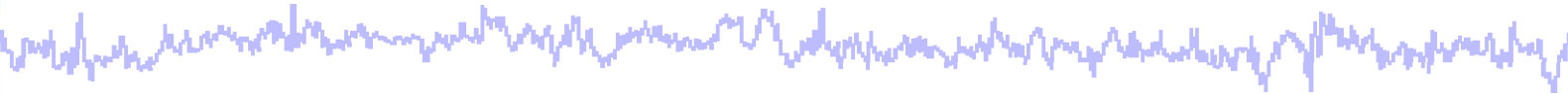


# STUDY clustering overview



## STEP 1

Build a STUDY

## STEP 2

Precompute the data

## STEP 3

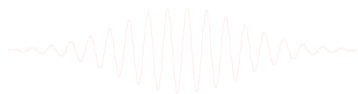
Precluster the data

## STEP 4

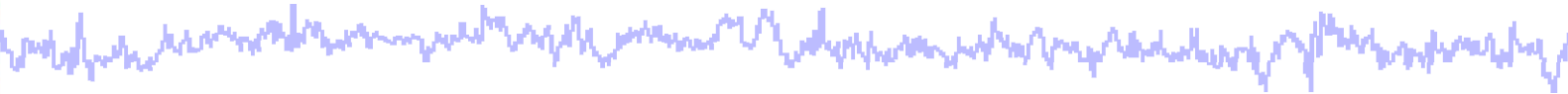
Cluster the data

