Structural and functional brain MRI: overview of image analysis methods

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1.5 ECTS

Course dates
- Tuesday April 20, Thursday April 22, Tuesday April 27, Thursday 29, 
  Tuesday May 4, Wednesday May 5
- Exam on Tuesday May 18
- Always from 9h-11h30

Course location  Online live streams (details tba). The course has an interactive format, 
please keep your camera switched on, the microphones should yet be off during the presentations.

Objectives
- Overview on structural and functional brain image analysis methods
- Understanding of what one can “derive” from brain MR acquisition 
towards the application of interest.
- Identify several tools to go from neuroimaging (observations) to 
meaningful maps of biomarkers
- Be able to identify the major steps and pitfalls in the design of a 
prospective MR brain study.

Pre-requirements  We encourage students who are curious to better understand the image 
processing methods behind widely used structural and functional image 
analysis methods to participate to this course.

Content of course sessions
- Tuesday April 20, 9h-11h30
  1.  Introduction to the course & Image Registration – 45 min
  2.  Segmentation (atlas-based, machine learning) - 45 min
      Q/A – 30 min

- Thursday April 22, 9h-11h30
  3.  Diffusion MRI (basics, reconstruction and scalars) – 45min
  4.  Intro to functional MRI (I) - 45 min
      Q/A – 30 min

- Tuesday April 27, 9h-11h30
  5.  Intro to functional MRI (II) - 45 min
  6.  Brain morphometry (I) – 45min
      Q/A – 30 min
• **Thursday April 29, 9h-11h30**
  7. Brain morphometry (II) – 45min
  8. Group-wise analysis: voxel-based analysis structural & functional (I) – 45 min
  Q/A – 30 min

• **Tuesday May 4, 9h-11h30**
  10. Group wise morphometry – 45 min
  Q/A – 30 min

• **Wednesday May 5, 9h-11h30**
  11. Group wise - machine learning: classification / diagnosis - 45 min
  12. Q/A – Assignments of the journal club – 45 min

• **Tuesday May 18, 9h-11h30**
  Journal club sessions

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**Course materials**

- Slides (+ voice), papers, websites, included in MOODLE
- Go to "https://moodle2.unil.ch"
- Log in with your institutional address (unil, chuv, epfl)
- Click on "Faculté de Biologie et de Médecine" > "École doctorale / doctoral school" > "Lemanic Neuroscience Doctoral School"
- Course materials and papers will be stored under "Structural and functional brain MRI: overview of image analysis methods" (Enrollment key: SF-MRI2021)
- In case of Moodle enrollment problems please contact Ulrike.toepel@unil.ch

**Evaluation**

Journal Club on a paper the students chose related to the methods explained during the course. One student per paper (if requested groups of two).
Presentation of approx. 10 min + 5 min questions.

**Registration**

The course is limited to 16 participants. Register before April 1 by writing a mail to lndscourses@gmail.com (with your supervisor in copy) and stating the course title as subject.