SDS 384-11

Theoretical Statistics
Spring 2021
Tu/Th 12:30-2 , via Zoom

Professor	Purnamrita Sarkar
Office Hours	TBA. via Zoom
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Syllabus

Course Delivery

From Monday March 30th, classes will be held via Zoom. Look at https://zoom.its.utexas.edu/ for more information. Few things to remember, when you join you will be muted, and you will have to unmute yourself to talk. You can also use the raise hand feature to ask a question. In each class, there will be a preassigned moderator(s) who will keep an eye on who is raising hands/asking questions on chat, so that we have tons of communication.

Course Description

This course provides an introduction to theoretical frequentist Statistics. The first half of the course covers concentration of measure and U statistics, etc. The second half introduces basics from empirical processes, asymptotic testing and applications including bootstrap, subsampling, kernel regression etc.

We will cover

- Consistency of parameter estimates
  - Stochastic Convergence
  - Concentration inequalities
  - Asymptotic normality of estimators
- U Statistics and applicationss
- Empirical processes, VC classes, covering numbers, chaining
- Bootstrap and subsampling

Update after winter storm We will have 4 homeworks instead of 5 now. We are also going to shed material. For example, typically I teach Efron Stein inequalities for about 3 classes, but now they will be taught for 2 classes. We will possibly not be able to cover chaining in full detail. You will not be expected to read things that are typically covered but I could not cover because of the

winter storm. The final exam will only be on material we have covered. Finally, I may give out a homework 5 as a set of practice problems. So you can solve them but you will not be graded on them.

Prerequisites Students are expected to have a good familiarity with Calculus and undergraduate probability.

Textbook

This course is designed to be self-contained, and there is no required textbook. Two textbooks that you may find useful is:

- High dimensional Statistics: A Non-Asymptotic viewpoint, Martin Wainwright, Cambridge,
- Asymptotic Statistics, Aad van der Vaart. Cambridge. 1998.
- Convergence of Stochastic Processes, David Pollard. Springer. 1984. Available on-line at `http://www.stat.yale.edu/~pollard/1984book/`

Course website

https://psarkar.github.io/sds384.html

Evaluation Grading - 4-5 homeworks (70%), class participation (5%), Take home final Exam (25%)

Homework will be assigned biweekly and due via canvas..

Exam There will be one take home final exam.

Requests for Regrade: Clerical requests will be corrected without hassle. Other regrading requests must be submitted in writing within 2 days of the assignment/exam return. Be aware that the entire assignment/exam will be subject to regrading, and grades may go up or down.

Students with Disabilities

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, `http://www.utexas.edu/diversity/ddce/ssd/`.

Religious Holidays

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Scholastic Honesty

We expect students to behave with integrity. Students found Cheating on exams or homeworks will receive a score of zero for that exam or assignment, and may be subject to additional disciplinary action. For more information on the University of Texas scholastic dishonesty policy, see the 2006-2007 General Information Catalog, Appendix C.

Campus Safety

Please note the following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, `http://www.utexas.edu/safety`:

- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation should inform the instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors.
- Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- Behavior Concerns Advice Line (BCAL): 512-232-5050
- Further information regarding emergency evacuation routes and emergency procedures can be found at: `http://www.utexas.edu/emergency`.

SPECIAL NOTE: Please be aware that SB 11, concerning the concealed carrying of handguns on campus, does not take effect until August 2016. The possession of a firearm, illegal knife, or prohibited weapon on the grounds of an educational institution is currently a third-degree felony in Texas.