Topics in Machine Learning (CS-729)

Instructor: Saketh

1 Scope and Syllabus

This is a specialized course on machine learning that introduces the students to statistical learning theory and focusses on kernel methods. The syllabus is as follows[1]:

I. Background

- Introduction to Statistical Learning Theory and Support Vector Machines (30%)
- Introduction to Kernel Methods (30%)

II. Advanced Topics

Learning theory, Formalization and Algorithms for:

- Learning with Structured-Data (40%)

Basic background in the following subjects will be assumed: Linear Algebra, Probability Theory, Optimization Theory and Machine Learning.

The following books may be referred to during this course: [1, 2, 3, 4, 5, 6, 7].

2 Evaluation Scheme

The grades (relative grading) will be decided based on the overall marks obtained in:

S.No.	Exam	Weightage	Date
1.	End-Semester	35%	As per TT
2.	Mid-Semester	35%	As per TT
2.	Projects	30%	One each around mid and end sems

[1] Numbers in brackets *roughly* indicate the number of lectures spent on the corresponding topic

Practice problems will be given and they do not carry direct credit. However 30% of overall marks in exams may come from these practice problems.

3 Contact

The course page is at `http://www.cse.iitb.ac.in/saketh/teaching/cs729.html`. Office hours for the course are "ANYTIME". The instructor can also be contacted via phone: x7903 or email: saketh at cse anytime.

References

[1] M. Mohri, A. Rostamizadeh, and A. Talwalkar. *Foundations of Machine Learning*. MIT Press, 1 edition, 2012.

[2] Relevant papers (will be announced in class).

[3] Bernhard Schölkopf and Alex Smola. *Learning with Kernels*. MIT press, Cambridge, 2002.

[4] John Shawe-Taylor and Nello Cristianini. *An Introduction to Support Vector Machines and other Kernel-based Learning Methods*. Cambridge University Press, 2000.

[5] O. Chapelle, B. Scholkopf, and A. Zien. *Semi-Supervised Learning*. The MIT Press, 2006.

[6] G. Bakir, T. Hofmann, B. Scholkopf, A. J. Smola, B. Taskar, and S. V. N. Vishwanathan. *Predicting Structured Data*. The MIT Press, 2007.

[7] J. Q. Candela, M. Sugiyama, A. Schwaighofer, and N. D. Lawrence. *Dataset Shift in Machine Learning*. The MIT Press, 2009.