MATH 524: Statistical Estimation and Inference – Spring 2025

Institute of Mathematics
École Polytechnique Fédérale de Lausanne

Last update: February 7, 2025

1 Introduction

This graduate class provides a theory-based introduction to classical and modern mathematical nonparametric statistics at the masters level. The main focus of this class is on foundational aspects of estimation and inference theory, but some applications will also be covered.

2 Useful Information

Instructor:	Rajita Chandak (rajita.chandak@epfl.ch).
Lectures:	Wednesdays 11:00 – 13:00 (MA A3 31).
Moodle :	https://go.epfl.ch/MATH-524
TAs:	Ulysse Naepels (ulysse.naepels@epfl.ch)
Lecture Notes:	Will be shared on Moodle each week.
Discussion Forum:	See Moodle for link.
Exercises:	Fridays 13:00 – 15:00 (MA A1 10).

3 Grading

Students will be required to complete one comprehensive final exam. The final grade will be determined by performance solely on this exam.

4 References

Material covered in this class is also covered in the following reference books:

(1) Tsybakov, A. B. (2009): Introduction to Nonparametric Estimation, Springer.
(2) Wasserman, L. (2006): All of Nonparametric Statistics, Springer.
(3) Györfi, L. et al. (2010): A Distribution-free Theory of Nonparametric Regression, Springer.
(4) Wainwright, M. J. (2019): High-Dimensional Statistics, Cambridge.

Additional resources:

(5) Bickel, P. J. and K. A. Docksum (2015): Mathematical Statistics (vol. I), CRC.
(6) Bickel, P. J. and K. A. Docksum (2016): Mathematical Statistics (vol. II), CRC.
(7) Van der Vaart, A. W. (1998): Asymptotic statistics, Cambridge.
(8) Vershynin, R. (2018): High-Dimensional Probability, Cambridge.

5 Weekly Schedule and Important Dates

Week 1 (Feb 19):	Introduction and review of statistical foundations.
Week 2 (Feb 26):	Nonlinear and nonparametric regression.
Week 3 (Mar 5):	Kernel density estimation.
Week 4 (Mar 12):	KDE continued.
Week 5 (Mar 19):	U- and V-statistics.
Week 6 (Mar 26):	Uniform convergence.
Week 7 (Apr 2):	Minimaxity.
Week 8 (Apr 9):	Minimaxity continued.
Week 9 (Apr 16):	Semiparametric methods.
Week 10 (Apr 23):	K-nearest neighbours.
Week 11 (Apr 30):	**No Classes: Easter holiday.**
Week 12 (May 7):	General theory of partitioning estimators.
Week 13 (May 14):	High-dimensional estimation.
Week 14 (May 21):	*Optional topic, TBD.*
Week 15 (May 28):	Review and discussion.

Final exam: 3 hours, in person, closed book. Date and time to be announced.