Syllabus for Theory of Statistics (Stat 593)

1. **Instructor**: Dr. Zijian Guo
    (a) **Lecture time**: Monday, Wednesday 10:20 am to 11:40 am; see the end of the syllabus for some potential changes.
    (b) **Lecture location**: Hill 552
    (c) **Contact email**: zijguo@stat.rutgers.edu
    (d) **Instructor office**: Hill 488
    (e) **Office hours**: Monday 1:00pm to 2:00pm.
2. Teaching assistant: Zhenyu Wang (Office hour and location to be determined)
3. **Communications are strongly encouraged!** Feel free to contact the instructor by emails if you would like to have more additional discussions. The discussions are not limited to the course materials, but can be about other academic related discussions.
4. **Pre-requisite**: Probability theory, calculus and linear algebra
5. **Course Description**: Theory of point and interval estimation and hypothesis testing, with emphasis on fundamental concepts underlying the theory. If time allows, we may include more modern topics, such as, high-dimensional inference, conformal prediction, causal inference, and post-selection inference.
6. **Grading policy**
    (a) Subscription of the lecture note (20%)
        - Each student is expected to subscribe lecture notes.

    (b) Homework (20%)
    (c) Mideterm Exam (20%)

- In-class exam, time to be determined.

(d) Final Exam (20%)

- In-class on Dec 13 (last day of this semester)

(e) Final Presentation (20%)

- A paper list on the related topics will be given.

7. **Instruction on Scribe Notes**: The notes are subscribed for **the entire class**! Try to be responsible and rigorous. Take careful notes during class and be a good scriber.

   The link for editing the lecture notes is listed as

   `https://www.overleaf.com/5817917789ntgntmhfgnrm`

   - Minimal (5/10): your source file should be compilable; your notes must contain no serious typos or mistakes and it should reflect everything we discussed in class and be written in complete sentences; you should fill in the skipped proofs if expected.
   - Acceptable (8/10): your notes should contain enough explanation (between sections, after main theorems) so that even a student who might have missed the class can understand the material reasonably well; the proofs should be succinct, clear, and correct; your notations and numbering should be consistent.
   - Exemplary (10/10): your note should be a wholistic piece of work and ideally it should be instructive. I encourage you to read the reference books or papers related to form a comprehensive understanding of the topic and you may add your thoughts, questions, or relevant material in the notes.

   Please email me the latex and pdf of your notes as well as any figures included, within 3 days after the class for which you were the designated scriber. If your note falls in the unacceptable region, you will be asked to make revisions.

8. **Recommended lecture notes and textbooks.** The lecture notes will be self-contained but students are encouraged to read the following materials. We plan to mainly follow the first textbook.

   (a) Bickel, P. J., & Doksum, K. A. (2015). Mathematical statistics: basic ideas and selected topics, volumes I-II package. CRC Press.

   (b) Romano, J. P., & Lehmann, E. L. (2005). Testing statistical hypotheses.

   (c) Lehmann, E. L., & Casella, G. (2006). Theory of point estimation. Springer Science & Business Media.

9. **Take your professor to Lunch.** This will be implemented in the form of a group lunch. Ideally, four to six students form a group and have lunch with the instructor. We will create a sign-up sheet for students to have lunch with the instructor.

10. **Class schedule**: Some of the classes have to be rescheduled or switched to a virtual teaching. We can figure out more details during the class.

    (a) Classes on Sep 25 and 27 will be cancelled and made up. Possible dates: Sep 15 or Oct 13.

    (b) Classes on Oct 2 and 4 will be cancelled or switched to a virtual teaching, based on the students' preference.

    (c) Presentation on Dec 6 from 9:00 am to 11:40 am. The class on Dec 11 will be switched to the office hour.

    (d) Dec 13, 10:20 am to 11:40 am, in class final exam.