Course: Statistics 620

Course Web Site: `http://www.stat.ohio-state.edu/~tjs/620/`

Credit Hours: 4

Instructor: Professor Santner (405 Cockins Hall)

Grader: Jingyuan Yang

Prerequisites: Knowledge of multivariate calculus, basic matrix algebra

Text: G. Casella and R. Berger (1990) *Statistical Inference, 2nd Ed.* (Chaps 1–5) Wadsworth & Brooks/Cole.

Related Texts:
1. M. F. Neuts (1973) *Probability*, Allyn and Bacon.
2. V. K. Rohatgi (1976) *An Introduction to Probability Theory and Mathematical Statistics*, Wiley.
3. Bickel, Peter J. and Doksum, Kjell A. (2000) *Mathematical statistics: Basic ideas and selected topics Vol I (2nd Ed)*, Holden-Day Inc (San Francisco) [Warning: the 1977 edition got better reviews].
4. Mlodinow, Leonard (2008) *The Drunkard's Walk: How Randomness Rules Our Lives*, Penguin Books, Limited [Educational Light Reading].

Objectives: Learn basics of probability modeling, in particular distribution theory, that are for the study of statistical inference.

Grading:

Component	Points
Homework (no late homework accepted)	12.5%
Test #1 (October 20)	25%
Test #2 (November 26)	25%
Final	37.5%
Total	100%

The two tests are closed book but you may bring an 8.5×11 "cheat sheet."

The Course Goals In the broad, our goal is to learn as much probability theory as possible during the quarter. We will focus on the parts of probability theory that are essential to understanding Statistical Theory, i.e., the distribution theory of random variables–both exact and large sample theory. The course is also be the starting place to learn more about stochastic processes because these probability models form the basis for applied probability modeling and a number of important types of statistical inference such as Markov Chain Monte Carlo.

It is critical that you work problems. Most (all?) problems can be worked using several methods. It can be very instructive to discover how many ways you can work each exercise! I will assign a selection of problems each week; try as many others as you can. For those students who will be taking the Statistics Qualifier I Exam, I will also point some additional problems that you may want to work in preparing for this exam.

The lectures will cover the key and subtle points of the course material; I assume that you are reading the book and I will *not* attempt to cover every detail of every section. However, you are responsible for the text material in addition to that covered in the lectures. *If you are having difficulty keeping up or just have questions, please come and see me–I am always happy to answer questions. I will be around during office hours and many other times besides.*

Outline

I. Introduction

- Foundations (1.1-1.3)
- Random Variables (1.4)
- Specifying the Distributions of Random Variables (1.5-1.6)

II. Transformations of Random Variables (2.1)

III. Expectation (2.2-2.3)

IV. Important Families of Distributions (3.1-3.2)

V. Exponential Families (3.3)

VI. Joint Distributions (4.1-4.6)

VII. Random Samples (5.1)

VIII. Distributions of Functions of a Random Sample (5.2,5.4,5.5)

IX. Convergence Concepts [aka Large Sample Theory, to contrast it with the small sample theory of (I)–(VIII)] (5.3)