Centre de Recherche
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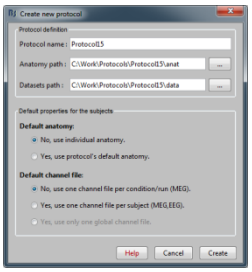
Psychologie et Neuroscience

MEMORY:	Close all your applications, including web browsers
INTERNET:	Internet connection needed for the MNI normalization

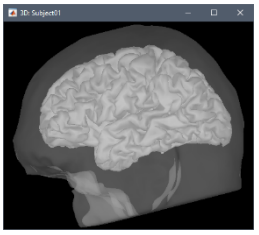
9:00-9:30 Onsite assistance in installing the material for the training session
Install SPM12 plugin



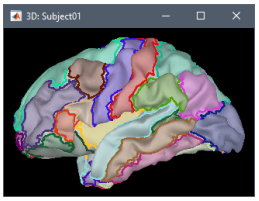
9:30-9:45 Lecture: Brief introduction to Brainstorm

9:45-10:30 Import anatomy 45min

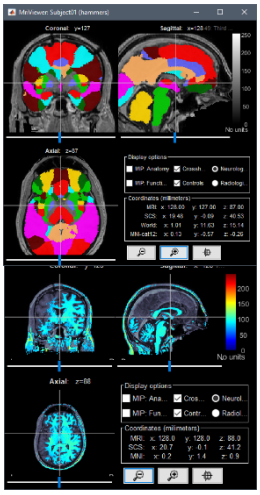
- Start Brainstorm: from Matlab or stand-alone
- Create new protocol "WIRED2024":
  No, use individual anatomy
  No, use one channel file per acquisition run
- Create new subject:
  Introduction to database explorer: protocols, exploration modes, popup
  Switch to anatomy view: 1st button above database explorer
  Right-click on protocol top node > New subject: Subject01
- Import T1 pre-implantation + CAT12 segmentation:
  Right-click on Subject01 > **Import anatomy folder (auto)**
  Select format: **CAT12**
  Select folder: workshop_cuttingeeg/derivatives/cat12/sub-01_ses-pre
  Number of vertices: 15000
  Coordinate systems: MRI, SCS, World, MNI



- How to run CAT12 segmentation from Brainstorm
- Display cortex:
  Close figure, double-click on central_15002V (low-resolution central surface)
  3D figure: Rotation, zoom, predefined views
  Surface tab: Smooth slider, sulci, edges
  Scout tab: Parcellations of the surface vertices



- Volume parcellations: AAL3, Hammers, tissues
  Adjust transparency (Data options), open different atlases
- Import T1 post-implantation:
  Right-click on Subject01 > **Import MRI** (File Format *MRI: NIfTI*)
  Select file:
  workshop_cuttingeeg/sub-01/ses-postimp/anat/sub-01_ses-postimp_T1w.nii.gz
  Apply transformation: **YES**
  How to register: **IGNORE** (volumes are already co-registered with SPM)
  Reslice the volume: **YES** (so we can overlay them)
  Surface tab: Adjust threshold with slider "Data options: Amplitude"



- Rename the volumes *MRI* → **T1pre** and *sub-01_ses-postimp_T1w_reslice* → **T1post**
- **Close all**: Big cross on the top-right, close all the figures and empty memory

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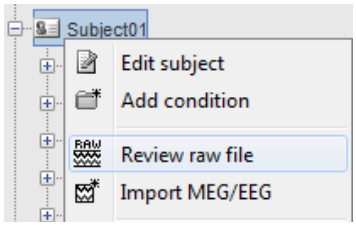
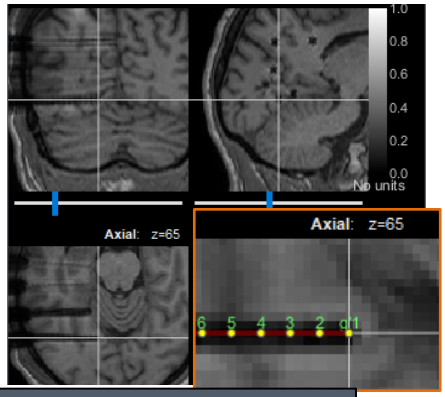
10:30-11:00 SEEG contact positions 30 min



- Switch to functional view : 2nd button above database explorer
- Create link to SEEG recordings:
  Right-click on Subject01 > **Review raw file**
  Select format: **SEEG: Deltamed/Micromed/…**
  Select file: sub-01/ses-postimp/ieeg/sub-01_... _ieeg.eeg
  Double click on the channel file: Missing 3D positions

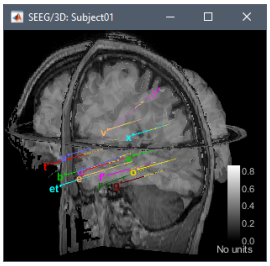


- Mark electrode **g '**:
  Right-click on channel file > MRI registration > Edit: **T1post**
  Tab iEEG: Select **g '**: Model : **DIXI D08-12AM** Microdeep
  Set tip: [X=115, Y=64, Z=65] (MRI coordinates)
  Set entry: [X=76, Y=64, Z=64]
  Menu Contacts > Save modifications
- Contacts > Compute atlas labels
  File selection: Cancel (do not save) / Keep default options

