REQUIREMENTS

Semmelweis University, Faculty of Medicine
Name of the managing institute (and any contributing institutes):
Department of Anatomy, Histology and Embryology

Name of the subject: Systems Neuroscience IV. Statistics of the brain

in English: Systems Neuroscience IV. Statistics of the brain

in German:

Credit value: 2

Number of lessons per week: 28 lecture: 0 practical course: 3 seminar: 25

Subject type: compulsory course elective course optional course

Academic year: 2019/2020. academic year II. semester

Subject code: AOSANT560_4A

(In case of a new subject, it is filled by the Dean's Office, after approval)

Name of the course leader: Dr. Gerber Gábor

His/her workplace, phone number: 53653

Position: Vice Chairman of the dept.

Date and registration number of their habilitation: 04/2019

Objectives of the subject, its place in the medical curriculum:
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.

Place where the subject is taught (address of the auditorium, seminar room, etc.):
library room, Department of Anatomy, Histology and Embryology

Successful completion of the subject results in the acquisition of the following competencies:

Course prerequisites:
Medical biophysics, Biostatistics and informatics and Artificial intelligence in medical sciences. Grade point average (GPA) of 3.0 in the last semester.

Number of students required for the course (minimum, maximum) and method of selecting students:
min. 5, max. 7; on the first-come first-served basis

How to apply for the course:
Neptun

Detailed curriculum:
(Theoretical and practical lessons shall be given separately by numbering the lessons (by weeks). Please provide the names of the teachers of the lectures and practical lessons and indicate guest

lecturers. Do not use attachments!
Always attach a CV for guest lecturers!)

Gergő Orbán PhD, guest lecturer
Theoretical lessons

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

Practical lessons:

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

Other subjects concerning the border issues of the given subject (both compulsory and optional courses!). Possible overlaps of themes:

Special study work required to successfully complete the course:
(E.g. field exercises, medical case analysis, test preparation, etc.)

Requirements for participation in classes and the possibility to make up for absences:
Total absence allowed: 25% of the course hours
Recovering missing hours: studying the material provided by the course leaders, consultation

Methods to assess knowledge acquisition during term time:
(E.g. homework, reports, mid-term test, end-term test, etc., the possibility of replacement and improvement of test results)
Exam on the last day of the course
Additional occasions to be arranged by the teacher for improvement

Requirements for signature:
Succesful written test

Type of examination:
colloquium

Requirements of the examination:
(*In case of a theoretical examination, please provide the topic list; in case of a practical exam, specify the topics and the method of the exam)*
Verbal and electronic etc. material provided by the lecturers. Syllabus is available upon opening the program on the web page**.**

Method and type of evaluation:
(*Method of calculating the final mark based on the theoretical and practical examination. How the mid-term test results are taken into account in the final mark.)*
Grades are given after obtaining points as follows: 0-50% fail, 51-60% pass, 61-75% fair, 76-90% good, above 90% excellent.

How to register for the examination?:
Neptun

Possibilities for exam retake:
2 occasions arranged by the teacher

Printed, electronic and online notes, textbooks, guides and literature (URL address for online material) to aid the acquisition of the material:

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

Signature of the habilitated instructor (course leader) who announced the subject:

Signature of the Director of the Managing Institute:

Hand-in date:

Opinion of the competent committee(s):

Comments of the Dean's Office:

Dean's signature: