Tutorial: fMRI Analyses Explained

2 ECTS

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Course Level: Beginners/Intermediate

Requirements: This course will use SPM, which is a Matlab based toolbox for analyses of neuroimaging data. We will show you examples of how to write Matlab scripts so that you can do your analyses without going through the GUI. As such, prior experience with Matlab is recommended. The “Matlab Onramp” tutorial on https://matlabacademy.mathworks.com/ introduces you to the basic concepts of Matlab. This tutorial is free and you don’t need to have Matlab on your computer.

Summary: The idea of this course is to provide an intuitive approach to the analyses of functional MRI (fMRI) data. This course will combine weekly one-hour theoretical lectures taught by different advanced researchers, followed by two hours of practical sessions per week. Throughout the course, we will use clear examples to guide intuition and make the assimilation of theoretical concepts easy and accessible. We will also provide practical sessions on the analysis of functional imaging data using the graphical user interface (GUI) of the SPM software. In addition, we will give examples of basic MATLAB scripts and will show how to derive them from the GUI interface. Finally, we will address common pitfalls that are encountered during fMRI analyses. We aim to provide students with a solid understanding of the different steps involved in standard fMRI analysis pipelines and endow them with the confidence necessary to apply these methods in their own research projects. Each lecture will introduce the next step in fMRI analysis pipelines, and the practical sessions will allow students to gain hands-on experience using SPM and MATLAB. Our classes will thoroughly cover fMRI preprocessing steps as well as basic (and some more advanced) models of fMRI analyses.

Syllabus:
- Course Overview and Introduction to fMRI
- Experimental Design
- Realignment and Coregistration
- Normalization and Segmentation
- First Level Analyses – The GLM and the OLS
- First Level Analyses – Modelling Assumptions and Extending the Model
- First Level Analyses – Inference: Contrasts and Multiple Comparisons
- First Level Analyses – Design Efficiency
- Group Level Analyses
- Connectivity Analyses: Resting State and Psychophysiological Interactions
Evaluation:
- Participation to 80% of the course sessions is mandatory to get the credits
- Multiple choice quizzes and practical exercises during classes

Dates & Rooms
In light of the current situation, to guarantee adherence to social distancing rules, all lectures will take place in Zoom rooms. Practical sessions will be divided into Zoom breakout rooms, where students will be working in small groups on the practical exercises. A stable internet connection during the course is thus strongly recommended.

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<th>Lectures (Tuesdays)</th>
<th>Practicals (Thursdays)</th>
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<td>29 Sep - 10.30 - 11.30</td>
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Course Materials
Course materials will be stored on the UNIL e-learning platform Moodle. You can access by doing the following:

- go to “https://moodle2.unil.ch”
- log in with your institutional/university address
- click on "Faculté de Biologie et de Médecine" > "Ecole doctorale / doctoral school" > "Lemanic Neuroscience Doctoral School"

The materials are stored under “Tutorial: fMRI Analyses Explained”. Please use the self-enrollment method to access them.

Registration
There needs to be a minimum of 6 registrations for the course to take place. The course is limited to 12 participants and registrations will be considered in a first come first served basis. Registration is open until the 31st of August 2020 by writing an email to indscourses@gmail.com (with your supervisor in copy) and stating the course title as subject. In case there are too many applicants, places will be given on a “need for PhD project” basis...