## STEP 5

Edit/view the clusters



# STUDY clustering overview



## STEP 1

Build a STUDY

## STEP 2

Precompute the data

## STEP 3

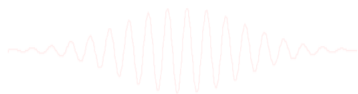
Precluster the data

## STEP 4

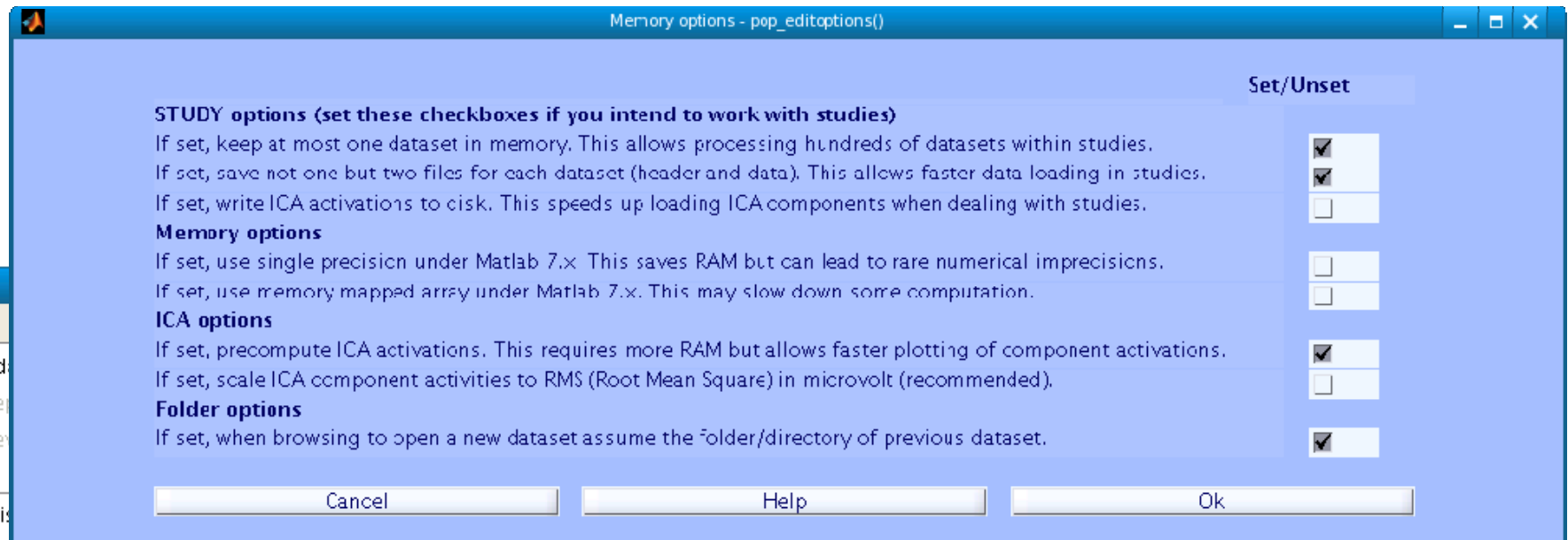
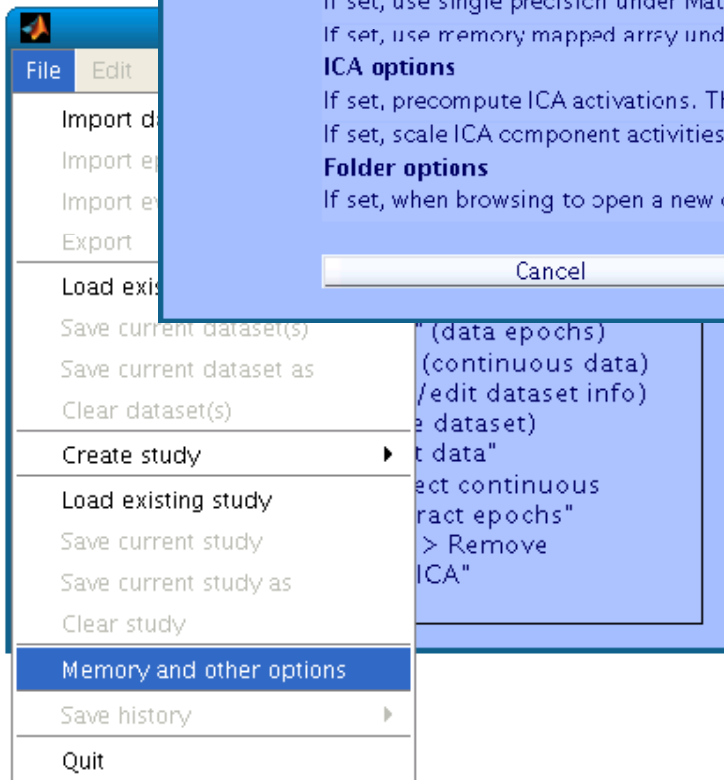
Cluster the data

