Clustering of ICA components

Arnaud Delorme

(with Julie Onton, Romain Grandchamp, Nima Bigdely Shamlo, Scott Makeig)

Steps of clustering

- Select ICA components for clustering
- Precompute measures of interest
- Cluster measures
- Plot clusters and edit them if necessary



Edit dataset info

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Precompute data measures

	EEGLAB v6.0b										
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Precompute data measures

TIP: Compute all measures so you can

test different combinations for clustering

	Select and compute comp Select and compute comp						
	Pre-compute component						
	Compute ERP/spectrum						
l	List of measures to prec	ompute					
L	🔽 ERPs	Baseline ([min max] in m	[-200 0]				
L	Power spectrum	V Power spectrum Spectopo parameters Test					
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	 Scalp maps Recompute even if prese 	nt on disk			Time- optic	-frequency ons	
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Cluster components

-	EEG	GLAB v6.0b								
File	Edit Tools Plot	Study Datasets Help 🏾 🖜								
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	Study filename:	Plot channel measures								
	Studý task name	Precompute component measures								
	Nb of subjects	Build preclustering array								
	Nb of sessions	Cluster components								
	Nb of groups	Edit/plot clusters	Select a	nd compute com	ponent mea	asures for later clusteri	ng pop_p	reclust()		
	Epoch consistency Channels per fram	yes a 31								
	Channel locations	yes Sa Sa	uild pre-clustering ma elect the cluster to refin	ttrix for STUD) during sub-cl	'Attentio	in' any existing sub-hier	archy will	he overwritten)		
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			Final dimensions	10	Help					
			Save STUDY to file	/	home/juli	ie/WorkshopSD2007/	STUDY/att	tention.study		
			Cancel			Help		Ok		

Precluster schematic



Precluster: Use singular values from PCA





Classical KMean



Cluster components





Choosing data measures

What measure(s) should you use?

It depends on your final cluster criteria...

- If for example, your priority is dipole location, then cluster only based on dipole location...

But consider:

- What is the difference between these two components?



Choosing data measures



Choosing data measures



ERPs seem different...



Subject differences?





Subject differences?



statistics within subject and binomial probability between subjects (p < 0.01)

between the two clusters by bootstrap statistics (p < 0.001)

Subject differences?



Plot/edit clusters



Plot cluster data



Plot cluster data



Plot cluster data



Plot cluster ERP



Reassigning components

View View	and edit current component clusters	pop_clustedit()	
Study ": 151 of 151 components clustere	d		
Select cluster to plot		Select component(s) to plot	
Cls 12 (6 ICs) Cls 13 (5 ICs) Cls 14 (11 ICs)		All components S07 IC14 S07 IC33 S08 IC23 S10 IC60	
<u>File Edit View Insert Tools Desktop Window H</u> elp		3101000	
▷ ☞ 묘 鎶 ╘, �. ♀. ᡧ ᢀ □ ☷ ■ ⊐		Plot scalp map(s)	
CIs 17 average scalp map, 3Ss	ic14/S07	Plot dipole(s) Plot ERP(s)	
ic23/S08 ic23/S08 ic60/S10	ic33/S07	Cls 1: - 3 sets - 4 components (4 dipoles) File Edit Yiew Insert Tools Desktop Window Help D Image: Cls 1: - 3 sets - 4 components Image: Cls 1: - 3 sets - 4 components Image: Cls 1: - 3 sets - 4 components Image: Cls 1: - 3 sets - 4 components Image: Cls 1: - 3 sets - 4 components Prev Next Prev Image: Cls 1: - 25 Verkshop06/55 Y tal: - 25 Z tal: 46 Image: Cls 1: - 25 Image: Cls 1: - 25 Image: Cls 1: - 25 Mesh on Tight view Sagittal view Image: Cls 1: - 25 Image: Cls 1: - 25 Very No controls No controls Image: Cls 1: - 25 Image: Cls 1: - 25	

Issue with standard clustering

Large parameter space problem: many different clustering solutions can be produced by changing parameters and measure subsets. Which one should we choose?

Select and compute component measures for later clustering -- pop_preclust() $-\Box \times$ Pre-compute measures on which to cluster components from study 'N400STUDY' **EEGLAB** clustering Select the cluster to refine during sub-clustering (any existing sub-hierarchy will be overwritten) has ~12 parameters ParentCluster 1 (151 ICs) Pre-compute or Load Norm. Rel. Wt. Dims. Frequency range [Hz] 3 25 ×. spectra 10 ×. 1 ERPs. Latency range in ms [lo hi] × 10 × 1 -2100 1995 × dipoles. 3 10 × × scalp maps ×. 10 1 Use channel values Absolute values **ERSPs** Time/freq. parameters e', [3 25], 'cycles', [3 0.5], 'pa ×. 10 1 × ITCs. 10 × 1 Time/jed_paraineters t, [3-25]. (cyclest, [3-0-5], (pz Final dimensions 10 Help Save STUDY to file /data/common4/amo/Ssubjects/N400preclust.study Cancel Help Ok.

Measure projection

(EEGLAB extension by Nima Bigdely Shamlo) only has one pre-clustering parameter.

🛃 Measure Product clustering -	- pop_mpcluster() 💷 🛛
Number of clusters to compute: Relative dipole weight (between 0 ar Select measuretures to be used in th	10 nd 1): 0.8 ne clustering:
♥ Dipole ♥ ERP ERSP ITC ♥ Spectra Scalp map	
Separate outliers (enter std.)	3
Help	<u>Cancel</u> Ok

(Affinity clustering by Pernet, Martinez, Delorme)

Exercise

- Load the STUDY
- Precluster and cluster components using ERPs
- Precluster and cluster components using spectrum
- Precluster and cluster components using dipoles
- Do you find clusters which are common to the different measures?

