Translational Research Center, UPD, 3000 Bern 60

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**UNIVERSITÄT
BERN**

Interfakultärer Schwerpunkt
Klinische Neurowissenschaften

Bern, January 9th 2020

GHS-Functional Neuroimaging in Clinical Neuroscience at 3T and 7T

Curriculum Course 2020: March 16th – 18th 2020

Dear scientist

On behalf of the Graduate School for Health Sciences (GHS) of the University of Bern we welcome you to the Block course "Functional Neuroimaging in Clinical Neuroscience at 3T and 7T" Participants of the course for the curriculum in GHS will earn a total of 1 ECTS.

We are pleased that lecture will be held by Prof PhD Kay Jann, USC, Los Angeles: the expert in ultrahigh filed fMRI.

Please note that the order of presentation of the different topics might change without announcement.

The course is free. However, we invite you to register to the course until March, 1th, 2020 by sending an email to: andrea.federspiel@upd.unibe.ch

We are looking forward to seeing you.

Kind regards

Prof. A. Federspiel, PhD.

Prof. Dr. med. T. Dierks
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GHS-Functional Neuroimaging in Clinical Neuroscience

Organizers	[1] Prof A. Federspiel, PhD [2] Prof K. Jann, PhD [1] Prof S. Walther, MD [1] Prof T. Dierks, MD [1] M. Grieder, PhD [3] R. I. McKinley, PhD

[1] University Hospital of Psychiatry and Psychotherapy, Translational Research Center, University of Bern,

[2] University of Southern California, USC Stevens Neuroimaging and Informatics Institute Keck School of Medicine of USC, Los Angeles, USA

[3] Neuroradiology Department of Inselspiel, Support Center for Advanced Neuroimaging, University of Bern

Location

UPD, University Hospital of Psychiatry and Psychotherapy
Translational Research Center
Lecture Hall "Auditorium Wölfli"
Bolligenstrasse 111
CH-3000 Bern

Schedule

March 16th 2020	Morning:	9:00 – 12:00
	Afternoon:	13:00 – 17:00
March 17th 2020	Morning:	9:00 – 12:00
	Afternoon:	13:00 – 17:00
March 18th 2020	Morning:	9:00 – 12:00

Contact andrea.federspiel@upd.unibe.ch

Phone: 031 9309371

Course Language English

Course Level Beginners to advanced users in the field of
functional magnetic resonance imaging (fMRI) and MRI in general

Practical MRI Datasets will be analysed and discussed during the sessions.

Aim of the Course At the end of the workshop, participants should be able to:

- understand the manifold methods of MRI/fMRI
- understand the basic physical principles of MRI
- conduct own fMRI analysis
- understand the benefit of fMRI techniques to clinical neuroscience
- understand the terminology used in common MRI/fMRI publications and articles

Timetable for trains in Bern
http://www.sbb.ch/en/home.html
Type in the destination "Bern, UPD Waldau" in order to get right connections to the University Hospital.

How to reach the University Hospital of Psychiatry in Bern?
https://www.google.ch/maps/place/Psychiatrische+Universit%C3%A4tsklinik/@46.964115,7.4801286,15z/data=!4m5!
1m2!2m1!1supd,+bolligenstrasse+111!3m1!1s0x0000000000000000:0xa149b25f28e167ed

Location at the University Hospital of Psychiatry, Bolligenstrasse 111, Bern

Lecture Hall "Auditorium Wölfli" is located in Building Nr 1 (red circle). That is at the main entrance.
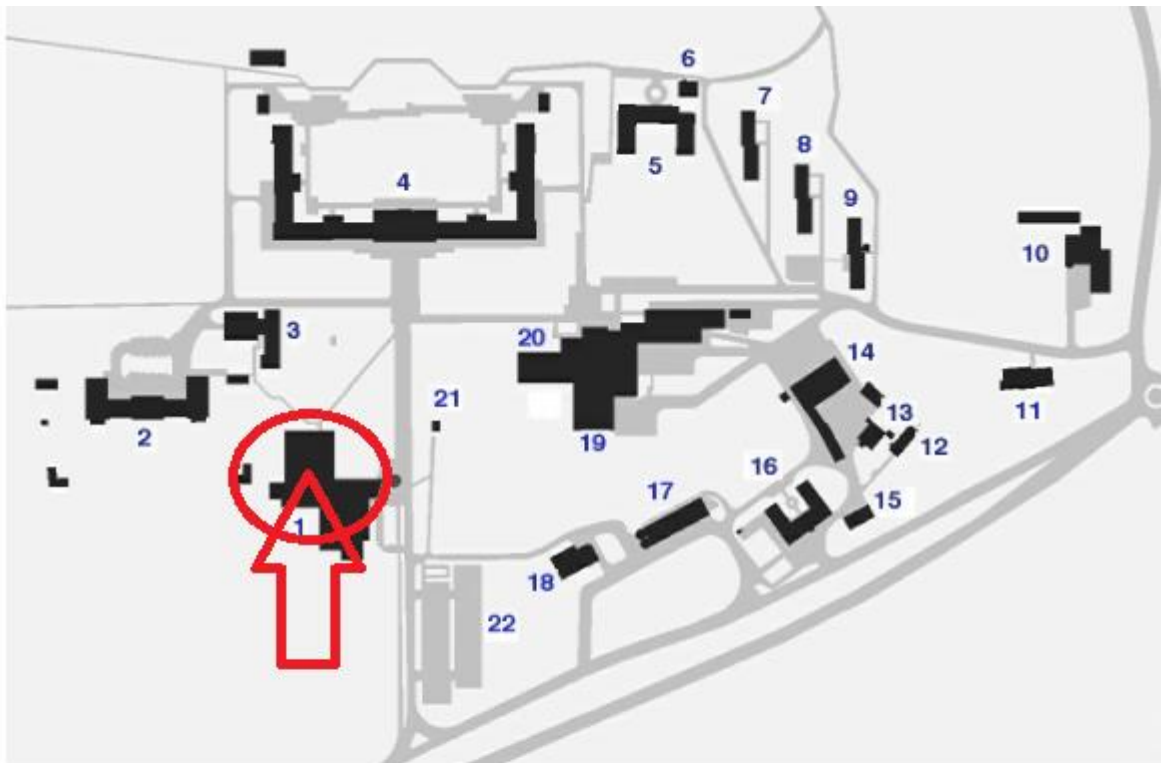
1 Aufnahmeklinik	6 Althaus-Stöckli	11 Grünthalhaus	16 Pfrundhaus	21 Minigolf
2 Alte Klinik	7 Personalhaus C	12 Kapelle	17 Holzplatz	22 Parkplatz
3 Laborgebäude	8 Haus B	13 Schlössli	18 Wunderbar	
4 Zentralgebäude	9 Haus A	14 Kurhaus	19 Wirtschaftsgebäude	
5 Althaus	10 Gärtnerei	15 Kornhaus	20 Personalrestaurant	