## STEP 5

Edit/view the clusters

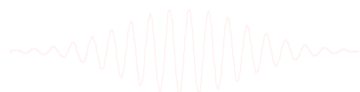
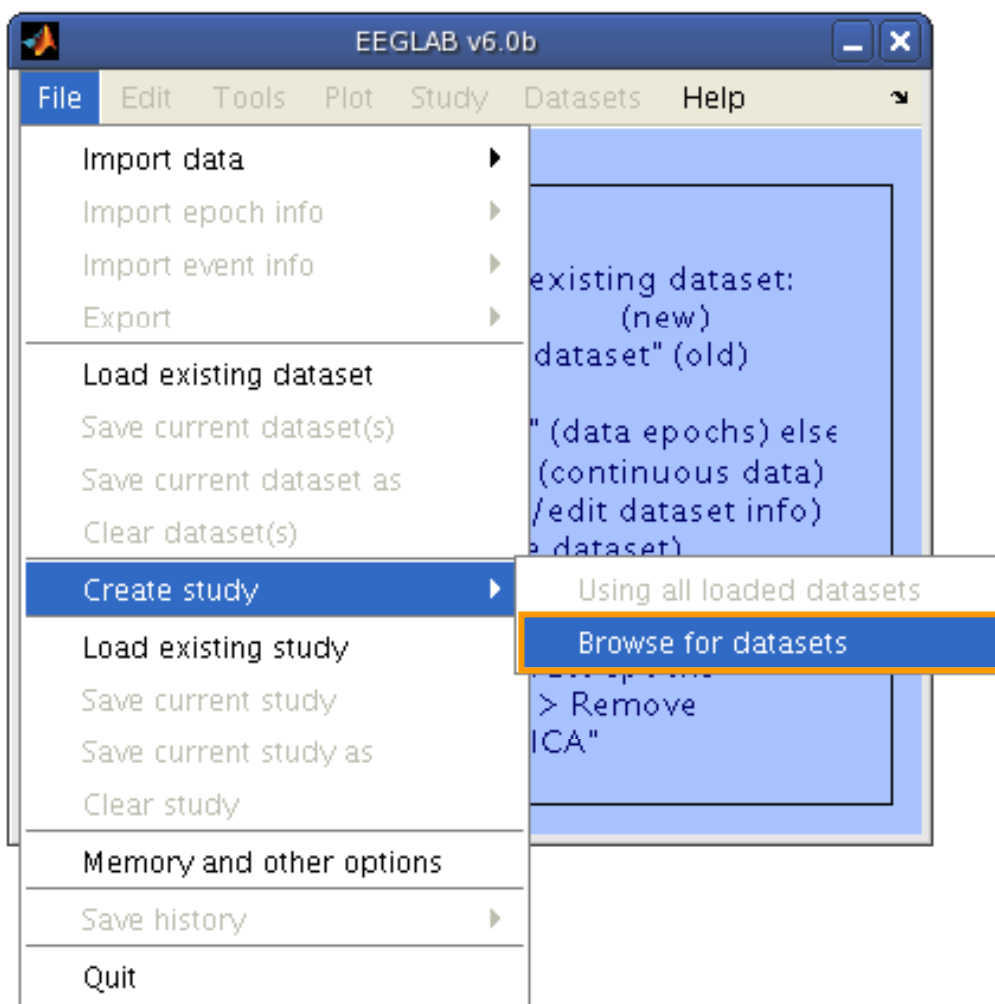
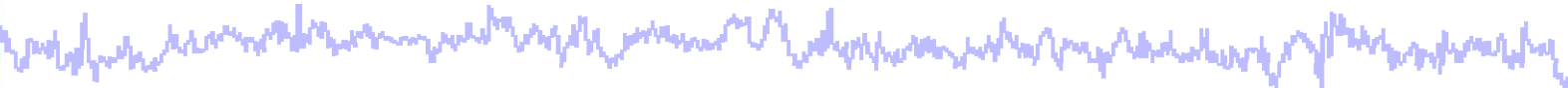


# Memory options

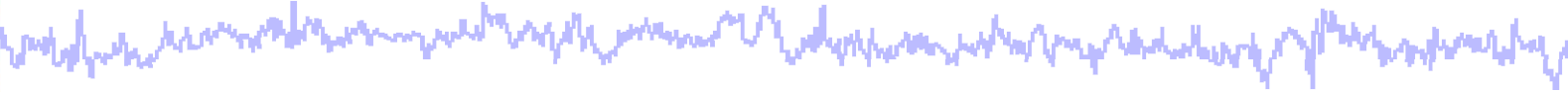


**Memory options should change when using STUDY vs single dataset**

# Build a STUDY



# Build a STUDY, cont'd



Create a new STUDY set -- pop\_study()

Create a new STUDY set  
STUDY set name: \_\_\_\_\_  
STUDY set task name: \_\_\_\_\_  
STUDY set notes: \_\_\_\_\_

	dataset filename	browse	subject	session	condition	group	Select by r.v.	
1		...						Clear
2		...						Clear
3		...						Clear
4		...						Clear
5		...						Clear
6		...						Clear
7		...						Clear
8		...						Clear
9		...						Clear
10		...						Clear

Important note: Removed datasets will not be saved before being deleted from EEGLAB memory

Page 1

Update dataset info – datasets stored on disk will be overwritten (unset = ...)  
 Delete cluster information (to allow loading new datasets, set new compon...)  
Save this study to a disk file named: \_\_\_\_\_

Cancel Help

Choose dataset to add to STUDY -- pop\_study()

Look In: S01

- S01\_attend1\_pos1.set
- S01\_attend1\_pos5.set
- S01\_attend5\_pos1.set
- S01\_attend5\_pos5.set

File Name: S01\_attend1\_pos1.set

Files of Type: (\*.set, \*.SET)

Open Cancel

# Edit dataset info



pop\_study(): Pre-select components

Enter maximum residual (topo map – dipole proj.) var. (in %)  
NOTE: This will delete any existing component clusters!

