MATH-699

Reading Group in Mathematical Statistics (2018)

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Cursus	Sem.	Type
Mathematics		Obl.

Language of teaching	English
Credits	2
Session	
Exam	Oral presentation
Workload	60h
Hours	**42**
Courses	14
TP	28
Number of positions	

Frequency

Only this year

Summary

This reading course will focus on non-asymptotic theory in the conetxt of high-dimensional statistics. Specifically, we will study the performance of modern statistical procedures when the number of variables is comparable to sample size, and consider explicit non-asymptotic performance bounds.

Content

In this course we mainly focus on non-asymptotic theory in high-dimensional statistics, covering capters 1, 2, 5, 6, 7, 12, and 13 of Wainwright (2019). In more detail, we investigate high-dimensional statistics based on a fixed (large) number of sample size n and dimension d. The content of the course is divided in two parts: (a) Chapters 2, 3, and 6 develop some foundamental techniques and derive theory (including standard techniques on tail bounds and concentration inequalities, geometric notions of covering and packing in metric saces and theor connection to Gaussian processes, and RKHS theory) that are broadly applicable in high-dimensional statistics. (b) Chapters 4, 5, and 7 concern particular models and statistical estimation problems (including high dimensional covariance estimation, sparse regression models, and nonparametric least squares) thate are frequently arising in applications.

Contents:
1. Introduction
2. Basic tail and concentration bounds
3. Metric entropy and its uses
4. Random matrices and covariance estimation
5. Sparse linear models in high dimensions
6. Reproducing kernel Hilbert spaces
7. Nonparametric least squares

The course is based on the following book:
[1] Martin J. Wainwright. High-Dimensional Statistics A Non-Asymptotic Viewpoint. Cambridge University Press, 2019.

Keywords

non-asymptotic statistical theory
high-dimensional statistics

Learning Prerequisites

Recommended courses

Statistical Theory, Stochastic Processes, Linear Models, Multivariate Analysis

Learning Outcomes

By the end of the course, the student must be able to:

- To grasp the basic techniques of non-asymptotic statistical theory in high dimensions and be able to implement them in the appropriate contexts