NBE-E4530 Special Course in Human Neuroscience: Human brain connectivity - 2018

Start date: 10.04.2018, room F175b (Otakaari 3, Espoo)
Teaching: Lectures (Tuesdays, 5 x 4h), hands-on sprints (Thursdays, 3 x 3h)
Teacher: Enrico Glerean, enrico.glerean@aalto.fi, www.glerean.com
Invited lecturers: Marijn van Vliet
Teaching language: English
Credits: 5 ECTS
Teaching period: V

Course content: This special course covers the current state of the art in human brain connectivity studies and practices. The student will learn how to pre-process, analyse and visualize functional brain connectivity data while gaining knowledge about brain network science and brain network anatomy in healthy and clinical populations. The course will focus on functional magnetic resonance imaging (fMRI) and magnetoencephalographic (MEG) human brain data, but the covered approaches can be applied to many other types of brain imaging data and to other species. The course will also introduce the participants to the use of open datasets such as the Human Connectome Project and the Autism Brain Imaging Data Exchange.

Learning outcomes: After this course, the participant is able to

1. List the common functional human brain networks in clinical and healthy populations.
2. Explain methodological approaches, including their pitfalls, for assessing/estimating brain functional connectivity.
3. Analyse and visualize brain connectivity data.
4. Report and share results using online platforms such as github and neurovault.
5. Critically study scientific literature and evaluate new findings on brain connectivity.

Prerequisites: Statistics (NBE-E4030 or Becs-114.5501) and working skills on Matlab or Python. Prior knowledge in brain imaging methods or neuroscience is an advantage but not mandatory.

Level of the course: Master's and doctoral level. Helsinki University master or doctoral students can get credits from this course.

Study Material: Lecture slides, scientific articles. Book: Fornito, A., Zalesky, A., & Bullmore, E. (2016). Fundamentals of brain network analysis. Academic Press.

Pre-registration: Course is limited to 20 participants
https://www.webropolsurveys.com/S/2DCB5018BA20FE3C.par

Workload calculation:

Task	Hours	Assessment
A. Contact teaching (lectures and hands-on sessions)	28 h	20% (min 5)
B. Learning assignments* (all together) *a) Pre-task* *b) Reading* *c) Hands-on tutorials* *d) Tools for (brain-)data scientists* ____ **) These are tasks to be completed before and after each contact teaching session.*	36 h *4 h* *8 h* *12 h* *12 h*	25% (min 5)
C. Project work	40 h	30% (min 10)
D. Final essay	30 h	25% (min 5)
Total	**130 h (5 ECTS)**	**100% (min 25)**

Schedule:

Date	Time	H	Place	Topic
Tue 10/04/2018	9:00-12:00	4h	F175b Luentosali2	Human brain networks: What and why. Nodes, edges, and brain graphs.
Tue 17/04/2018	9:00-12:00	4h	F175b Luentosali2	Connectivity with fMRI: from preprocessing to networks. Tools for resting state and task connectivity.
Thu 19/04/2018	12:30-14:45	3h	F175b Luentosali2	Hands-on session with questions and answers.
Tue 24/04/2018	9:00-12:00	4h	F175b Luentosali2	Connectivity with MEG: from preprocessing to networks. Tools for resting state and task connectivity. *(guest lecturer: dr. Marijn van Vliet)*
Thu 26/04/2018	12:30-14:00	2h	F175b Luentosali2	Hands-on session with questions and answers.
Tue 8/05/2018	9:00-12:00	4h	F175b Luentosali2	Brain network science: from theory to practice. Hubs, clubs, and modules.
Tue 15/05/2018	9:00-12:00	4h	F175b Luentosali2	Statistical connectomics. Null models, permutations, machine learning.
Thu 17/05/2017	12:30-14:45	3h	F175b Luentosali2	Hands-on session with questions and answers.
t.b.c.	t.b.c.	-	-	Final short presentations of project work will happen during exam week (Mon 21 May - Sat 26 May 2018) or when agreed with participants.

Assessment Methods and Criteria: Contact teaching (20%), Assignments (25%), Project work (30%), Final essay (25%). No exam. Attendance is compulsory for at least 75% of the classes. Substitute assignments will be given in case of absence. Attendance is not compulsory for the hands-on sessions. Final short presentations of project work will happen during exam week (Mon 21 May - Sat 26 May 2018), date will be agreed with participants.

Grading: 1 (25%) - 5 (100%)

Academic integrity:
You are expected to adhere to Aalto Code of Academic Integrity. Academic dishonesty will not be tolerated in this class. Please familiarise yourself with the code of academic integrity and the consequences of not adhering to it. Specifically on plagiarism: plagiarism will result in a “0" grade for the plagiarized assignment, plus a deduction of 20% from the final course grade.

Students' ratings from previous version of this course:
Overall course assessment average score in 2017 was 4.3 (out of 5), with majority of students rating it “Excellent”. Most importantly, 12 out of 19 students have stated that they will strongly benefit from the things learnt on the course. Few students quotes from the 2017 feedback form:

- *A really great course! I enjoyed the interactive way of teaching and felt like I learned a lot.*
- *Combining neurobiology and theory with practical lab work was an excellent way of teaching the concepts. The course filled in an important gap between the neuron-level and systems-level.*
- *Teaching methods, content, everything started from very basics so it was quite nice to catch up tough things later. Many new tools, twitter conference, presemo etc were interesting things.*
- *I like the instant feedback throughout the course. The amount of breaks kept me engaged as well. Enrico's relaxed and enthusiastic teaching style was excellent, and made the topic a joy to learn.*