The Hebrew University of Jerusalem

Syllabus

Mathematical Modeling of Cognition - 51601

Last update 08-02-2021

HU Credits: 3

Degree/Cycle: 2nd degree (Master)

Responsible Department: Psychology

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Dr. Yuval Hart

Coordinator Email: yuval.hart@mail.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Dr. Yuval Hart

Course/Module description:

What are the computational mechanisms that govern our cognition? The course will present how using computational design principles can point to concrete mechanistic descriptions of cognition in health and disease. The course will showcase modeling and analysis methods on behavioral and neuronal levels that provide a unique peer into the clockwork of cognitive processes.

Course/Module aims:

The course will present a broad computational prism on cognition and familiarize students with mathematical methods to analyze and model cognitive processes.

Learning outcomes - On successful completion of this module, students should be able to:

Upon completion of the course, students will be able to:
1. Reflect on cognitive processes from a computational perspective.
2. Explain advanced analysis methods of cognitive processes.
3. Propose mathematical models for cognitive processes and discuss their strengths and limitations.
4. Map computational trade-offs in cognitive processes.

Attendance requirements(%):

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Teaching arrangement and method of instruction: Classes, Problem Sets, Project

Course/Module Content:

The course will cover a broad range of topics from a computational perspective - Randomness and probability perception, motion, learning, creativity, social signals, decision making, etc...

Required Reading:

The course will cover papers from the field in different topics. The list of papers will be distributed at the beginning of the course.

Additional Reading Material:

Course/Module evaluation:

End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 10 %
Project work 0 %
Assignments 0 %
Reports 0 %
Research project 90 %
Quizzes 0 %
Other 0 %

Additional information:

The course will present computational concepts from dynamical systems, control, and statistics such as - Robustness, Scale invariance, Computational trade-offs, Coupled systems, Phase transitions, Statistical learning and inference