CMPS 242 Course Information
David Helmbold, Fall, 2003

Welcome to CMPS 242, Machine Learning. The course meets Tu-Th 2-3:45 in Soc Sci II, room 165 (new location). My office is 319 Applied Sciences, and my E-mail address is dph@cse.ucsc.edu.

Description: This course is an introduction to the design and analysis of machine learning algorithms, and covers learning models from the fields of statistical decision theory and pattern recognition, artificial intelligence, and theoretical computer science. Topics include maximum likelihood and Bayes estimation, classification learning and the Probably Approximately Correct (PAC) learning framework, regression and neural networks, density estimation and other kinds of unsupervised learning, reinforcement learning and learning from queries.

Prerequisites: Knowledge of multivariate calculus, probability, and analysis of algorithms. Knowledge of analysis of algorithms should be at or above the level of CMP201. Knowledge of probability should be at least at the senior undergraduate math course level. You should know about discrete probability spaces and counting, conditional probabilities, Bayes' theorem, independence, random variables, expectation, and variance. It should be possible to make up this background during the course, a possible book to review these areas would be S. Ross, A First Course in Probability, McMillan, 1984, but there are many others.

Evaluation: Students will be evaluated based on a term project or paper (50%), periodic homework (20%), and midterm exam (30%). The project is due on the last day of classes, Friday December 5th. A one page project proposal is due Thursday October 23, and a midterm progress report will be due Thursday November 13, the (tentative) day of the midterm.

Most projects for CIS242 come in one of three forms:

1. Code up and evaluate/test/experiment with a learning algorithm, often on a new learning problem, but may validate previously published work.
2. Establish a new analytical performance bound for a learning algorithm, or
3. Write a critical review of current research in one area of Machine Learning.

Options 2 and 3 involve writing a paper that is at least of the quality of a short (10-15 pages) technical report, with papers for option 2 often being shorter than those for option 3. Option 1 involves mostly coding and experimenting, although programs must be accompanied by a brief (2-3 page) user guide describing what the software is and how it is used, and a (6-8 page) summary and analysis of the experimental results. Note that option 2 is considerably “riskier” than the others, but can often be migrated into one of the other options. Although I expect most projects will be individual, I am willing to consider group project proposals. Ideally, I will learn something from each of the projects.

Texts: The primary text for the course is Machine Learning by Tom Mitchell, it will be supplemented with additional (more advanced) material.