Course Outline for Fall 2013, Statistics 151: Linear Modelling - Theory and Applications

University of California, Berkeley

September 17, 2013

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

- **Lectures**: 5 pm to 6:30 pm on Tuesdays and Thursdays at 3106 Etcheverry Hall.

- **Office Hours**: 1 pm to 2 pm on Tuesdays and Thursdays at 423 Evans Hall.

- **GSI**: Derek Bean. Email: dbean85@berkeley.edu

- **GSI Lab Section**: 9 am to 11 am OR 2 pm to 4 pm on Mondays at 334 Evans Hall (the first section will be on 9 September because of the Labor Day Holiday).

- **GSI Office Hours**: TBA (on Mondays and Wednesdays).

**Short Description**: Linear modelling is the most important tool to solve regression problems where the focus is on understanding the relationship between a response variable and a bunch of explanatory variables. These problems arise in a very diverse set of applications. In addition to being practically invaluable, linear models also have a rich and beautiful mathematical theory. The goal of this class is to understand this theory and to learn how to do applied regression analysis via linear models.

**Tentative List of Topics**: The linear model, Estimation, Inference, Diagnostics, Applications to ANOVA models, Variable Selection, Generalized Linear Models.

**Prerequisite**: Atleast one previous statistics class is necessary. This class will be heavy on linear algebra. I will review the basic concepts from linear algebra when they will be used but prior experience is necessary. Also required are basic calculus and elementary probability.

**Text**: There is no required textbook. I recommend *Plane Answers to Complex Questions* by Christensen for the first part of the course on the Linear Model. This book, which is available for free via the library website, covers the theory aspects very well; but it is a little dry. There are plenty of good applied books on linear models (e.g., *Applied Regression Models and Generalized Linear Models* by John Fox) and you are encouraged to consult them.

For the second part of the course on Generalized Linear Models, I recommend *Generalized Linear Models* by MuCullagh and Nelder.

**Lecture Notes and R code**: I usually prepare slides or typed notes for each lecture. I also show data analysis examples on R in class. I will post both the lecture notes and R code on either my website or on bspace after each lecture.

**Homework assignments**: These will involve a mix of theoretical (pen and paper) and computer exercises. I will post them on the class bSpace page or on my website (roughly once every two weeks) on a
Tuesday and will be due at the beginning of the Monday section the week after. Late assignments will not be accepted.

**Exams:** There will be three exams in all: two midterms and one Final. Midterm 1 will be an in-class exam on October 8 and Midterm 2 will be either an in-class exam or a take home exam (if in-class, it will be on November 7). The Final is on December 19.

**Assessment:** Your final grade will be a weighted average of our homework (30%), Midterm (35% = 20% of the midterm you do well in + 15% of the other midterm) and the final (35%).

**Grade Complaints:** If you have a complaint against an assigned homework or exam grade and want to talk to me about it, first send me a written request through email explaining your case clearly.

**Collaboration, Independence and Cheating on Homeworks:** Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one's own independent work. Copying homework solutions, in whole or in part, from other students in the class constitutes cheating. Any student found to be cheating on homeworks risks automatically failing the class and being referred to the University Center of Student Conduct.

**Cheating in Exams:** Anyone caught cheating on an exam in this course will receive a failing grade in the course and will also be reported to the University Center for Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during exams.

**Honor Code:** The student community at UC Berkeley has adopted the following Honor Code: *As a member of the UC Berkeley Community, I act with honesty, integrity, and respect for others.* The hope and expectation is that you will adhere to this code.

**Students with disabilities:** If you need accommodations for any physical, psychological, or learning disability, please get in touch with me so that we can make the necessary arrangements.