Syllabus

Advanced data analysis II: data vs. theory - 77743

 Last update 19-11-2018

<u>*HU Credits:*</u> * 3*

<u>*Responsible Department:*</u> *Physics*

<u>*Academic year:*</u> *0*

<u>*Semester:*</u> *2nd Semester*

<u>*Teaching Languages:*</u> *Hebrew*

<u>*Campus:*</u> *E. Safra*

<u>*Course/Module Coordinator:*</u> *Prof Yehuda Hoffman*

 <u>*Coordinator Email:*</u> [*hoffman@huji.ac.il*](hoffman@huji.ac.il)

<u>*Coordinator Office Hours:*</u> *upon appointment*

<u>*Teaching Staff:*</u>
  Prof Yehuda Hoffman

<u>*Course/Module description:*</u>
  The course develops advanced methods of analyzing and simulating

experimental/observational data. The main focus is on the confrontation of theory with data: parameters estimation, hypothesis testing and Bayesian inference. Inference without theory by machine learning will be introduced

Course/Module aims:
To introduce students to up to date ideas and concepts and expose and train them with state of the art tools of (big) data analysis.

Learning outcomes - On successful completion of this module, students should be able to:
Conceptual and practical know-how of big data analysis

Attendance requirements(%):
100

Teaching arrangement and method of instruction: lectures

Course/Module Content:
1. Review: statistics and probability
2. Frequentist vs. Bayesian analysis
3. Fourier analysis: FFT, power spectrum and correlation functions
4. Signal and image processing: filtering and noise reduction
5. Random variables and random fields: random and constrained realizations
6. Theory vs. data: parameters estimation, Fisher matrix, hypothesis testing
7. Bayesian inference in (numerical) practice: Monte Carlo Markov Chains (MCMC)
8. Inference without theory: artificial neural networks (also known as machine learning)

Required Reading:
None

Additional Reading Material:
None

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 0 %

Participation in Tutorials 0 %
Project work 75 %
Assignments 25 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

<u>*Additional information:*</u>
  prerequisite: advanced data analysis (77742)