3rd international Lead-DBS workshop 2019, Hamburg, Germany

– Satellite Workshop, Jahrestagung der Sektion Stereotaxie und Radiochirurgie –

The aim of this workshop is to give a basic overview on a state-of-the art neuroimaging pipeline for the context of deep brain stimulation (www.lead-dbs.org). The workshop will cover the processes of precise electrode localizations, multispectral spatial normalization, brain shift correction, and related topics.

TARGET AUDIENCE & PREPARATION

Ideally, participants should have at least minimal pre-existing experience with the use of MATLAB and Lead-DBS. It is recommended that participants try the software on their own using online resources (see walkthrough videos, manual and help-forum / slack channel on the website) in preparation for the workshop. Of note, Lead-DBS is not intended for clinical use but instead is a research tool that allows flexible and powerful analyses to empower scientific studies.

For best experience, it is important that participants bring their own laptops with MATLAB >R2015b and the newest version of Lead-DBS preinstalled. Additionally, SPM12 is needed, optionally, 3D Slicer software. ***Please see the last page for specific instructions.*** *We recommend at least 8 GB, best 16 GB of RAM. Optimally, participants are expected to bring their own test datasets (pre- and postoperative imaging data) of DBS patients. Please see last page for further information.*

SUGGESTED READING

As mentioned, best preparation is to walk through the basic steps of Lead-DBS before the workshop. Lead-DBS software can be freely downloaded from the website. The following manuscripts give an up-to-date overview of analyses that are currently possible using Lead-DBS:

- Lead-DBS v2 manuscript (Horn, Li et al. 2018)
  - This manuscript gives a good overview on the current processing pipeline
- Example of mapping electrophysiology to anatomy (Geng et al. 2018)
  - This manuscript is an up-to-date example of the subcortical electrophysiology mapping approach.
- Example study for connectivity benefit mapping (Horn et al. 2017)
  - This manuscript is the first example of the connectivity benefit mapping method implemented in Lead-DBS.

We are looking forward to meeting you in Hamburg!

Best regards, Friederike and Andy

PROGRAMME

	21st February 2019	
09:00 AM		*Arrival / Welcome / Coffee*
		Potential installation questions, setup of datasets
10:00 AM	Andreas Horn	Electrode localizations with Lead-DBS: Introduction and Examples
11:15 AM	Andreas Horn	*Linear Deformations and Basics in Volumetric Imaging* Hands-On Session: Co-registrations in Lead-DBS
12:15 PM	Andreas Horn	*Function & anatomy of the subthalamic region, cortex-basal-ganglia loops and specialized MRI sequences for imaging the basal ganglia*
1:15 PM		*Lunch Break*
2:15 PM	Andreas Horn	*Nonlinear Deformations, Atlases, Spaces and Advanced Concepts* Hands-On Session: Spatial Normalization
3:00 PM	Friederike Irmen	*Electrode Reconstructions, VTA modeling* Hands-On Session: FEM based VTA model in Lead-DBS
3:45 PM	Friederike Irmen	*Troubleshooting: What to do if co-registrations or normalizations fail* Hands-On Session: CT / MR Fusions using 3D Slicer
4:00 PM		*Coffee break*
4:30 PM	Andreas Horn	*Connectomic Deep Brain Stimulation*
5:00 PM	Andreas Horn	*Group Analyses with Lead-DBS / Subcortical electrophysiology mapping*
5:45 PM		*Clearing of open questions, re-cap / individual help on localizing DBS electrodes. In this session, processes that were explained too fast for individual participants may be reiterated*
6:15 PM		*Wrap up / End of workshop*

Dear Participants,

for best experience during the course, please bring a laptop and if you can, prepare the following:

The latest **Lead-DBS** can be downloaded here:
http://lead-dbs.org/release/download.php?id=lead_dropbox
The latest **SPM12** can be download from here:
http://www.fil.ion.ucl.ac.uk/spm/download/restricted/eldorado/spm12.zip
An **example dataset** to be processed during the course can be downloaded here:
https://filedn.com/lsPIJ4ragTWjjmV6PvlDQLu/data/course_example.zip

System requirements of the computer:

- Better to have a fast CPU, e.g. Intel Core i5 at least
- Better to have large RAM, 8GB at least. To run ANTs registration, one would need at least 16GB RAM.
- 64-bit OS
- MATLAB version > R2015b, newer versions preferable
- Matlab Statistics & Machine learning, as well as Image Processing toolboxes

For Windows users:

- It's recommended to install the runtime libraries: https://www.lanzous.com/i1j69id (all-in-one installer)

Other useful software:

- **Windows**
  - MRIcron: https://github.com/neurolabusc/MRIcron/releases/download/v1.0.20180614/mricron_windows.zip
  - ITK-SNAP: https://master.dl.sourceforge.net/project/itk-snap/itk-snap/3.6.0/itksnap-3.6.0-20170401-win64.exe
  - 3DSlicer: https://download.slicer.org/bitstream/738956
  - TrackVis: http://trackvis.org/bin/TrackVis_setup_v0.6.1.exe (**free but license needed**, register here: http://www.trackvis.org/download/)
- **Mac**
  - MRIcron: https://github.com/neurolabusc/MRIcron/releases/download/v1.0.20180614/MRIcron_macOS.dmg
  - ITK-SNAP: https://master.dl.sourceforge.net/project/itk-snap/itk-snap/3.6.0/itksnap-3.6.0-20170401-MacOS-x86_64.dmg
  - 3DSlicer: https://download.slicer.org/bitstream/738961
  - TrackVis: http://trackvis.org/bin/TrackVis_v0.6.1_x86_64.dmg (**free but but license needed**, register here: http://www.trackvis.org/download/)