Keep only in-brain dipoles.

Cancel Help Ok

Create a new STUDY set – pop\_study()

### Edit STUDY set information

STUDY set name:

STUDY set task name:

STUDY set notes:

	dataset filename	browse	subject	session	condition	group	Select by r.v.	
1	IDY/S01/S01_attend1_pos1.set	...	S01	1	TargAttnL	normals	All comp.	Clear
2	IDY/S01/S01_attend1_pos5.set	...	S01	1	NONTargAttnL	normals	All comp.	Clear
3	IDY/S01/S01_attend5_pos5.set	...	S01	1	TargAttnR	normals	All comp.	Clear
4	IDY/S01/S01_attend5_pos1.set	...	S01	1	NONTargAttnR	normals	All comp.	Clear
5	IDY/S02/S02_attend1_pos1.set	...	S02	1	TargAttnL	normals	All comp.	Clear
6	IDY/S02/S02_attend1_pos5.set	...	S02	1	NONTargAttnL	normals	All comp.	Clear
7	IDY/S02/S02_attend5_pos5.set	...	S02	1	TargAttnR	normals	All comp.	Clear
8	IDY/S02/S02_attend5_pos1.set	...	S02	1	NONTargAttnR	normals	All comp.	Clear
9	IDY/S03/S03_attend1_pos1.set	...	S03	1	TargAttnL	normals	All comp.	Clear
10	IDY/S03/S03_attend1_pos5.set	...	S03	1	NONTargAttnL	normals	All comp.	Clear

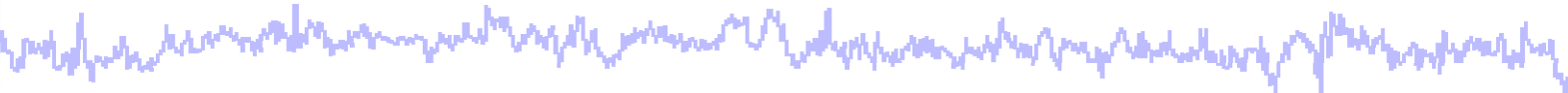
Important note: Removed datasets will not be saved before being deleted from EEGLAB memory

< Page 1 >

Update dataset info – datasets stored on disk will be overwritten (unset = Keep study info separate).  
 Delete cluster information (to allow loading new datasets, set new components for clustering, etc.)  
 Re-save STUDY. Uncheck and use menu File > Save study as to save under a new filename

Cancel Help Ok

# ICs to cluster



Create a new STUDY set -- pop\_study()

Create a new STUDY set  
STUDY set name:  
STUDY set task name:  
STUDY set notes:

dataset filename
1 objects/S02/syn02-S253-clean.
2 objects/S02/syn02-S254-clean.
3 objects/S05/syn05-S253-clean.
4 objects/S05/syn05-S254-clean.
5 objects/S07/syn07-S253-clean.
6 objects/S07/syn07-S254-clean.
7 objects/S08/syn08-S253-clean.
8 objects/S08/syn08-S254-clean.
9 objects/S10/syn10-S253-clean.
10 objects/S10/syn10-S254-clean.

Important note: Removed datasets will

Update dataset info - datasets  
 Delete cluster information (to allow loading new datasets, set new components for clustering, etc.)  
Save this study to a disk file named: \_\_\_\_\_

Cancel Help Ok

select components

- ic 19
- ic 20
- ic 21
- ic 22
- ic 23
- ic 24
- ic 25
- ic 26
- ic 27
- ic 28
- ic 29
- ic 30
- ic 31
- ic 32

