UNIVERSITÄRE PSYCHIATRISCHE DIENSTE BERN

GHS Advanced functional neuroimaging analysis

Organizer /Lecturer: PD. Dr. med Yosuke Morishima, PhD

Time: 16th (Mon) and 17th (Tue) of January, 2023
9:15 – 12:00, 13:00 – 16:00

Location: Conference room, Laborgebäude, UPD Waldau
Bolligenstrasse 111, 3000 Bern

Registration and contact:
Students at University of Bern should register from the KSL systems.
All other attendees should register to
PD. Dr. med Yosuke Morishma, PhD
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Course language: English

Course description:
Functional MRI is an inevitable approach to understanding human brain functions and is used in basic cognitive neuroscience as well as clinical neuroscience. It has been widely used but requires proper implementation of data acquisition as well as data analysis. This course aims to guide designing your fMRI studies, and a wide variety of topics is covered in the course as listed below. In particular, the course emphasizes practical issues around fMRI studies: Choice of MR sequence, task optimization for fMRI study, pitfalls of preprocessing, efficient batch scripting, pros and cons of connectivity analysis, data quality control, and more. Therefore, the target audience is PhD students and postdocs with minimal experience with fMRI approaches. The SPM toolbox, including external toolboxes, is mainly used during the course, but FSL and Freesurfer are also briefly covered during the lectures. The course will not cover diffusion-weighted imaging.

Following topics will be included

- Rationale to choose MR sequences
- fMRI design
- Preprocessing
- VBM
- Group level statistics
- Batch scripting
- Functional and effective connectivity analysis
- Brain network dynamics analysis
- Data harmonization for multi-center studies
- Quality control / quality assurance

Credit:
The Graduate School of Health Science of the University of Bern grants 1 ECTS.

Grading:
Pass or fail
Full participation in the course and submission of homework assignments are required

Prerequisite

Minimal knowledge of fMRI and its analysis.
If you don't have any experience in fMRI and fMRI analysis, try data processing with the following sample data sets at the SPM website.
https://www.fil.ion.ucl.ac.uk/spm/data/auditory/ (Preprocessing, 1st level analysis)
https://www.fil.ion.ucl.ac.uk/spm/data/attention/ (Connectivity analysis)

Suggested reading and watching list

Methods for dummies
https://www.fil.ion.ucl.ac.uk/mfd_archive/index.html

SPM course slides
https://www.fil.ion.ucl.ac.uk/spm/course/

Basic operation of SPM
SPM official manual (included in the toolbox or download from the link below)
https://www.fil.ion.ucl.ac.uk/spm/doc/manual.pdf
Andrew Jahn's YouTube videos
https://www.youtube.com/c/AndrewJahn/playlists

Mathematical theory behind fMRI analysis
Statistical Parametric Mapping: The Analysis of Functional Brain Images,
Edited by William Penny, Karl Friston, John Ashburner, Stefan Kiebel, Thomas Nichols
Academic Press, 2007
Older versions of the book PDF are available from
https://www.fil.ion.ucl.ac.uk/spm/doc/

Some articles worth to read
Botvinik-Nezer es al., Variability in the analysis of a single neuroimaging dataset by many teams. Nature, 2020
Eklund et al., Cluster failure: Why fMRI inferences for spatial extent have inflated false-positive rates, PNAS, 2016
Soares et al., A Hitchhiker's Guide to Functional Magnetic Resonance Imaging, Front. Neurosci., 2016

Venue map