STA607: THEORY OF STATISTICAL INFERENCE II
Part 1: Classical Inference

Instructor

Dr. Simon Bonner

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Office hours: Monday 2:00-5:00 or by appointment

Lectures

Times: September 3 to October 17
Monday 1:00-1:50
Wednesday 1:00-2:30
Friday 1:00-1:50

Place: MDS 337

Web-Site

I will maintain a web-site for the course on Blackboard where I will post slides for the lectures, assignments, and exercises, along with any extra reading material. I will do my best to have slides for each lecture posted by 9:00am on the day of class. Please let me know as soon as possible if you have any troubles accessing the Blackboard site.

Materials

The required text for the first half or the course is:

Casella, G. and Berger, R. L. (2002) *Statistical Inference.* 2nd Edition, Duxbury Press.

I expect you to have a copy of this text available.

I will also make use of two other texts for some of the course material:

Keener, R. (2010) *Theoretical Statistics: Topics for a Core Course.* Springer.

Knight, K. (2000) *Mathematical Statistics.* Chapman & Hall/CRC.

Necessary readings from these texts will be made available on Blackboard.

Assessment

1. Coursework (15% of final grade):
   Your coursework grade for the first half of the course will be based on three components.
   i) Daily questions (5%):
   Each day I will assign one homework question to be submitted at the start of the next class. These questions will test your immediate understanding of the material covered in class and will be graded on a pass/fail basis.

   ii) Assignments (5%):
   I will assign four or five longer sets of problems at the end of the different sections of the course. The questions on these assignments will test your deeper understanding of the material and your ability to apply the concepts learned to new problems.

   iii) Presentations (5%):
   Each of you will work with a partner to present one of the theorems covered in class. The list of who will cover which theorem (chosen at random) and the expected days you will present is included in the course schedule on the next page. Proofs for all of these theorems are included in the texts, but presenting the theorem means more than simply copying its statement and the proof from the text to the whiteboard. First, you will need to give a brief statement of the importance of the theorem and how it fits with the rest of the class material. You will then need to explain the proof showing how the steps given follow from one another and filling in any gaps as you go. You will be responsible for learning the necessary material and I expect you to give a practice presentation for me at least one day before you are scheduled to present.

   Your mark on the presentation will be assigned according to the following criteria:
   - Provides context for the theorem and explains its importance (1%).
   - Presents proof in a clear, concise, and logical manner (1%).
   - Demonstrates a clear understanding of the material (1%).
   - Listens actively during presentations by other students (2%).

2. Midterm exam (20% of final grade):
   The two-hour in-class midterm examination will be held on October 15. This exam will cover all of the material discussed in the first four sections of the course (Point Estimation, Hypothesis Testing, Interval Estimation, and Large Sample Theory).

3. Final exam (50% of final grade):
   The final exam for the course will be held on Monday, December 12 at 1:00pm. The final exam will be cumulative and will cover material from both the first half of the course (classical inference) and from the second half of the course (Bayesian inference).

Schedule

		Topics	Theorems
1. Point Estimation Sept 3--12	W	- Rao-Blackwell Theorem - Uniqueness of UMVUEs	CB 7.3.17 (Embree, Tong) CB 7.3.19 (Berugoda, Li)
	F	- Complete Statistics - Completeness and UMVUEs	CB 7.3.20 (Ellis, Koebcke) CB 7.3.23 CB 6.2.25
	M	- Ancillary Statistics - Basu's Theorem	CB 6.2.24 (Anthony, Huang)
	W	Exercises	
2. Hypothesis Testing Sept 14--24	F	- Introduction - Randomized tests	
	M	- Neyman-Pearson Lemma	Keener 12.2 Keener 12.3 (Fu, Zhang)
	W	- Monotone likelihood ratio - UMP Tests for Families with MLR	Keener 12.9 (Polewan, Xie)
	F	- Unbiased Tests - UMP Unbiased Tests for Exp. Fam.	Keener 12.26
	M	Exercises	
3. Interval Estimation Sept 26-- Oct 3	W	- Introduction - Shortest intervals for unimodal PDFs - Inversion of test statistics	CB 9.3.1 (Duan, Qi) CB 9.2.2 (Ness, Yang)
	F	- UMP Tests and UMA Intervals	CB 9.3.5 (Wang, Wang)
	M	- False Coverage and Interval Length	CB 9.3.9 (Perry, Augustine)
	W	Exercises	
4. Large Sample Theory Oct 5--12	F	- Scales of magnitude - Consistency	CB 10.1.3
	M	- Asymptotic normality - Asymptotic efficiency - Asymptotic relative efficiency	
	W	- Asymptotic distribution of MLEs - Asymptotic distribution of LRTs	CB 10.1.6 CB 10.1.12 CB 10.3.1
	F	Exercises	
5. Extensions Oct 15—19	M	Robustness and M-Estimators	
	W	Midterm Exam	
	F	Sequential Hypothesis Tests	