Methods & models for fMRI data analysis – HS 2016

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Translational Neuromodeling Unit

Universität Zürich
ETH Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich
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FAQs

Credits: 6 points (ETH), 3 points (UNI, Neuroeconomics)
Attendance requirements: 12/14 presentations

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!!! Check the rules of the program you have signed up for !!!
UZH students are enrolled for the course through the Department of economics → Enrolment for course = sign up for exam!!! Withdraw your official enrolment if you do not want to take the exam!
Exam

• Exam for medical students (first half of course):
  – 15.11.2016: 10:00– 11:30
  – (36 MC questions, 90 min time)
  – Pass is required to get credit points

• Exam for all other students:
  – 10.01.2017: 13:00– 14:30
  – (36 MC questions, 90 min time)
  – Pass is required to get credit points

!!! Check the rules of the program you have signed up for !!!
UZH students are enrolled for the course through the Department of economics → Enrolment for course = sign up for exam!!! Withdraw your official enrolment if you do not want to take the exam!
What's next?

How to design the experiment?
Terminology of fMRI

- subjects
- sessions
- runs
- single run
- volume
- slices

TR = repetition time
Time required to scan one volume

voxel
Statistical Parametric Mapping (SPM)

- Image time-series
- Kernel
- Design matrix
- Statistical parametric map (SPM)

Flowchart:
- Realignment → Smoothing → General linear model → Statistical inference
- Normalisation → Template → Parameter estimates
- p < 0.05

Key terms:
- Realignment
- Normalisation
- Template
- Kernel
- Design matrix
- Parameter estimates
- p < 0.05
- Statistical inference
- Gaussian field theory
- General linear model
- Statistical parametric map (SPM)
- Image time-series
SPM12

- the history
- the program
- the spirit
SPM online bibliography

http://www.fil.ion.ucl.ac.uk/spm/

1. A.P. Holmes, Statistical Issues in Functional Brain Mapping
   PhD thesis, University of Glasgow, December 1994

   of random field theory and permutation methods for the
   statistical analysis of MRG data. NeuroImage, 23:383-394,
   2005.

   Nichols. Non-Stationary Cluster Size Inference with Random

   field theory. In R.S.J. Frackowiak, R.J. Frith, C. Frith, R. Dolan,
   K.J. Friston, C.J. Price, S. Zeki, J. Ashburner, and W.D. Penny,
SPM web site

- Introduction to SPM
- SPM distribution: SPM99, SPM2, SPM5, SPM8, SPM12
- Documentation & Bibliography
- SPM email discussion list
- SPM short course
- Example data sets
- SPM extensions

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    - Usage queries, theoretical discussions, bug reports, patches, techniques, &c...
SPM documentation

peer reviewed literature

SPM course notes, SPM book & SPM manual

algorithm descriptions, code annotations, pseudo-code

online help & function descriptions