Cancel Ok

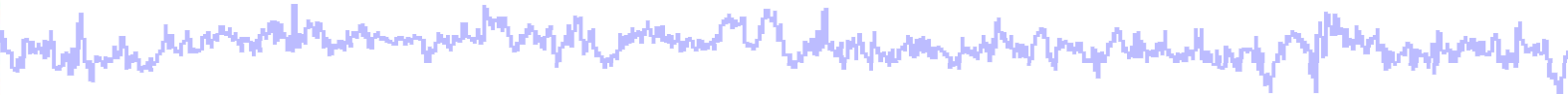
Synonyms  
Word Recognition

condition	group	Select by r.v.	
synonyms		Comp.: 1 2 ...	Clear
on-synonyms		Comp.: 1 2 ...	Clear
synonyms		Comp.: 1 2 ...	Clear
on-synonyms		Comp.: 1 2 ...	Clear
synonyms		Comp.: 1 2 ...	Clear
on-synonyms		Comp.: 1 2 ...	Clear
synonyms		Comp.: 1 2 ...	Clear
on-synonyms		Comp.: 1 2 ...	Clear
synonyms		Comp.: 1 2 ...	Clear
on-synonyms		Comp.: 1 2 ...	Clear
GLAB memory			

>

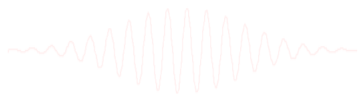
Keep study info separate).

# STUDY structure



STUDY =

```
    name: 'Synonyms'  
    task: 'Word Recognition'  
    notes: ''  
    filename: 'workshop.study'  
    cluster: [1x1 struct]  
    history: [1x6654 char]  
datasetinfo: [1x10 struct]  
    filepath: '/data/STUDY'  
    subject: {'S02' 'S05' 'S07' 'S08' 'S10'}  
    group: {}  
    session: []  
    condition: {'non-synonyms' 'synonyms'}  
    setind: [2x5 double]  
    etc: [1x1 struct]  
    preclust: [1x1 struct]  
    saved: 'no'  
    changgrp: []
```



>>



# Subject info in STUDY structure



**Gives information  
for each subject**

```
>> STUDY.datasetinfo
```

```
ans =
```

```
1x10 struct array with fields:
```

```
    filepath
```

```
    filename
```

```
    subject
```

```
    session
```

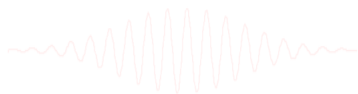
```
    condition
```

```
    group
```

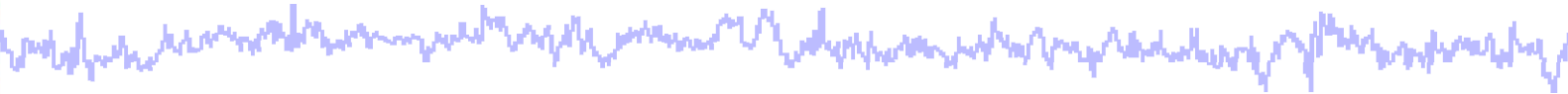
```
    comps
```

```
    index
```

```
>>
```



# STUDY clustering overview



## STEP 1

Build a STUDY

## STEP 2

Precompute the data

## STEP 3

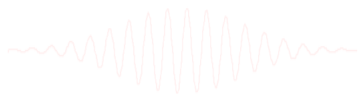
Precluster the data

## STEP 4

Cluster the data

## STEP 5

Edit/view the clusters



# Precompute data measures



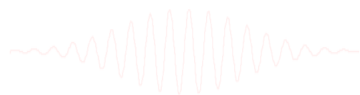
EEGLAB v6.0b

File Edit Tools Plot Study Datasets Help

**STUDY set: A**

Study filename:  
Study task name  
Nb of subjects  
Nb of conditions  
Nb of sessions  
Nb of groups  
Epoch consistency    yes  
Channels per frame    31  
Channel locations    yes  
Clusters    1  
Status    Ready to precluster  
Total size (Mb)    30.4

- Edit study info
- Precompute channel measures
- Plot channel measures
- Precompute component measures**
- Build preclustering array
- Cluster components
- Edit/plot clusters



# Precompute data measures



Select and compute component measures for later clustering -- pop\_precomp()

**Pre-compute component measures for STUDY 'Attention'**

Compute ERP/spectrum/ERSP for all components (set) or only those selected by RV (unset)

