



- **1.** Apply ICA weights
- 2. IC scalp map interpretation
- **3. Basic IC evaluation**
- 4. Identify IC artifacts

ICA weights in EEG structure



Applying ICA weights to EEG data

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Applying ICA weights to EEG data

	Edit dataset information - pop_editset()			
	Dataset name		jo74 Sternberg Dat	a
	Data sampling rate (Hz)	250	Subject code	
	Time points per epoch (0->continuous)	750	Task condition	
	Start time (sec) (only for data epochs)	-1	Session number	
	Number of channels (D->set from data)	71	Subject group	
	Ref. channel indices or mode (see help)	common	About this dataset	Enter comments
			-	
	Channel location file or info	From oth	er dataset	Browse
	Note: The file format may be auto-detecte	ed from its file extensio	n. See menu "Edit > Channel I	ocations" for other options.
EEGLAB VIU.2.2.1D	ICA weights array or text/binary file (if any): From oth	er dataset	Browse
File Edit Tools Plot	ICA sphere array or text/binary file (if any)	From oth	er dataset	Browse
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	you must save them yourself:			
floatwrite(I	EEG.icaweights,'C:\MyDirectory\IC	A.wts');	Network	
			File name: NewICA71.w	vts
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Applying ICA weights to EEG data

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	a share when the second	Dataset name			jo74 Stern	berg Data		
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	Dataset size (N	Mb) 402.1			Network			
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		EGLAB Workshop June	16-18 2012 Beijing (hina: Julia (Onton - Evaluation			Cancel



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Plot ICA scalp maps



Single-dipole projections



Compare 'good' and 'bad' scalp maps







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Scroll component activities





Time periods that are not independent across ICs

should be removed and ICA run again for better decomposition

Plot component power



Plot component power

Correction of the second secon	Component spectra and maps pop_spectopo() Epoch time range to analyze [min_ms max_ms]: Frequency (Hz) to analyze: Electrode number to analyze ([]=elec with max power Percent data to sample (1 to 100): Components to include in the analysis: Number of largest-contributing components to map: Else, map only these component numbers: [Checked] Compute comp spectra; [Unchecked] (data Plotting frequency range ([min max] Hz): Encented as a mark set in a constraint of the set in a mark set in	er; 0=whole scalp): a-comp) spectra:	0 2440528 6 ◀ 0 20 1:71 5 7 2 25		Swartz Center for Computational Neuroscience
	Spectral and scalp map options (see topoplot):	Figure 2: spectopo	0		
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	Jata statistics	_	5 _ 10	.15	20
	FEGLAB Workshop June 16-18 2012 Bi	eiliba China Julie	Onton – Evaluating IC/	A Compor	ients

Component ERPs



Component ERP envelope

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~~~~M/////////

## **Definition: The data envelope**



# **IC** back-projection envelope





# IC back-projection envelope





# IC contributions to ERP envelope



### IC contributions to ERP envelope



#### **Component ERP image**

![](_page_20_Picture_1.jpeg)

![](_page_20_Picture_2.jpeg)

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ERP Image basics

ERP Image basics

ERP Images: smoothing across trials

50 40

10

-200

0

200

Trials 30 20

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Plot ICA component properties

Reviewing component properties

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Component scalp maps/properties

more brain ICs

Pulse artifacts

IC rejection/back-projection

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Help

pop_subcomp()

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Scroll channel activities -- eegplot() Figure Display Settings Help

Exercise

- ALL
 - Load stern.set (continuous data, contains ICA weights)
- Novice
 - Plot IC scalp maps
 - Scroll the IC activations and compare to channel data scroll
 - Identify "artifact" ICs

> How can you be sure it is an artifact?

- Intermediate / Advanced
 - Practice saving EEG.icaweights and EEG.icasphere as .wts and .sph files and re-apply the weights again to stern.set
 - Plot IC power, try different parameters from the GUI
 - From supplementary material, try automatic data epoch rejection.

Supplementary lessons

Auto-reject data epochs

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Reject data epochs

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		Find abnormal values					
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le a la action		Find abnormal trends					
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		Find improbable data					
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		Electrode(s)	1:70	Currently marked trials	0		
		Calculate	Scroll Data	Plot	Help		
		Find abnormal spectra (slow)					
		Upper limit(s) (dB)	25	Lower limit(s) (dB)	-25		
		Low frequency(s) (Hz)	0	High frequency(s) (Hz)	50		
		Electrode(s)	1:70	Currently marked trials	0		
		Calc / Plot			Help		
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		Show all trials marked for rejection by the	measure selected abo	ve or checked below	-		
		Abnormal appearance	Abnormal values	Abnormal tre	nds		
		V Improbable epochs	Abnormal distributio	ons 🔽 Abnormal sp	ectra		
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Reject data epochs

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#### **Reject or retain marked epochs**

![](_page_47_Figure_1.jpeg)

## **Reject marked epochs**

![](_page_48_Picture_1.jpeg)

![](_page_48_Picture_2.jpeg)

>> EEG = pop_jointprob(EEG,1,[1:70],5,5,0,0);
>> EEG = pop_rejepoch(EEG,find(EEG.reject.rejglobal),0);

#### **Select epochs**

F

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		_ Yes	Retain old event type na	ame(s) in (new) field nar	ned:						
	ICA weights	Yes	Keep only selected	events and remove all ot	ther events						
	Dataset size (Mb)	46.2	Remove epochs r	ot referenced by any	selected e	vent					
	. ,		nvert epoch selection	n							
			Cancel		H	Help		Ok	k		

>> EEG = pop_selectevent(EEG, 'type', { `in' }, ...
 'deleteevents', 'off', 'deleteepochs', 'on');
>> [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 4, ...
 'setpames', 'faces only 20 epochs', 'on' ) :

#### Select epochs with specific events

![](_page_50_Picture_1.jpeg)

_	_			📣 Select events pop_se	lectevent()			
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		Select data	100	Duration	No description			
		Select data using events	346	Uncertainty2	No description			
		Select enorths or events	250	ReqTime	No description			
		Select epochs of events	1 000	ReqDur	No description			
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#### **Repeat for 'out-of-set' responses**

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#### Separate datasets with different conditions

Manana Manana

![](_page_52_Picture_2.jpeg)

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![](_page_52_Picture_4.jpeg)

# **Explanation of "sphering"**

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![](_page_53_Picture_2.jpeg)

![](_page_53_Figure_3.jpeg)

For more explanation, see:

http://sccn.ucsd.edu/~arno/indexica.html

and <a href="http://sccn.ucsd.edu/wiki/Linear_Representations_and_Basis_Vectors">http://sccn.ucsd.edu/wiki/Linear_Representations_and_Basis_Vectors</a>