SEEG contact labels

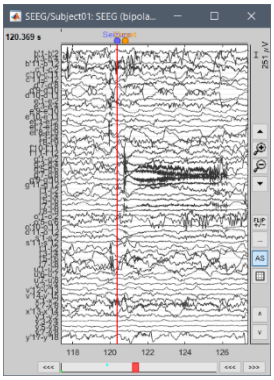
Channel	SCS	aal3	hammers	tissues_cat12	Schaefer2018_100_7net (MNI-cat12)
g'1	[-46.734,12.724,33.596]	Left Lingual gyrus	OL lingual gyrus L	Gray	Vis_3 L
g'2	[-46.713,16.224,33.526]	Left Lingual gyrus	OL lingual gyrus L	White	Vis_3 L
g'3	[-46.692,19.723,33.455]	Left Lingual gyrus	OL lingual gyrus L	White	Vis_3 L
g'4	[-46.671,23.222,33.385]	Left Lingual gyrus	OL lingual gyrus L	White	Vis_2 L
g'5	[-46.649,26.721,33.315]	Left Lingual gyrus	OL lateral remainder occipital lobe L	Gray	Vis_2 L
g'6	[-46.628,30.220,33.244]	N/A	OL lateral remainder occipital lobe L	White	N/A

- Import positions for all the electrodes
  Right-click on channel file > Add EEG positions > Import from file
  Select format: **EEG: BIDS electrodes.tsv, subject space mm**
  Select file: sub-01/ses-postimp/ieeg/..._**space-Other**_electrodes.tsv
  Scaling factor: 1
  Double-click on channel file, Move slices, Add cortex from Surface tab

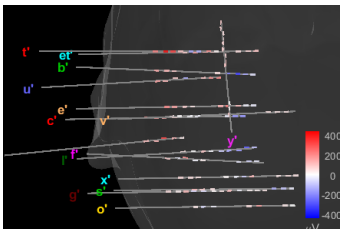


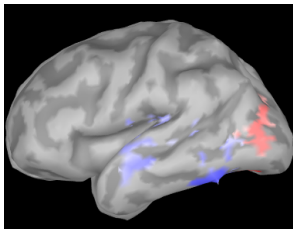
11:00-11:15 Review the recordings 15 min

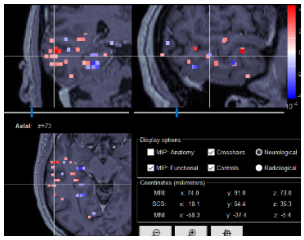
- Review SEEG: Right-click on "Link to raw file" > SEEG > **Display time series**
  Display in columns: Button [~] in the Record tab
  Amplitude: Buttons and shortcuts, Display menu
  Time: Display windows of **10 seconds**, Scroll with F3, Auto-Scale button
  Select bad channels (o'1) + right click > Channels > **Mark selected as bad**
  Montages: **SEEG (Bipolar 1)** - shift shortcuts
  Online filters
  Markers: seizure

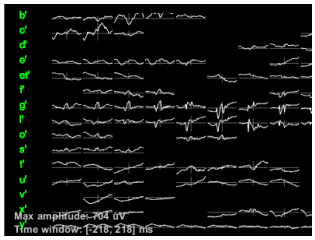


- Right-click on "Link to raw file" > SEEG > **2D Layout**
- Change the window layout to "Tiled"
- Other menus: **Display on cortex, Display on MRI (MRI Viewer), 3D Electrodes (Head)**

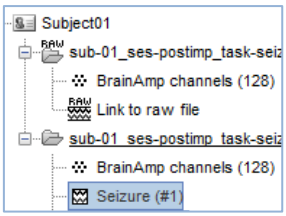




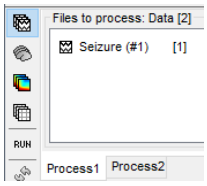




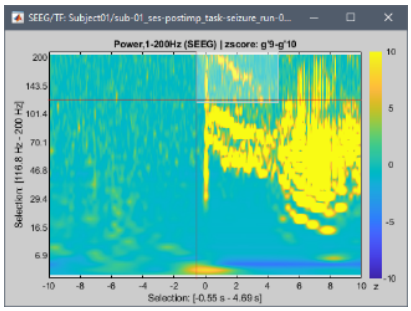
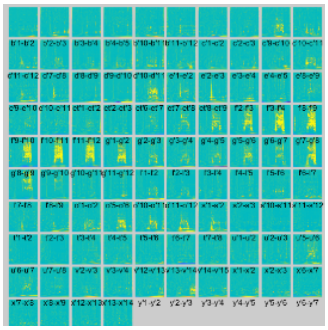
Time-Frequency decomposition (OPTIONAL)



- Import seizure:
  Right-click on “Link to raw file” > Import in database
  Use events: **Seizure**, Epoch time: **[-10000, +10000] ms**
  NO Remove DC offset
  Do **NOT** select: Create a separate folder for each event type



- Apply bipolar montage:
  Drag and drop the imported file in the Process1 box
  Run > Process Standardize > **Apply montage**:
  Montage name: **Subject01: SEEG (bipolar 2)**
  Create new folders: **YES**



- Time-frequency decomposition and normalization
  Frequency > **Time-frequency (Morlet wavelets)**:
  Sensor types: **SEEG** (or empty → apply to all channels)
  Log 1:40:200, Central frequency: **1Hz**, Time resolution: **10s**
  Pile up another process
  Standardize > **Baseline normalization**:
  Baseline: **[-7.5, -2.5]** s, **Z-score**, **Overwrite**
- Run, right-click on result > All channels
- Look for the highest frequency band with significant activity:
  Hypothesis: the closest to the seizure onset zone, the highest the frequency
  Smooth display
  Set colormap max to [-10,+10]z (0.1 * 10^2)
  Change colormap to Parula