**List of measures to precompute**

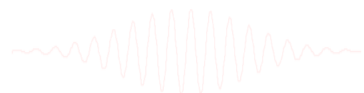
<input checked="" type="checkbox"/> ERPs			
<input checked="" type="checkbox"/> Power spectrum	Parameters	<input type="text"/>	Test
<input checked="" type="checkbox"/> ERSPs	Time/freq. parameters	<input type="text" value="'cycles', [3 0.5], 'padratio', 1"/>	Test
<input checked="" type="checkbox"/> ITCs			
<input checked="" type="checkbox"/> Scalp maps			

Recompute even if present on disk

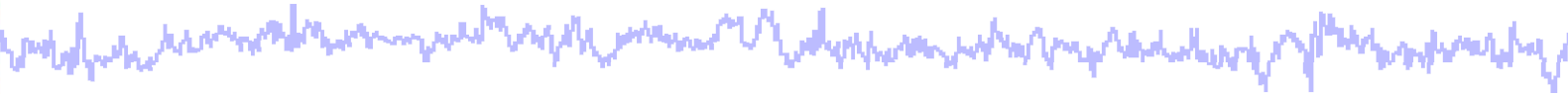
Cancel      Help      Ok

**Recommend:**  
**'alpha', .01**  
**(time-consuming)**

**TIP: Compute all measures so you can test different combinations for clustering**



# STUDY clustering overview



## STEP 1

Build a STUDY

## STEP 2

Precompute the data

## STEP 3

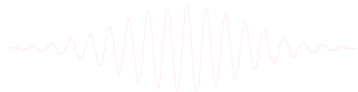
Precluster the data

## STEP 4

Cluster the data

## STEP 5

Edit/view the clusters



# Precluster the data



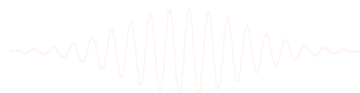
EEGLAB v6.0b

File Edit Tools Plot Study Datasets Help

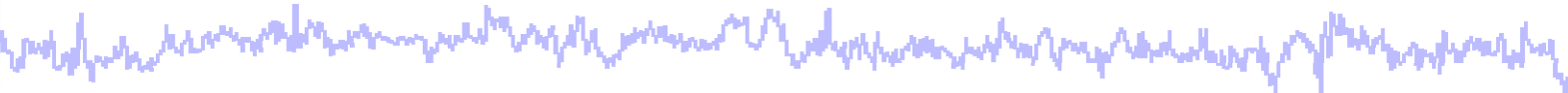
**STUDY set: At**

Study filename:  
Study task name  
Nb of subjects  
Nb of conditions  
Nb of sessions  
Nb of groups  
Epoch consistency    yes  
Channels per frame    31  
Channel locations    yes  
Clusters    1  
Status    Pre-clustered  
Total size (Mb)    32.4

- Edit study info
- Precompute channel measures
- Plot channel measures
- Precompute component measures
- Build preclustering array**
- Cluster components
- Edit/plot clusters



# Precluster the data



Select and compute component measures for later clustering -- pop\_preclust()

**Build pre-clustering matrix for STUDY 'Attention'**  
 Select the cluster to refine during sub-clustering (any existing sub-hierarchy will be overwritten)

ParentCluster 1 (181 ICs)

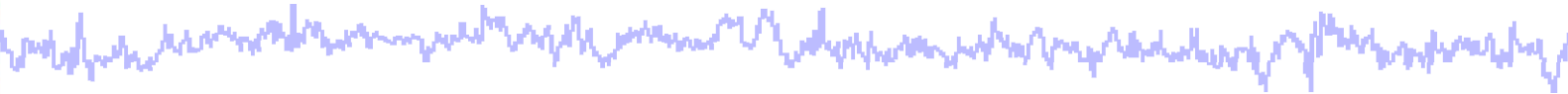
(note: only measures that have been precomputed may be used)

Load	Dims.	Norm.	Rel. Wt.	Measure	Parameters
<input checked="" type="checkbox"/> spectra	10	<input checked="" type="checkbox"/>	1	Freq. range [Hz]	3 25
<input checked="" type="checkbox"/> ERPs	10	<input checked="" type="checkbox"/>	1	Time range [ms]	0 600
<input checked="" type="checkbox"/> dipoles	3	<input checked="" type="checkbox"/>	10		
<input type="checkbox"/> scalp maps	10	<input checked="" type="checkbox"/>	1	Use channel values	
<input checked="" type="checkbox"/> ERSs	20	<input checked="" type="checkbox"/>	1	Time range [ms]	0 1500
<input checked="" type="checkbox"/> ITCs	10	<input checked="" type="checkbox"/>	1	Time range [ms]	0 600
<input type="checkbox"/> Final dimensions	10				<input checked="" type="checkbox"/> Absolute values
				Freq. range [Hz]	3 45
				Freq. range [Hz]	2 30

Save STUDY to file /home/julie/WorkshopSD2007/STUDY/attention.study ...

