00102721: Advanced Theory of Statistics II
Fall 2026

Lectures: Wednesdays 1:00–2:50 pm and odd Fridays 10:10 am–12:00 noon, 204 Classroom Building 1

Instructor: Wei Lin (weilin@math.pku.edu.cn)
Office hours: Wednesdays 3:00–4:30 pm, 346 Zhihua Building

Course Description:
This course continues and extends the study of statistical theory initiated in Advanced Theory of Statistics. After introducing modern mathematical tools including empirical processes, concentration inequalities, and random matrices, we will discuss general theory and methodology for M- and Z-estimators, semiparametric and nonparametric models, and high-dimensional models, from both asymptotic and nonasymptotic points of view. Working through this course will help students develop a comprehensive understanding of modern statistical theory and acquire the necessary knowledge and skills for conducting research in statistics and data science.

Primary Texts:
1. van der Vaart, A. W. (1998). *Asymptotic Statistics*. Cambridge Univ. Press.
2. Wainwright, M. J. (2019). *High-Dimensional Statistics: A Non-Asymptotic Viewpoint*. Cambridge Univ. Press.

Supplementary Texts:
1. Kosorok, M. R. (2008). *Introduction to Empirical Processes and Semiparametric Inference*. Springer.
2. van der Vaart, A. W. and Wellner, J. A. (1996). *Weak Convergence and Empirical Processes: With Applications to Statistics*. Springer.
3. Boucheron, S., Lugosi, G. and Massart, P. (2013). *Concentration Inequalities: A Nonasymptotic Theory of Independence*. Oxford Univ. Press.
4. Vershynin, R. (2018). *High-Dimensional Probability: An Introduction with Applications in Data Science*. Cambridge Univ. Press.
5. Bach, F. (2024). *Learning Theory from First Principles*. MIT Press.

Homework:
Homework will be assigned throughout the semester but will not be collected.

Exams:
There will be an in-class, closed-book midterm exam on Wednesday, December 9. Each student is also required to write up a final open-problem paper of up to 4 pages excluding references, where an open problem in an area relevant to the course should be clearly stated and thoroughly reviewed.

Grading:
The course grade breaks down as follows: midterm 50% and final paper 50%.

Website:
Lecture topics and homework assignments will be posted on the course website at http://www.math.pku.edu.cn/teachers/linw/2721f26.html.

AI Use Policy:
You may use AI tools to assist with your coursework, such as for brainstorming, exploring ideas, clarifying concepts, or improving your writing. However, AI-generated material may be inaccurate, incomplete, or misleading, especially for technical questions. You are responsible for carefully checking and verifying any information, arguments, calculations, or references produced by AI. The use of AI should support, rather than replace, your own independent thinking, mathematical reasoning, and understanding.