

BIO-620

Neuroeconomics / Decision Neuroscience

Gerstner Wulfram, Invited lecturers (see below)

Cursus	Sem.	Type
Neuroscience		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Project report
Workload	60h
Hours	24
Courses	20
TP	4
Number of positions	

Frequency

Only this year

Remark

From June 10th to 14th, the course runs every morning 9h15-10h45 and 11h10 - 12h40

Summary

This course covers three major topics introducing: (1) fMRI methods, experimental designs and fMRI analysis; (2) recent research on cognitive and decision neuroscience in humans; (3) neuroimaging studies in the field of social cognition. Guest speaker: Visiting Professor Jean-Claude Dreher

Content

This course is designed for PhD students interested in Human Decision Making in a broad sense. Even though the main target audience are EPFL PhD students in neuroscience, the course is open for students with various backgrounds. Basic knowledge in neuroscience or fMRI or Reinforcement Learning is a plus, but not required, since essentials concepts are covered during the first day.

It will cover three major topics introducing: (1) fMRI methods, experimental designs and fMRI analysis; (2) recent research on cognitive and decision neuroscience in humans; (3) neuroimaging studies in the field of social cognition. The course will focus on our current understanding regarding the neural underpinnings of reward processing, motivation and individual/social decision-making. Topics covered include model-based fMRI, reinforcement learning, the neural bases of choice, preferences and relative rewards, the role of emotion in decision-making, social cognition, social dominance hierarchies, moral judgments and prosocial behavior.

The topics to be covered are:

Course 1

Introduction to Cognitive, Decision and Social neurosciences. Experimental Methods in Cognitive Neurosciences.

Course 2

Introduction to Reinforcement learning and model-based fMRI

Course 3

The computation of stimulus values in choice and models of perceptual decisions

Course 4

The social brain: Social learning, reference frames and dominance representations in the human brain

Course 5

The cognitive neuroscience of moral decisions and social emotions

Exams: form teams of two and come up with a research question (related to the class) that students would want to answer and the experimental design they would choose to do this. A short proposal up should be written on two A4-pages.

Credits will be given for assessed proposals. No grades need to be given. The reports must be turned with in 2 weeks of the last day of the course.

The objective of this course is to introduce basic elements of fMRI technique, experimental design and model-based analysis in the fields of human Cognitive, Decision and Social Neurosciences, with a particular focus on reward, motivation, emotion, individual and social decision making. We will illustrate how computational modeling can be used to identify the neural substrates of different cognitive processes using model-based fMRI.

Learning Outcomes:

+Learn about the academic field of cognitive neuroscience, neuroeconomics and social neuroscience, its major theories, results and debates.

+Become a critical reader of research findings by learning the methodological standards for evaluating the soundness of such studies.

+Develop the ability to effectively write and speak about cognitive neuroscience results and debates.

+Acquire some practical skills for designing and analyzing an experiment in the field of cognitive/decision neuroscience.

Keywords

fMRI, neuroeconomics, decision neuroscience, social neuroscience, machine learning

Learning Prerequisites

Required courses

Undergraduates: 'Introduction to Neural Science' or with permission of the instructor.

Also recommended are 'Behavioral and Integrative Neuroscience', 'Introduction to Theoretical Neuroscience', 'Bayesian Modeling of Behavior' and 'Neural data analysis'

Resources

Bibliography

- Neuroeconomics, Decision Making and the Brain, 2nd Edition, Edited by Glimcher and Fehr, Academic Press, Elsevier, 2014.

-Decision Neuroscience: an integrative perspective, 1st edition, Edited by JC Dreher and L Tremblay, Academic Press, Elsevier, 2016

Moodle Link

- <https://go.epfl.ch/BIO-620>