STA 6448: Advanced Probability and Inference II

2018 Spring

Tue, Thu 11:00AM – 12:15PM, HCB 0207

Course Information

Instructor: Yun Yang, Assistant Professor, Department of Statistics, OSB 209G, `yyang@stat.fsu.edu`. Office hours: Tue, Thu 1:15PM – 2:00PM or by appointment via email.

Website: On Canvas at `https://fsu.instructure.com/`

TA: Shuang Zhou, `shuang.zhou@stat.fsu.edu`. Office hours: M 3:30PM – 4:30PM, W: 10:30AM – 11:30AM, 448 Dirac Science Library.

Prerequisites: Distribution Theory (STA 5326), Statistical Inference (STA 5327) and Advanced Probability and Inference I (STA 6346) or equivalent. Talk to me if you are unsure of your background.

Textbooks (recommended):

- `Asymptotic Statistics`, Aad van der Vaart, Cambridge, 1998.
- `Weak convergence and empirical processes: with applications to statistics`, Aad van der Vaart and Jon Wellner, Springer, 2000.
- `Empirical processes in M-estimation`, Sara van de Geer, Cambridge University Press, 2009.

Tentative Outline:

We will cover a selection of modern tools and topics in mathematical statistics and advanced probability theory, with a focus on high-dimensional and non-parametric statistical models. One of the main goals of this course is to provide you with some theoretical background and mathematical tools for the finite sample analysis of modern data science methods. Some topics to be covered in this class:

- Concentration of measure
- Uniform laws of large number

- Metric entropy, chaining, asymptotic equicontinuity
- High-dimensional regression
- High-dimensional covariance matrix estimation
- Non-parametric regression
- Minimax lower bounds

Assessment:

Grading: The course grade will be calculated on the basis of homework (40%), a midterm (25%), a final project (30%), and attendance (5%). The following scheme will be used to convert your percentage scores to letter grades.

- If your final score is 90 - 100, your letter grade will be at least A-.
- If your final score is 75 - 89, your letter grade will be at least B-.
- If your final score is 60 - 74, your letter grade will be at least C-.
- If your final score is 50 - 59, your letter grade will be at least D.
- If your final score is below 50, your letter grade may be an F.

Homework: There will be homeworks every two weeks. Homeworks will be posted on Canvas after Thursday's class, and will be collected (due) two weeks later in class. You are encouraged to discuss with each other, but should write down the answers independently. Your final grade for homework (40%) will be based on the best 5 out of total 6 homeworks. **Late homework will not be accepted.**

Attendance: You will get the 5% points for attendance and class participation if you do not miss more than four classes. Please note that if you miss more, except in very special cases, you will get 0% on attendance. You are strongly encouraged to attend all classes.

Exam: The midterm will be based on the material covered by the time of the exam. You are allowed to bring an 8.5×11 sheet of notes (one side). **There will be no makeup exam.** The midterm will take place in class, tentatively on February 27th, 11:00AM – 12:15PM.

Project: An important component of the course is a final project. A final project can be: 1. a review of a theoretical paper (you need to go beyond the paper in some way, for example, giving a new proof of some result); 2. a survey of recent development in a concrete topic (should be specific); 3. or a research project involving contributing novel

research (theoretical result, statistical method, computational algorithm, or interesting application).**You must send me a proposal** (at most two page) on the paper/topic you want to study/survey, or what problem you want to solve. The proposal is due March 15th. You are required to turn in a 10–20 page typed report by 5pm on Friday, April 27, 2018.

Academic Dishonesty: Your attention is drawn to the Academic Honor Policy Committee. In particular, you should be aware that copying solutions, in whole or in part, from other students in the class or any other source constitutes cheating. Any student found to be cheating risks automatically failing the class and being referred to the Center for Academic Integrity (Florida State University Academic Honor Policy, found at `http://dof.fsu.edu/honorpolicy.html`).

Other Policies:

Classroom Policy: The classroom environment is an important factor for effective learning. In order to not distract other students attention please follow these classroom policies. The first one of these is the university policy:

1. Remember that no food or drinks are allowed in the classroom.
2. Turn off all audible alarms (cell phones, pagers, calculators, watches etc.) Do not use cell phones in the class.
3. Come to the class on time. Opening and closing the classroom door in the middle of a class cause distraction to the students and the teacher.
4. Do not talk to other students without permission while the professor is teaching. More than one conversation creates noise and makes it difficult for the students to pay attention to the lecture.

Students With Disabilities: Students with disabilities in need of academic accommodation should:

1. Register with and provide documentation to the Student Disability Resource Center (SDRC);
2. Bring a letter to the instructor indicating the type of accommodation needed.

This should be done during the first week of class. See `http://www.disabilitycenter.fsu.edu/` for more information.

Syllabus Change Policy: This syllabus is a guide for the course and is subject to change without advance notice.