REQUIREMENTS

Semmelweis University Faculty, Department:

Faculty of Medicine, Department of Anatomy, Histology and Embryology

Name of the course: Systems Neuroscience VII. Statistics of the brain

Type of course: optional course-unit

code: AOSANT560_7A

credit: 2

Name of the responsible person: Dr. Gábor Gerber (Gergő Orbán, PhD)

Academic year: 2018/2019., second semester

Role of the course in the training of the Department:

Stimuli that the brain needs to process are noise and ambiguous. Thus, the brain needs to make inferences, form hypotheses, and generalize over the finite number of observation one can make to build a coherent percept and to devise actions. In this set of lectures we will explore the properties of a "probabilistic brain". We will introduce the Bayesian inference as a formal framework to perform probabilistic computations and we will formulate "ideal observer models", which establish optimal performance under conditions where uncertainty arises. This framework will be used to explore human perception, action planning and execution in the context of probabilistic computations.

The program of the course:

1. Lecture: Sensation, perception, action. I
2. Lecture: Sensation, perception, action. II
3. Lecture: Sensation, perception, action. III
4. Lecture: Sensation, perception, action. IV
5. Lecture: Sensation, perception, action. V
6. Lecture: The Bayesian brain. I
7. Lecture: The Bayesian brain. II
8. Lecture: The Bayesian brain. III
9. Lecture: The Bayesian brain. IV
10. Lecture: The Bayesian brain. V
11. Lecture: Model learning. I
12. Lecture: Model learning. II
13. Lecture: Model learning. III
14. Lecture: Model learning. IV
15. Lecture: Model learning. V
16. Lecture: Neural representation of probabilities. I
17. Lecture: Neural representation of probabilities. II
18. Lecture: Neural representation of probabilities. III
19. Lecture: Neural representation of probabilities. IV
20. Lecture: Neural representation of probabilities. V
21. Lecture: Students' presentations, discussion I
22. Lecture: Students' presentations, discussion II
23. Lecture: Students' presentations, discussion III
24. Lecture: Written test
25. Lecture: Written test

Practical courses:

1. course: Statistical analysis of neural signals, application of the Bayesian models. I
2. Course: Statistical analysis of neural signals, application of the Bayesian models. II
3. Course: Statistical analysis of neural signals, application of the Bayesian models. III

Consultations: personally with the actual course leader

Requirements of course participation and options to recover missed hours:

1. **Total absence allowed: 10% of the course hours**
2. **Recovering missing hours: studying the material provided by the course leaders, consultation**

Eligibility: US grade point average (GPA) of 3.0. Students with a GPA lower than 3.0 should inquire with the Directors on the possibility of a waiver.

Justification of absence from course hours or exams:
Hungarian medical certificate

Number and schedule of the examinations:

1 on the last day of the course

Requirements of the successful completion of the program:

written or oral test in each course material

Marks:

In case of a written test grades are given after obtaining points as follows: 0-50% fail, 51-60% pass, 61-75% fair, 76-90% good, above 90% excellent.

Types of exam: test, essay, verbal

Requirements of the examinations:

Verbal and electronic etc. material provided by the lecturers. Syllabus is available upon opening the program on the web page.

Registration for exams: NEPTUN

Rescheduling the tests:

N/A
Each student has to take an examination in each block of the course.

Justification of absence from the exam:

Hungarian medical certificate (see above).

List of useful literature (books, papers etc):

Rajesh Rao, Bruno Olshausen, Michael Lewicki (2002) Probabilistic Models of the Brain: Perception and Neural Function, Bradford Book

Kenji Doya, Shin Ishii, Alexandre Pouget, Rajesh Rao (2011) Bayesian Brain: Probabilistic Approaches to Neural Coding, MIT Press

Special Issue: Probabilistic models of cognition, Trends in Cognitive Sciences, 2006, 10(7):287-344