact DRC by phone at 831-459-2089, or see [http://drc.ucsc.edu](http://drc.ucsc.edu) for more information.

• If you need accommodation due to conflicts, family emergencies, illness/injury, or other difficulties, inform the instructor as soon as possible. An “incomplete” in the course is usually only be given if there is a medical, family, or similar emergency that prevents a student who has been doing clearly passing work from finishing the course.