Cancel Help Ok

# STUDY clustering overview



## STEP 1

Build a STUDY

## STEP 2

Precompute the data

## STEP 3

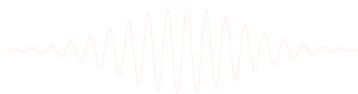
Precluster the data

## STEP 4

Cluster the data

## STEP 5

Edit/view the clusters





# Cluster components



EEGLAB v6.0b

File Edit Tools Plot **Study** Datasets Help

**STUDY set: A**

- Edit study info
- Precompute channel measures
- Plot channel measures
- Precompute component measures
- Build preclustering array
- Cluster components**
- Edit/plot clusters

Study filename:  
Study task name  
Nb of subjects  
Nb of conditions  
Nb of sessions  
Nb of groups  
Epoch consistency yes  
Channels per frame 31  
Channel locations yes  
Clusters  
Status  
Total size (Mb)

Set clustering algorithm -- pop\_clust()

Performing clustering on cluster 'ParentCluster 1'

Clustering algorithm: Kmeans (stat. toolb...)

Number of clusters to compute: 24

Separate outliers > [N] std.dev. from any cluster center

Save STUDY set to disk /home/julie/Workshops/EPIC2009/STUDY/: ...

Cancel Help Ok

# Cluster info in 'STUDY'



```
>> STUDY.cluster
```

```
ans =
```

```
1x26 struct array with fields:
```

```
name  
parent  
child  
comps  
sets  
algorithm  
centroid  
preclust  
dipole  
topo  
topox  
topoy  
topoall  
topopol
```

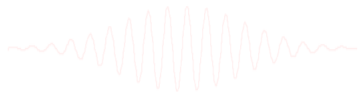
Gives information  
for each cluster  
(1<sup>st</sup> cluster is  
always the  
parent cluster)

```
>> STUDY.cluster(2)
```

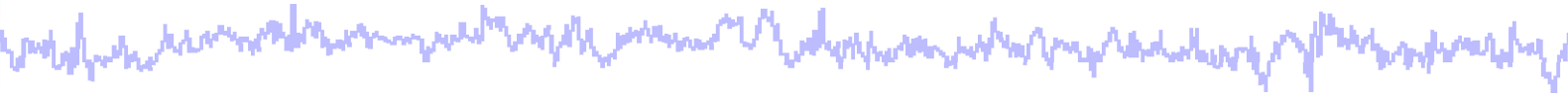
```
ans =
```

```
name: 'Cls 2'  
parent: {'ParentCluster 1'}  
child: []  
comps: [9 10 21 18 26 20 27]  
sets: [2x7 double]  
algorithm: {'Kmeans' [12]}  
centroid: []  
preclust: [1x1 struct]
```

More on  
cluster info  
in later  
tutorials



# STUDY clustering overview



## STEP 1

Build a STUDY

## STEP 2

Precompute the data

## STEP 3

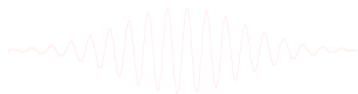
Precluster the data

## STEP 4

Cluster the data

## STEP 5

Edit/view the clusters



# View and edit clusters



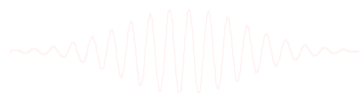
EEGLAB v6.0b

File Edit Tools Plot Study Datasets Help

**STUDY set: At**

Study filename:  
Study task name  
Nb of subjects  
Nb of conditions  
Nb of sessions  
Nb of groups  
Epoch consistency yes  
Channels per frame 31  
Channel locations yes  
Clusters 26  
Status Pre-clustered  
Total size (Mb) 39.1

