| **ISyE 6412A** | **Theoretical Statistics** | **Fall 2019** |

Instructor:	**Dr. Yajun Mei**, Groseclose 343. ~~Email (y███████████████weu); Phone: 4-1-██~~
Class Meets:	TR 8:00-9:15am in Groseclose 119. See Canvas for class homepage
Office Hours:	After the classes, i.e., TR 9:15-9:45am in Groseclose 343.
Textbook:	Recommended: *"Statistical Inference,"* by George Casella and Roger L. Berger; Duxbury Press, Second Edition. ISBN: 0-534-24312-6. Additional notes on Statistical Decision Theory will be provided. All lecture notes will also be posted at Canvas.
Pre-requisites:	ISYE 2027 & 2028 (or equivalent); Solid math skills (especially calculus). The students' *probability* backgrounds are expected to be at the level of Ch. 1-5 of the textbook.
Homeworks:	Weekly Homeworks will be assigned, and **due back at Canvas** after one week (we will use Canvas extensively to save trees). Active, live collaboration/discussion is allowed and encouraged on the homework, but **each student must write down the solution in her or his own individual way** and there should be no two identical solutions to any problem. In particular, **do not consult the solution sets from classmates, previous years or online** when working this year's problems. Late homework might be accepted with 50% penalty within 72 hours of the deadline (and no penalty if you have a valid reason, i.e., a note from the Dean's Office). No homework is accepted after 72 hours of the deadline.
Exams:	All exams are closed book. Students are allowed to bring **two (2)** cheat sheets during **Midterm I**, **four (4)** cheat sheets during **Midterm II**, and **six (6)** cheat sheets during the final exam (both sides are fine). The two midterm exams will be seventy-five (75) minutes (during 8:00-9:15am), and the final exam will be longer (during 8:00-10:50am), as the final exam covers all materials that have been taught in class. No make-up exam will be given unless prior arrangement is made with the instructor with a valid reason, e.g., a note from the dean.

Midterm I:	Sep. 26 (Thursday)
Midterm II:	Nov. 07 (Thursday)
Final:	Dec. 12 (Thursday), 8:00-10:50am

Grading:	The course grade is based on homeworks (20%), Midterms (20% + 20%), and Final (40%).
Software:	If necessary, R statistical software package will be used for the examples discussed in class. Handouts with R code lines will be provided from time to time.
TA:	TBD
Honor Code:	It is your responsibility to get familiar with the Georgia Tech Honor Code. In particular, it is cheating if you copy homework/exam solutions from your classmates, previous years, or online, and the penalty will include a lower course grade or even Fail. For any questions involving these or any other Academic Honor Code issues, please consult me or `http://osi.gatech.edu/content/honor-code`
Accommodation:	At Georgia Tech we strive to make learning experiences as accessible as possible, and your experience in this class is important to me. If you have already established accommodations with the Offices of Disability Services, please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through Disability Services, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact Disability Services at 404.894.2563 or `dsinfo@gatech.edu`. See more information at `disabilityservices.gatech.edu`.

Table 1: Tentative Schedule (the actual schedule may vary)

week	Date	Lect#	Content
1	Aug 20	1	Introduction; Specification & Classification of a Statistical Problem
	22	2	**Statistical Decision Theory (SDT):** Risk function; Admissible
2	Aug 27	3	**The Bayes Paradigms**
	29	4	Focusing on Point Estimation
3	Sep 03	5	
	05	6	**The Minimax Paradigms**
4	Sep 10	7	
	12	8	**Relationship between Admissiblity, Bayes and Minimax**
5	Sep 17	9	
	19	10	**SDT** for high-dim data: James-Stein estimator (Shrinkage)
6	Sep 24	11	
	26	12	**Midterm I**
7	Oct 01	13	**Sufficient Statistics**: Sufficient; Factorization Theorem
	03	14	Minimal Sufficient; Ancillary
8	Oct 08	15	Complete Sufficient; Basu' Theorem
	10	16	
9	Oct 15		**no class**, fall break
	17	17	
10	Oct 22	18	**Point Estimation** (Ch. 7, 10): **MOM**; **MLE**
	24	19	**UMVUE** (Uniformly Minimum Variance Unbiased)
11	Oct 29	20	Rao-Blackwell Method; Cramer-Rao Inequality
	31	21	
12	Nov 05	22	
	07	23	**Midterm II**
13	Nov 12	24	**Asymptotic Properties of MLE** (Ch. 10)
	14	25	
14	Nov 19	26	**Modern applications:** sparsity in high-dim data — LASSO
	21	27	
15	Nov 26	28	**Hypothesis Testing** & Classification in Machine Learning (Ch. 8, 9, 10)
	28		**no class**, thanksgiving
16	Dec 03	29	Last Day of Classes
Final	Dec 10		**Final Exam:** (Thursday, Dec 12) 8:00-10:50am