



## *The Hebrew University of Jerusalem*

### *Syllabus*

## *Advanced data analysis II: data vs. theory - 77743*

*Last update 19-11-2018*

*HU Credits: 3*

*Degree/Cycle: 2nd degree (Master)*

*Responsible Department: Physics*

*Academic year: 0*

*Semester: 2nd Semester*

*Teaching Languages: Hebrew*

*Campus: E. Safra*

*Course/Module Coordinator: Prof Yehuda Hoffman*

*Coordinator Email: [hoffman@huji.ac.il](mailto:hoffman@huji.ac.il)*

*Coordinator Office Hours: upon appointment*

*Teaching Staff:*

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Prof Yehuda Hoffman

Course/Module description:

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

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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 %

Additional information:

prerequisite: advanced data analysis (77742)