STAT 9917: Topics in Selective Inference and Predictive Inference

Spring 2026

Classes: Mon/Wed 10:15 – 11:44 am, SHDS 105

Instructor: Zhimei Ren
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Course website: https://zhimeir.github.io/selinf. We will also use canvas for announcements and submission.

Course overview: This PhD course covers topics in selective inference and distribution-free predictive inference. The first half focuses on selective inference, introducing problems and tools in multiple testing, post-selection inference, and adaptive/sequential inference. The second half centers on distribution-free predictive inference, with an emphasis on conformal inference. Throughout, we highlight recent advances, practical considerations, and open problems in both areas. We will cover the following topics in class:

- Multiple testing: global null, FWER, FDR, local FDR
- Post-selection inference, sequential testing
- Testing with e-values
- Empirical Bayes, Compound decision-making
- Permutation test, Conformal inference
- Distribution-free predictive inference

Grading policy: Grade will be based on a course project. Each student is expected to complete a research project that is related in some way to the themes and topics of the course. Projects may be theoretical or empirical (ideally a mix of both), and students are encouraged to build on or connect to their thesis research. The instructor will meet with students individually to discuss project ideas and provide feedback on progress throughout the semester. The grading components are:

- 10% - Proposal (due **Feb 16, 2026**): Submit a short report (no more than 1 page) stating the research problems that you plan to work on. Describe why they are important or interesting and provide some appropriate references.
- 10% - Progress report (due **Mar 23, 2026**): Submit a progress report (no more than 3 pages) summarizing what you have completed so far, any preliminary results, and your updated plan for the remainder of the project.
- 40% - Final presentation (in class): Give an in-class presentation on your project, outlining the problem, approach, main findings, and takeaways. Final timing may be adjusted depending on enrollment.
- 40% - Final report (due **May 4, 2026**): Submit a final project report summarizing your goals, methodology, main results, and conclusions. Discuss limitations and possible next steps. Include complete references and, when relevant, provide a link to reproducible code and data.

Academic integrity: In accordance with Penn's Code of Academic Integrity, students must comply with the course collaboration policies described in this syllabus and in the assignment instructions. All

suspected academic integrity violations will be reported to the Office of Student Conduct and all assignments where violations occurred will receive grades of zero. If you have any questions about collaboration policies, please do not hesitate to contact the instructor.

Accessibility for students with disabilities: The instructor is committed to creating a learning experience that is as accessible as possible. Students with disabilities should reach out to the Office of Student Disabilities Services (SDS) by calling 215-573-9235 (services are confidential) and email the instructor. The instructor will then work with the student and SDS to provide reasonable accommodations. For more on academic accommodations, please see the Weingarten Center.