



Measure Projection Analysis: Practicum

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STUDY set: rsv Study lilename:udy_tvp_wi Study task name Nb of subjects Nb of conditions	Edit study info Select/Edit study design(s) Precompute channel measures Plot channel measures						
Nb of sessions Nb of groups Epoch consistency Channels per frame Channel locations Clustens Status	Precompute component measures Affinity Product clustering PCA clustering (original) Edit/plot clusters Correlation between IC maps						
Tatal size (Mb)	Measure Projection	ERP	•	Project			
	std_envtopo plugin	ERSP	•	Create Domains			
-		ITC	- 3 2	Domains	Domain 1	•	Show condition difference
		Spec Options	*	Show volume Show colored by Measure	Domain 2 Domain 3	\$	Show group difference Show measure
		About		Show colored by Domain Show volume as MRI	Domain 4 Domain 5	•	Show volume Show volume as MRI Show high contributing dipoles

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GUI Overview



- 1. Select a measure and 'Project'.
- 2. Visualize the result and select significance threshold (optional).
- 3. Create Domains: cluster projections
- 4. Analyze Domains: compare conditions, groups... similar to operations performed on IC clusters.

Each commands runs the chain of pre-required commands.

Installation

- Installation: unzip [USB drive content]/eeglab10_2_5_5a/ folder into your home directory . If you already have this version (but not from this USB), copy unzipped /eeglab10_2_5_5a/plugins/measure_projection/ folder from to your computer.
- Run EEGLAB in Matlab from [home directory]/eeglab10_2_5_5a/. If this version was already running, type >> eeglab rebuild;
- 3. In EEGLAB, go to **File->Memory and other options** and make sure that the option indicated below is checked:

-	Memory options - pop_editoptions()	
		Set/Unset
	STUDY options (set these checkboxes if you intend to work with studies)	
	If set, keep at most one dataset in memory. This allows processing hundreds of datasets within studies.	X
	If set, save not one but two files for each dataset (header and data). This allows faster data loading in studies.	x
	If set, write ICA activations to disk. This speeds up loading ICA components when dealing with studies.	

Loading Sample Study

- Load study_rsvp.study from [USB driver]/Advanced_EEGLAB_Workshop/Session C -MPA/Data/rsvp_study in EEGLAB.
- 5. Check if can you see **Measure Projection** under **Study** menu.

EEGLAB v1	0.2.5.5b	
File Edit Tools Plot	Study Datasets Help 🛥	
STUDY set: rsv Study liename:udy_isvp_wi Study task name Nb al subjects Nb al conditions Nb al sessions Nb al groups Epoch consistency Channels per frame Channel locations Clusters	Edit study info Select/Edit study design(s) Precompute channel measures Plot channel measures Precompute component measures Affinity Product clustering PCA clustering (original) Edit/plot clusters	
Tatal size (Mb)	Measure Projection	ERP
	std_envtopo plugin	ERSP ITC Spec Options About

GUI

- 1. Go to **Study->Measure Projection -> ERSP -> Project**
- 2. Click **Show colored by Measure** under ERSP menu (result A).
- Click Create Domains under ERSP menu. Notice 'Domains' submenu become available, this will take some time to finish... (you may alternatively load study_rsvp_with_ersp_domains.study to save time, although it can crash Matlab 2009a on 32 bit Windows)
- 4. Click **Show colored by Domain** under ERSP menu (result B).





GUI

if your Matlab crashed while loading
study_rsvp_with_ersp_domains.study or
study_rsvp_with_domains.study , try loading
study_rsvp_with_erp_domains.study which is considerably smaller.

You can now follow practicum steps for ERP, instead of ERSP.



GUI: Condition Differences

- Click on ERSP->Domains -> Domain 2 -> Show Measure
- Click on ERSP->Domains -> Domain 2 -> Show condition difference.



GUI: Domain Dipoles

- Click on ERSP->Domains -> Domain 2 -> Show high contributing scalp maps
- Click on ERSP->Domains -> Domain 2 -> Show high contributing dipoles





GUI

- Load study_rsvp_with_domains.study in EEGLAB. 1.
- 2. On Windows 32 bit with old Matlab (2009a), this operation may crash Matlab, instead you can try loading files named study_rsvp_with_[measure] name: erp, ersp...]_domains.study separately.
- All domain for different measures (ERP, ERSP, ITC..) are already created, 3. choose different measures and run commands on their domains.





