Course Outline for Spring 2014, Statistics 210b:
Theoretical Statistics

University of California, Berkeley

January 21, 2014

• **Instructor:** Aditya Guntuboyina. Email: aditya@stat.berkeley.edu and Website: www.stat.berkeley.edu/~aditya.

• **Lectures:** 3:30 pm to 5 pm on Tuesdays and Thursdays 334 Evans Hall.

• **Office Hours:** After class.

• **GSI:** Siqi Wu. Email: siqi@stat.berkeley.edu

• **GSI Office Hours:** to be announced.

**Tentative List of Topics:** This class is supposed to be an introduction to modern theoretical statistics; *modern* as opposed to the classical finite dimensional theory covered in STAT 210a. I will focus on techniques based on empirical process theory and concentration inequalities. The main applications we will focus on are M-estimation and empirical risk minimization. Below is a tentative list of topics along with the main references. Topics will be added to or subtracted from the following list depending on time constraints:

1. Some aspects of Empirical Process Theory: (Text: Pollard’s *Convergence of Stochastic Processes*)
   
   (a) Uniform Laws of Large Numbers.

   (b) Convergence in Distribution.

   (c) Uniform Central Limit Theorems.

2. Applications of Empirical Processes to the theory of M-estimators and Z-estimators (Text: Chapters 3.1 to 3.4 of Van der Vaart and Wellner’s *Weak convergence and Empirical Processes*).

**Prerequisite:** Statistics 210A and a graduate level probability course; a good understanding of various notions of stochastic convergence.

**Evaluation:** Evaluation will be based on homework and a final exam. Homeworks will be posted on bspace or my website (roughly once every two weeks) and will be due after about a week.