

00102721: Advanced Theory of Statistics II Spring 2021

Lectures: Wednesdays 1:00–2:50 pm and odd Fridays 10:10 am–12:00 noon, 306 Classroom Building 3

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Office hours: Fridays 2:00–3:30 pm, 1547 Science Building 1

Teaching Assistant: Huiyuan Wang (huiyuan.wang@pku.edu.cn)

Office hours: Wednesdays 10:00 am–12:00 noon, 259 Science Building 5

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.

Homework:

There will be about five homework assignments due in class. If you missed the class, contact the TA to turn in your homework by the end of the day. No late homework will be accepted.

Exams:

There will be an in-class, closed-book midterm exam on Wednesday, May 5, and a take-home final exam in the last week of the semester. The final exam may include write-up questions such as literature reviews.

Grading:

The course grade breaks down as follows: homework 30%, midterm 30%, and final 40%.

Website:

Lecture topics and homework assignments will be posted on the course website at <http://www.math.pku.edu.cn/teachers/linw/2721s21.html>.