E0 370 Statistical Learning Theory **Aug 9, 2011**

Course Information

Lecturer: Shivani Agarwal

Instructor: Dr. Shivani Agarwal (`shivani@csa.iisc.ernet.in`)

Timings/Venue: Tu-Th 11:30am–1:00pm, CSA 252 (Multimedia Classroom)

Office Hours: Tue 2-3pm, CSA 201 (check course webpage for changes/cancellations)

Course Webpage: `http://www.csa.iisc.ernet.in/~shivani/Teaching/E0370/Aug-2011/`

Course Topics: Topics currently planned to be covered include the following (not all topics may eventually be covered, and they will not necessarily be covered in the order below):

- probabilistic and game-theoretic settings of machine learning
- generalization error bounds (uniform convergence, margin analysis, algorithmic stability analysis)
- complexity measures in learning (VC-dimension, covering numbers, Rademacher averages)
- PAC learning
- statistical consistency
- kernel methods (support vector machines)
- ensemble methods (boosting)
- online learning algorithms and regret bounds
- possibly some additional topics of current interest

References: The course will not follow any single textbook; lecture notes will be made available online and pointers to relevant literature will be provided. In addition, the following references may be useful as supplementary material:

- L. Devroye, L. Gyorfi, and G. Lugosi, *A Probabilistic Theory of Pattern Recognition*. Springer, 1996.
- M. Anthony and P.L. Bartlett, *Neural Network Learning: Theoretical Foundations*. Cambridge University Press, 1999.
- V.N. Vapnik, *Statistical Learning*. Wiley-Interscience, 1998.

Prerequisites: A strong foundation in probability and statistics, and (ideally) some previous exposure to machine learning. Some background in linear algebra and optimization will be helpful.

Grading: Machine learning and statistical learning theory are active areas of research, and part of the goal of this class is to equip you to appreciate some of the research literature in the field and apply the techniques learned to new problems. As such, the course will include some reading assignments, which will involve reading a paper that supplements some of the material taught in the class and writing an expository note (4-6 pages) on the main techniques/results of the paper. The later part of the course will also include project work (in teams of 2-3), which will involve some literature survey and possibly investigation of a research-level question related to a topic/problem to be suggested by the instructor. Some part of the grade will be based on participation, which will include class attendance and discussion, and may include scribing a lecture and/or participating in a grading lab. The rough break-up will be as follows:

2 reading assignments:	40% (20% each)
participation:	20%
project:	40%