ITC Domain 1

Setting Options from GUI

- 1. Select Measure Projection->Options
- Change ERSP->Significance from
 0.01 to 0.001
- 3. Close the figure.
- Select STUDY -> Measure
 Projection->ERSP-> Show colored
 by Measure



Measure Projection Options	
I FRP	
Significance	0.01
Max Domain Exemplar Correlation	0.7
FDR Correction	24295
□ ERSP	
Significance	0.01
Max Domain Exemplar Correlation	0.8
FDR Correction	
EITC	
Significance	0.01
Max Domain Exemplar Correlation	0.8
FDR Correction	
E Spec	0.01
Significance	0.01
Max Domain Exemplar Correlation	0.9
Std. of Dipole Dencity	12
Number of kept standard deviations	12
Normalize In-brain Dinale Density	
Number of permutations	2 000
Head-Grid Spacing	2,000
Flomain	
Condition Difference Significance	0.03
Group Difference Significance	0.03
	and a second
(Name)	
(Description)	

Scripting

1) Load ERSP data into MPT (creates a Matlab object):

>> erspInfo = pr.dipoleAndMeasureOfStudyErsp(STUDY, ALLEEG);

Type >> erspInfo to see what information is contained in the object.

2) Create a head grid:

>> headGrid = pr.headGrid;

(you can run headGrid .plot; to see the grid)

3) Project ERSP (using this head grid) and calculate significance of projections:

>> erspProjection = pr.meanProjection(erspInfo, erspInfo.getPairwiseCorrelationSimilarity, headGrid);

(all in one line, press Tab key to autocomplete)

4) Visualize significant locations:

>> erspProjection.plotVolume(0.01);

Scripting

5) To see the list of function of measure projection object **erspinfo** type:

>> methods(erspProjection)

6) Visualize ERSP domain 4 (calculated before and saved in the STUDY.measureProjection):
>> domain4 = STUDY.measureProjection.ersp.projection.domain(4).plotVolume;
>> domain4.plotVolume;

>> domain4.plotMeasure;

7) Create subject space with domain 4 as an ROI:

>> subjectSpace = pr.subjectSpace(erspInfo, headGrid, erspProjection.projectionParameter, domain4.membershipCube);

8) Plot subject space in 2D:

>> subjectSpace.plot;

Scripting

• MPT uses Matlab object classes, so it is easy to find functions that act on each object. (place a dot after the name of the object and press the Tab key

	conditionId	
	conditionLabel	1999
	convertDipoleCoordinatesFromSphericalToMni	
	coordinateFormat	
	createSubsetForGroup	
	createSubsetForId	
	createSubsetForSubject	
	createSubsetInRelationToBrain	-
>> erspInfo.		

- Variable and function names are descriptive.
- MPT objects have minimal interdependency (almost all related information is encapsulated in the properties of each object to simply scripting).
- You can extend the toolbox by deriving new classes from current object.

New Versions

- New versions of MPT can be downloaded directly from our repository: <u>https://bitbucket.org/bigdelys/measure-projection/get/default.zip</u>
- Please report bugs/feature request using our issue tracking system (no login necessary):

https://bitbucket.org/bigdelys/measure-projection/issues?status=new&status=open

- A Wiki is under construction and located at:
- <u>http://sccn.ucsd.edu/wiki/MPT</u>
- These links are available under **Measure Projection->About** menu.

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Measure P	Projection Toolbox
Developed and Maintained by: Nir	na Bigdely-Shamlo (SCCN, INC, UCSD)
Reference:	
Diguery-brianno N., Mullell L., NI	cutz-Deigado IX., Makely J., Measule 🔺
Projection Analysis: A Probabilisti Component Source Comparison a preparation.	c Approach to EEG Independent nd Multi-Subject Inference," In
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Projection Analysis: A Probabilistic Component Source Comparison a preparation. /isit tutorials and wiki at: submit issues or suggestions at:	c Approach to EEG Independent nd Multi-Subject Inference," In http://sccn.ucsd.edu/wiki/MPT https://bitbucket.org/bigdelys/measure