Part A   **Principles of functional magnetic resonance imaging (fMRI)
(A. Federspiel / K. Jann, USC, Los   Angeles)**

Preprocessing: Coregistration, Normalisation, Cortex based inter-subject alignment

Statistical testing: GLM, Factorial design, Predictors, Statistical thresholding, false discovery rate, ROI analysis, Random Effects Analysis, ANCOVA Models, Independent component analysis, Bayesian analysis Granger Causality, Functional Network Analysis,

Design strategies: Hypothesis-driven approach, Data-driven approach, event-related design, block design, mixed design, Functional and effective connectivity analysis and Cerebral Blood flow (CBF) measure with Arterial Spin Labeling (ASL).

Part B   **Advanced Neuroimaging methods in fMRI at 3T and 7T (K. Jann, USC, Los Angeles)**

Ultrahigh Field (UHF) fMRI experiments, laminar BOLD fMRI, benefit of UHF in clinical neuroscience, Clinical 7T: are we there? Structural and functional advantages of UHF. ASL at 7T: benefit and pitfalls.

Part C   **Application of fMRI paradigm to clinical questions (S. Walther)**

Various MRI-techniques allow for exciting investigations of how abnormal brain structure and functions shapes aberrant behaviour. Explore the hidden world of psychiatric symptoms such as acoustic hallucinations in Schizophrenia with fMRI. Explore signs, such as abnormal motor behaviour in psychiatric disorders by perfusion MRI and fMRI. Highlight processing of emotion stimuli by fMRI. More examples of the link between neuroimaging and the pathophysiology of psychiatric disorders will be presented and discussed.

Part D   **Application of fMRI paradigm to basic neuroscience (M. Grieder)**

Various MRI-techniques allow for exciting investigations of how abnormal brain structure and functions shapes aberrant behaviour. Explore the hidden world of psychiatric symptoms such as acoustic hallucinations in Schizophrenia with fMRI. Explore signs, such as abnormal motor behaviour in psychiatric disorders by perfusion MRI and fMRI. Highlight processing of emotion stimuli by fMRI. More examples of the link between neuroimaging and the pathophysiology of psychiatric disorders will be presented and discussed.

Part E   **Basic principles of magnetic resonance (MR) physics (A. Federspiel)**

Laws of conservation in physics, basic forces in physics, electromagnetism, particle physics, nuclei, quantum physics, relaxation properties, Bloch equations, imaging

Part F   **Deep Learning: principles and applications in neuroscience (R.L. McKinley / A. Federspiel)**

Principles and application of deep learning in clinical neuroscience. Theoretical and practical part with fMRI Dataset.

Note:

- All these theoretical parts will include practical parts in the sense of "Hands on MRI/fMRI Dataset"

- We encourage participants to bring their own MRI/fMRI Dataset that could be analysed or discussed during the practical sessions of the workshop.

- The MRI/fMRI Dataset would be ideally on DICOM Format (*.dcm) or on NIfTI Format. Please do also remember to bring your functional protocol of the fMRI dataset in order to build the 1-level analysis.

- For the "Hands on MRI/fMRI Dataset" we will work on Matlab platform. However, we are also able to switch to R-project if needed.

- "Interaction" will be the basis of the workshop: the more you interact-the more everybody learns!

- Participants are also encouraged to suggest their own topic in case this is not covered by the list presented above.

- We will follow the standard rules for distributing the "Certificate of attendance".
  At the beginning of the course I will present the participant list, which should be signed by each student.
  More in detail, the "Certificate of attendance" will be distributed at the end of the second day of the course only if the participant was present during the course.