**COURSE DESCRIPTION (GENERAL DESCRIPTION)**

**Course title: Magnetic Resonance Imaging (MRI) Data Analysis**

**Course code: PSZM21-MO-KOGN-104**

**Head of the course: Keresztes Attila**

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| **Aim of the course** |

**Aim of the course** *Building on minimal theoretical introduction necessary, the course aims to transfer skills that will enable students to perform univariate analyses of fMRI data on their own, and to have the capacity to further their fmri methods skills on their own. We will strongly rely on the freely available FSL program and FSL’s own freely available resources to help students learn importing data, preprocessing of fmri data, and preform full brain as well as region of interest based fmri analyses on existing data. On the go, the course will also provide a primer to shell programming.*

**Learning outcome, competences**

knowledge:

* **Conceptual basics of functional and structural magnetic resonance imaging of the human brain using “FMRIB Software Library” (FSL)**

attitude:

* Nincs

skills:

* **Practical basics of functional and structural magnetic resonance imaging of the human brain using “FMRIB Software Library” (FSL)**

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| **Content of the course** |

**Topic of the course**

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| These will be the analyses steps covered:  0. Basics of MRI and fMRI, as well as shell scripting  1. convert ima to nifti  -drag and drop  -run conversion in terminal for one file  -write shell wrapper script  -troubleshoot and run script  2. Intro to FSLeyes - overlays, thresholding, histograms, Using atlases, and for fmri: time series, and movie option  3. move and rename niftis  -write and run script  -view niftis using slicesdir or fsleyes  4. bet T1 images  -vary f in .2s visualize them using slicesdir and fsleyes, use transparency and colouring in fsleyes  -write script to bet all images  -check all to see if you are satisfied with them  5. fslutils  -fslinfo  -create mask from HC atlas  -save mask  -use fslinfo for range  -use fslmaths to save binary mask  -inspect result in fsleyes  6. fmri analyses with FEAT  -1st Level: 1 Participant, 1 Run  -2nd Level: 1 Participant, 3 Runs’ average  7. create feat scripts to run several feat jobs in parallel or one after the other  7.1. creating one template file from a 1st level design file of 1 Participant’s 1 Run  7.2. creating 4 (Participants) X 3 (Runs) = 12 design files.  7.3. Testing one out  7.4. Run all |

**Learning activities, learning methods**

* This course will be held in six online sessions: one 1-hour entry session and five 3-hour workshop sessions on dates we agree with all participants. A maximum of 10 participants can attend.
* The selected days of the workshop will be agreed @general channel of the course’s Teams site.
* The course will be fully online.
* Most of the materials are pre-recorded, however we are going to provide immediate assistance during the 3-hour timeslots agreed upon for the workshops. You must attend these sessions, and it is strongly encouraged to use these times for solving your assignments (more information below).

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| **Evaluation of outcomes** |

**Learning requirements, mode of evaluation and criteria of evaluation:**

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* **Preparation for the course**

For this course you need to have a working computer, with the minimal system requirements of:

* Windows 8 or above, MAC or Linux
* Dual-core CPU
* min. 4GB RAM
* minimum 10 GB free space
* **Participation at workshop sessions**
* 1 week before every session, we will upload the course material for the given session. These are tutorial slides and videos, that will walk you through steps you will need to do make to complete your assignment.  
  Assignments will be handed out on Teams, by the “Assignment” function at the start of each session. You have 1 week to solve these assignments, but ideally you we would like you to finish during the given timeslot for the session.
* At all sessions you will have to be in an online call for the duration of the session or until you submit your assignment for that session, with your camera turned on. These sessions serve the purpose of troubleshooting and clarify details of the analyses you are going to perform. We will assist you with immediate, live help via chat, calls, screen share, and remote control (if you agree). If you can’t finish your assignment during these hours, you can still submit it until the deadline.
* By the next occasion, you will receive written feedback from us, through comments and the Feedback section of the “Assignment” on Teams. You will need to revise your work based on our feedback to receive maximum points for the Assignment.

Mode of evaluation:: ………….

* **Requirements**
* *Be present at the very first, shorter consultation.*
* *Be present at every 3-hour workshop session, and complete your tasks by the time the session ends (20% contribution to your grade).*
* *On each occasion you will need to complete assignments (minor programming and analysis tasks) individually. You will have 1 week to upload your solutions, and another 1 week to revise them based on our feedback. If you hand in your assignments in time, and implement our suggestions for change, you will receive maximum point (this accounts for 40% of your grade).*
* *At the end of the semester, you need to write a 2-page methods and results section of the analyses performed at the workshop. After we reviewed your work, you will need to implement our feedbacks and corrections (this accounts for another 40% of your grade).*

Criteria of evaluation

* See above.

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| **Reading list** |

**Compulsory reading list**

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**Recommended reading list:**

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