האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

Syllabus

High dimensional statistics - 80629

Last update 02-09-2021

HU Credits: 3

Responsible Department: Mathematics

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Zemer Kosloff

Coordinator Email: zemer.kosloff@mail.huji.ac.il

Coordinator Office Hours:

Teaching Staff:
Prof Zemer Kosloff

Course/Module description:
The course will serve as an introduction to the methods of analyzing high

dimensional statistical models. The first part will deal with the basic of tail and concentration bounds, sub-Gaussian random variables, entropic methods and uniform laws of large numbers.
After that we aim to apply these methods to some problems such as covariance estimators, sparse-linear regression and the Lasso algorithm.

Course/Module aims:

Learning outcomes - On successful completion of this module, students should be able to:
Be familiar with the mathematical foundations and methods underlying modern research in the rapidly evolving field of high-dimensional statistics.

Attendance requirements(%):
0

Teaching arrangement and method of instruction: Lectures

Course/Module Content:
0) Introduction and some nice examples.
1) Basic tail bounds (Chernoff, Hoeffelding inequalities and martingale difference methods).
2) SubGaussian random variables, equivalent definitions and the sub-Gaussian norm.
3) Uniform laws of large numbers, Rademacher complexity and Vapnik-Chernovakis dimension.
4) Metric entropy and its uses: Covering, Packing, chainning and Dudley's integral.
5) Random matrices and covariance estimation.
6) Sparse linear regression.

Required Reading:
none

Additional Reading Material:
a) M.J. Wainwright. High-Dimensional Statistics, A Non-Asymptotic Viewpoint. Cambridge university press.

b) R. Vershynin, Introduction to the non-asymptotic analysis of random matrices. Cambridge University Press,

c) A New Look at Independence Special Invited Paper, by M. Talagrand, the Annals of Applied
Probability, 24(1),1–34, 1996.

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 50 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 50 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:
The interested students must have completed the course "introduction to probability theory and statistics. Knowledge in measure theory and continuous probability is an advantage.