unfold

THE EEG DECONVOLUTION TOOLBOX

Unfold Version Features

Feature	Unfold	Unfold.jl
Overlap correction	x	x
Non-linear splines	x	x
Plotting tools	x	UnfoldMakie.jl - beta
Sanity checks	x	
Tutorials	x	x
Speed	x	x
Unittests	x	x
HRF (fMRI) basis		x
Mix different basisfunctions		x
Different timewindows per event		x
Mixed models		x
Item & subject effects		x
Decoding		back2back regression

Data Structure

MATLAB

- EEG
  - .times — # Contains one timestamp for each sample point
  - .data — # Contains either continous data (chan X sample) or epoched data (chan X sample X epoch), depending on your approach
  - ...
  - .event
    - .latency — # Contains event latency in samples
    - .type — # Specifies type of event; required; E.g. Stimulus/ Fixation/ Response
    - .custom — # Custom additional info used in the model; can be Stimulus type (e.g. distractor/ target), covariate (e.g. saccade aplitude/ reaction time)

Julia

Variable	Format
Data	:Array{Union{Missing, Float64}, 2} [Channel X Sample]
Data - Epochs	: Array{Union{Missing, Float64}, 3} [Channel X Sample X Epcch]
Events	DataFrame

Example Events Dataframe

Row	latency :Int64	type :String15	intercept :Int64	condition :Int64
1	20	stimulus	1	1
2	40	stimulus	1	0
3	69	stimulus	1	0
4	90	stimulus	1	1

Setting up/ Running Models

MATLAB

Action	Function
Formula	Formula = 'y ~ 1 + condition' Type: String
Defining Desingmat	EEG = uf_designmat(EEG, 'eventtypes', {'stimulus'}, 'formula', Formula)
Timeexpansion	EEG = uf_timeexpandDesignmat(EEG, 'timelimits', [-0.2 1])
Fitting Model	EEG = uf_glmfit(EEG)
Condense results	Ufresult = uf_condense(EEG)

Julia

Action	Function
Formula	F = @formula 0 ~ 1 + condition
Defining Designmat	Basisfunction = firbasis(τ=(-0.4,.8), sfreq=50, name="stimulus")
	bfDict = Dict(Any=>(F,basisfunction))
Fitting Model	M = fit(UnfoldModel, bfDict, events, data)
Condense Results	Results = coeftable(M)

Plotting (tba)

MATLAB

Julia

Further Links:

Unfold MATLAB Docs: https://www.unfoldtoolbox.org/overview.html
Unfold.jl Docs: https://unfoldtoolbox.github.io/Unfold.jl/dev/
Unfold Paper: https://peerj.com/articles/7838/