- Edit study info
- Precompute channel measures
- Plot channel measures
- Precompute component measures
- Build preclustering array
- Cluster components
- Edit/plot clusters**



# Plot cluster data



View and edit current component clusters -- pop\_clustedit()

Study 'Attention': 181 of 181 components clustered

Select cluster to plot

- All cluster centroids
- ParentCluster 1 (181 ICs)
- outlier 2 (1 ICs)
- Cls 3 (5 ICs)

Select component(s) to plot

- 'outlier 2' comp. 1 (S12 IC12)
- 'Cls 3' comp. 1 (S01 IC1)
- 'Cls 3' comp. 2 (S05 IC11)
- 'Cls 3' comp. 3 (S06 IC15)

Plot scalp map(s)

Plot dipole(s)

Plot ERP(s)

Plot spectra

Params

Params

Params

Create new cluster

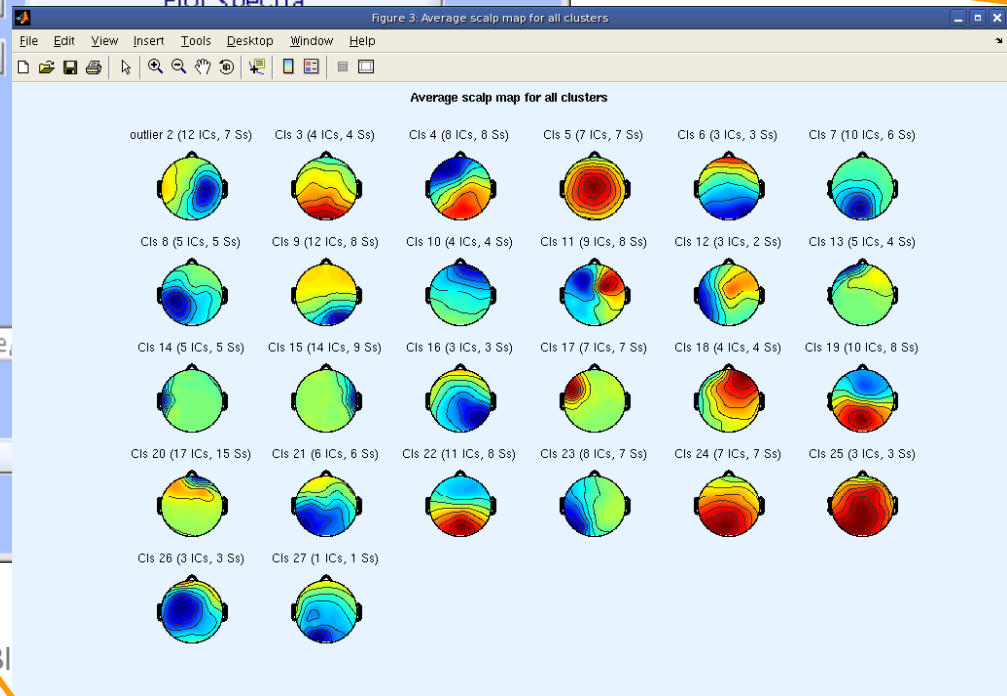
Rename selected cluster

Merge clusters

Save STUDY set to disk /home/julie

Cancel Help

Plot mean scalp maps for easy reference



# Plot cluster data



View and edit current component clusters -- pop\_clustedit()

Study 'Attention': 181 of 181 components clustered

**Select cluster to plot**

- Cls 6 (3 ICs)
- Cls 7 (10 ICs)**
- Cls 8 (5 ICs)
- Cls 9 (12 ICs)

**Select component(s) to plot**

- All components**
- S01 IC6
- S05 IC9
- S06 IC12

Plot scalp map(s)

Plot dipoles

Plot ERPs

Plot spectra

Plot ERSPs

Plot ITCs

Plot cluster properties

Params

Params

Params

Create new cluster

Rename selected cluster

Merge clusters

Save STUDY set to disk  /home/julie/WorkshopSD2

Cancel Help

Choose which cluster

Choose which components

