

LIMO EEG: LINEAR MODELING OF EEG DATA

List of functions

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1. GUI

eegplugin_limo: show the plug in EEGLAB

limo_central_tendency_questdlg: allows choosing estimators 1st and 2nd level e.g. mean per subjects and trimmed mean across subjects

limo_contrast_manager: GUI for visualization of the design matrix, takes contrasts, and check them, also compute tfce if bootstrap performed

limo_import: import GUI

limo_gui: starting GUI

limo_random_effect: GUI for 2nd level analysis

limo_results: GUI for looking at results

limo_tools: GUI showing various tools to select

2. Wrappers and handling functions

limo_batch: batch for 1st level analyses

limo_best_electrodes: find best electrodes across subjects (in terms of max value)

limo_central_tendency_and_ci: get the trimmed mean, or Harell-Davis 0.5 decile, or median and 95% CI

limo_eeg: does 1st level analysis

limo_get_files: utility to get files

limo_match_electrodes: create a data set of dim [expected chanloc, start-stop, values] giving as input data (dim electrodes, time frames, values), expected chanlocs and start / stop time frames

limo_random_robust: call stats routines to perform 2nd level analysis

limo_random_select: selection of files and creation of LIMO.mat for 2nd level analysis

limo_stat_values: compute statistical thresholds for mass univariate analyses

3. Visualization

limo_display_results: read files, get the stats and do the plots

limo_plot_difference compute and plot the difference between 2 data sets

limo_plots allows to plot data in various format – this function will be updated with robust estimators

4. Statistical functions

GLM related

GenCalcHFEps: Grennhouse-Geisser correction

GenOrthogComps: generate orthogonal contrasts for univariate repeated measure ANOVA

limo_contrast: post-hoc tests from *limo_glm1.m*, allows testing combinations of regressors

limo_decomp: Cholesky factorization or SVD (for non positive semidefinite matrix)

limo_glm1: allows performing two-samples t-test, ANOVA, ANCOVA and regression. Note analyses are performed for a given electrode. For full brain it is necessary to loop. As input it takes 3 methods 'OLS' 'WLS' and 'IRLS'. For now 'OLS' has been fully tested and showed to work. 'IRLS' has been tested and seems to work (be cautious more test is needed). 'WLS' is a new method where we have 1 single weight per trial for all time frames. It has not yet been validated (i.e. do not use yet).

limo_glm1_boot: bootstrap for *limo_glm1.m* – note that once the bootstrap is performed and data saved, *limo_contrast* will look for H0_betas and also perform the bootstrap of the contrast. Note, like *limo_glm1*, analyses are performed for a given electrode. For full brain it is necessary to loop.

limo_IRLS computes weights to plug into *limo_glm1* to perform an Iterative ReWeighted Least Square (uses a bisquare function)

limo_model_selection for a design with only one categorical factor (counfound) and many continuous covariates, find the best subset of continuous covariates

limo_non_linear for design with ordinal variable, the analysis can be performed using a regression (i.e. truly linear) or break into several conditions (ANOVA model). The difference between the two model allows testing if there is non linearities

limo_OrthogContrasts create orthogonal contrasts

limo_pcout Limo Principal Components Projection find multivariate outliers

limo_rep_anova Hotelling test for repeated measures ANOVA and gp x repeated measures

limo_rep_anova_old standard univariate repeated measure anova

limo_semi_partial_coef: compute semi partial coefficients

limo_WLS computes trial weights for a Weighted Least Squares GLM

Other tests

limo_bootttest1: bootstrap 1 sample t-test

limo_boot_yuen_ttest: bootstrap 2 samples t-tests

limo_lateralization: compute and test lateralization

limo_trimci one sample t-test using trimmed mean

limo_ttest: one sample, paired and two samples t-tests

limo_ttest_permute one sample t-test using permutation

limo_yuen_ttest: 2 samples t-test using trimmed means

limo_yuend_ttest: paired t-test using trimmed means

limo_robust_lway_anova: 1 way ANOVA based on trimmed means

Robust estimators

limo_boot_se: compute bootstrapped standard error of the median or Harrell-Davis
limo_harrell_davis: compute Harrell Davis estimate of the quintile and 95% CI
limo_median Compute a median and 95% CI from 3D matrix
limo_pbc one-sample percentile bootstrap confidence interval
limo_robust_ci create estimators and their 95% CI
limo_trimmed_mean compute trimmed mean and 95% CI
limo_winvar winsorized variance

Multiple comparison correction

limo_cluster_attributes: return various attributes of clusters (height, size, mass)
limo_cluster_test2: returns mask and corrected p values of significant clusters
limo_ecluster_make: get threshold for clusters
limo_ecluster_test: get significant temporal clusters
limo_get_cluster_sum: compute cluster mass
limo_FDR: returns thresholds to correct for multiple comparisons using false discovery rate
limo_tfce compute tfce scores
+ in the *limo_cluster_functions* folder all relevant fieldtrip functions

5. Others

cell2csv: export cell values to csv format
exportfig: high quality export for figures
limo_contrast_checking: allows 1 – to automatically add zeros to a contrast and 2 – check if a contrast is valid
limo_create_boot_table: create a table (cell) for resampling data – each cell maps onto an electrode such as the same resampling is applied across electrode with few changes when data are missing
limo_create_files: allows creating separate raw or modelled data based on the design matrix
limo_design_matrix: create design matrix and return outputs for *limo_glm1* + create few files on the disk
limo_expected_chanlocs: try to build the *expected_chanlocs* file looping through subjects
limo_get_channeighbstructmat: create neighbouring matrice
limo_make_interaction: from the data and a set of factors, create the interaction terms
limo_nb_items: return de nb of items for each column of categorical variables
limo_neighbourdist compute the distance matrix between channels
limo_path_update: allows to automatically update LIMO paths
limo_review: display design, orthogonality of regressors and covariance