Course Syllabus

STAT 582: Advanced Theory of Statistical Inference

Winter 2025

Instructor: Fang Han (fanghan@uw.edu)
Office hours: one hour per week; PDL B-317, time TBD.

TA: Lexi Liu
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Office hours: one hour per week; time TBD.
Quiz session [optional]: one hour per week starting from the 2nd week; time/location TBD.

Course website: Canvas!

Class schedule: There will be three lectures per week:

- (Lecture) MWF, 10:30-11:20 PM in person at **THO 211**.

Course overview: This 10-week lecture-based course builds on the foundation established in STAT 581. The primary topics covered include:

- Minimax rates of convergence (Chapter 1)
- Kernel-based methods (Chapter 2)
- Concentration inequalities (Chapter 3)
- Entropy arguments (Chapter 4)
- Empirical processes and weak convergence (Chapter 5)

Prerequisites: STAT 582 requires STAT 581/BIOST 583, is appropriate for a graduate student of a mathematics/probability/statistics background, and requires a certain level of mathematical maturity (at either MATH426 or STAT559). Please do not hesitate to approach the instructor if you have any concerns.

Grades: Your grades come from three parts: four homework assignments (40%), a midterm exam (20%), and a final exam (40%).

Format of HWs: There will be 5 homework assignments each worth 8%.

Homework 1: Assigned 01/06, Due 01/19 (23:59:59PM);
Homework 2: Assigned 01/20, Due 02/02 (23:59:59PM);
Homework 3: Assigned 02/03, Due 02/16 (23:59:59PM);
Homework 4: Assigned 02/17, Due 03/02 (23:59:59PM);
Homework 5: Assigned 03/03, Due 03/09 (23:59:59PM).

Late HWs will be penalized 30% per day (for instance, a homework turned in two days late will receive only 40% credit). Exceptions to these rules will of course be made for serious illness or other emergency circumstances; in these cases, please contact me as soon as you are aware of the problem. You need to upload your answers to the Canvas. Teamwork is allowed, but it is encouraged to think by yourself first; plagiarism is strictly forbidden. Technical correctness, clarity, and completeness are equally important.

Format of the exams: There will be a midterm and a final exam, both in-class, on Feb 10 and Mar 14. The exams are closed-book; however, each student is permitted to bring a single-sided cheat sheet (US letter size, in simple topological structure: no Mobius Strip please).

Course textbooks: This course is not built on any particular book, although the following four textbooks may be referenced:

1. A W van der Vaart. Asymptotic statistics. Cambridge university press, 2000
2. A W van derVaart and J A Wellner. Weak convergence and empirical processes. Springer, 1996
3. S van de Geer. Empirical Processes in M-estimation. Cambridge university press, 2000

4. A B Tsybokov. Introduction to Nonparametric Estimation. Springer, 2009

Illness protocols and safety: If you feel ill or exhibit respiratory or other symptoms, you should not come to class. Seek medical attention if necessary and notify your instructor(s) as soon as possible by email.

Please check your email daily BEFORE coming to class. If we need to conduct class remotely because the instructor is unable to attend in person, we will send all registered students an email with a Zoom link for remote instruction or a plan for making up the class.

Religious accommodations: "Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/)."

Academic integrity: The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you're uncertain about if something is academic misconduct, ask me. I am willing to discuss questions you might have.

Acts of academic misconduct may include but are not limited to:

- Cheating (working collaboratively on quizzes/exams and discussion submissions, sharing answers and previewing quizzes/exams)
- Plagiarism (representing the work of others as your own without giving appropriate credit to the original author(s))

Concerns about these or other behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by (include information for specific campus office).

Students found to have engaged in academic misconduct may receive a zero on the assignment (or other possible outcome).

Course schedule:

Date (M)	Content	Date (W)	Content	Date (F)	Content
01/06	Introduction	01/08	minimax theory	01/10	minimax theory
01/13	minimax theory	01/15	minimax theory	01/17	KDE
01/20	MLK Day: no class	01/22	KDE	01/24	KDE
01/27	concentration inequalities	01/29	concentration inequalities	01/31	concentration inequalities
02/03	concentration inequalities	02/05	entropy argument	02/07	entropy argument
02/10	Midterm	02/12	entropy argument	02/14	entropy argument
02/17	Presidents' Day: no class	02/19	entropy argument	02/21	entropy argument
02/24	entropy argument	02/26	entropy argument	02/28	entropy argument
03/03	weak convergence	03/05	weak convergence	03/07	weak convergence
03/10	weak convergence	03/12	weak convergence	03/14	Final

KDE: kernel density estimator

Figure 1: Course schedule (tentative).