

0. Setup

Initialization:

- FieldTrip top-level folder for ft_defaults.m
- MEGneto top level for megne2setup.m
- SPM T1 template visible

- project_path
- analysis_name
- rawdata_path
- mri_path
- overwrite

MATLAB input

- Run ft_defaults.m to add the right subfolders within FieldTrip.
- Create directories for project
- Initialize JSON config file

megne2setup.m

paths (struct)

out

1,2. Processing

fcp_1_TaskEpoching.m

- 1. Setup**
 - Read in config settings
 - Load and match PIDs from MEG and MRI folders
 - Create list of subjects with full sets of data
 - 2. Plot triggers**
 - Generate and save plot of event triggers
 - 3. Epoch continuous data into trials**
 - Set up trial definitions for epoching
 - Epoch events list to define time windows corresponding to each trial and overall number of trials; save to config
 - 4. Head motion**
 - Identify trials with excessive head motion
 - Reject those trials, save filtered version
 - 5. Artifacts**
 - Check for muscle, jump artifacts
 - Reject those trials with artifacts, save filtered version
 - 6. Bad channels**
 - Identify and save list of bad channels
 - Throw warning if there are many
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- Outputs**
- Plots:
 - Triggers for each event type
 - Head motion visualization
 - Epochs (into fcp_1_output JSON):
 - All trials
 - Filtered for head motion (HM)
 - Filtered for HM, muscle, jump artifacts
 - List of bad channels (saved to its own JSON)

fcp_2_PreprocessingICA.m

- 1. Setup**
 - As in fcp_1
 - 2. Noise reduction**
 - Load gradiometer info, 3rd order gradients from CTF to account for noise
 - 3. Bad channel repair**
 - Replace bad channel signal with average of neighbours
 - 4. ICA**
 - Remove bad channel signals altogether from analysis (they are dependent on neighbor sensor signals, thus redundant to include in ICA)
 - Run ICA
 - Interactive decision on whether to keep or reject component
 - Reject all selected components at once
 - Save
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- Outputs**
- Final preprocessed data output into *.mat file
 - fcp_2_output JSON tracking configurations, paths
 - Bad ICA components to JSON file

CHECKPOINT

Users should examine preproc. data output before proceeding!

3. Beamforming

fcp_3_beamforming_sourcegrid.m

- 1. Setup**
 - Read in config settings
 - Load and match PIDs from MEG and MRI folders
 - Create list of subjects with full sets of data; note that participants may be removed after preprocessing due to insufficient number of trials leftover (e.g., too much noise)
 - 2. Head model preparation**
 - Load and segment T1 template brain
 - Construct head model and do necessary unit conversions
 - Construct dipole grid in template brain
 - Load desired atlas and create binary masks to define valid voxels within head model
 - 3. Check alignment**
 - Load and segment participant MRIs, load preproc. MEG data
 - Construct subject-specific head, source models
 - Check alignment between subject and template head model
 - Check alignment source model and head model
 - Save images
 - 4. Source reconstruction**
 - Compute lead field matrix
 - Run source analysis, reduce to dominant orientation
 - Interpolate functional data onto anatomical data
 - Return these results
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- Outputs**
- Individual and template head model alignment, *.png
 - Source and head model alignment, *.png

- Source analysis output
- Source descriptives output
- Source interpolation onto MRI data

out

4. Connectivity Analysis

fcp_4_connectivity.m

- 1. Setup**
 - As in fcp_1
 - 2. Analysis**
 - Compute connectivity w/ FT code
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- Outputs**
- Connectivity statistics

- ft_defaults
- path_generation
- save_to_json
- path_check

- load_config
- load_participants
- ds_pid_match
- write_match_if_not_empty
- ft_definetrial
- plotTriggers
- HeadMotionTool
- ft_artifact_muscle
- ft_artifact_jump
- ft_rejectartifact
- save_to_json
- detectBadChannels

- load_config
- load_participants
- ds_pid_match
- write_match_if_not_empty
- save_to_json
- ft_channelrepair
- ft_channelselection
- ft_componentanalysis
- ft_denoise_synthetic
- ft_prepare_neighbours
- ft_preprocessing
- ft_rejectcomponent

- ft_resampleddata
- ft_selectdata
- ft_topoplotIC
- inputBADchannels
- saveSensorsToFile

- load_config
- load_participants
- ds_pid_match
- write_match_if_not_empty
- ft_convert_units
- ft_freqanalysis
- ft_plot_mesh
- ft_plot_sens
- ft_plot_vol
- ft_prepare_headmodel
- ft_prepare_leadfield

- ft_prepare_sourcemodel
- ft_read_atlas
- ft_read_mri
- ft_sourceanalysis
- ft_sourcedescriptives
- ft_sourceinterpolate
- ft_sourceplot
- ft_timelockanalysis
- ft_volumelookup
- ft_volumesegment

- load_config
- load_participants
- ds_pid_match
- write_match_if_not_empty
- ft_connectivityanalysis