



Analysis of multimodal data: MoBILAB

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Outline

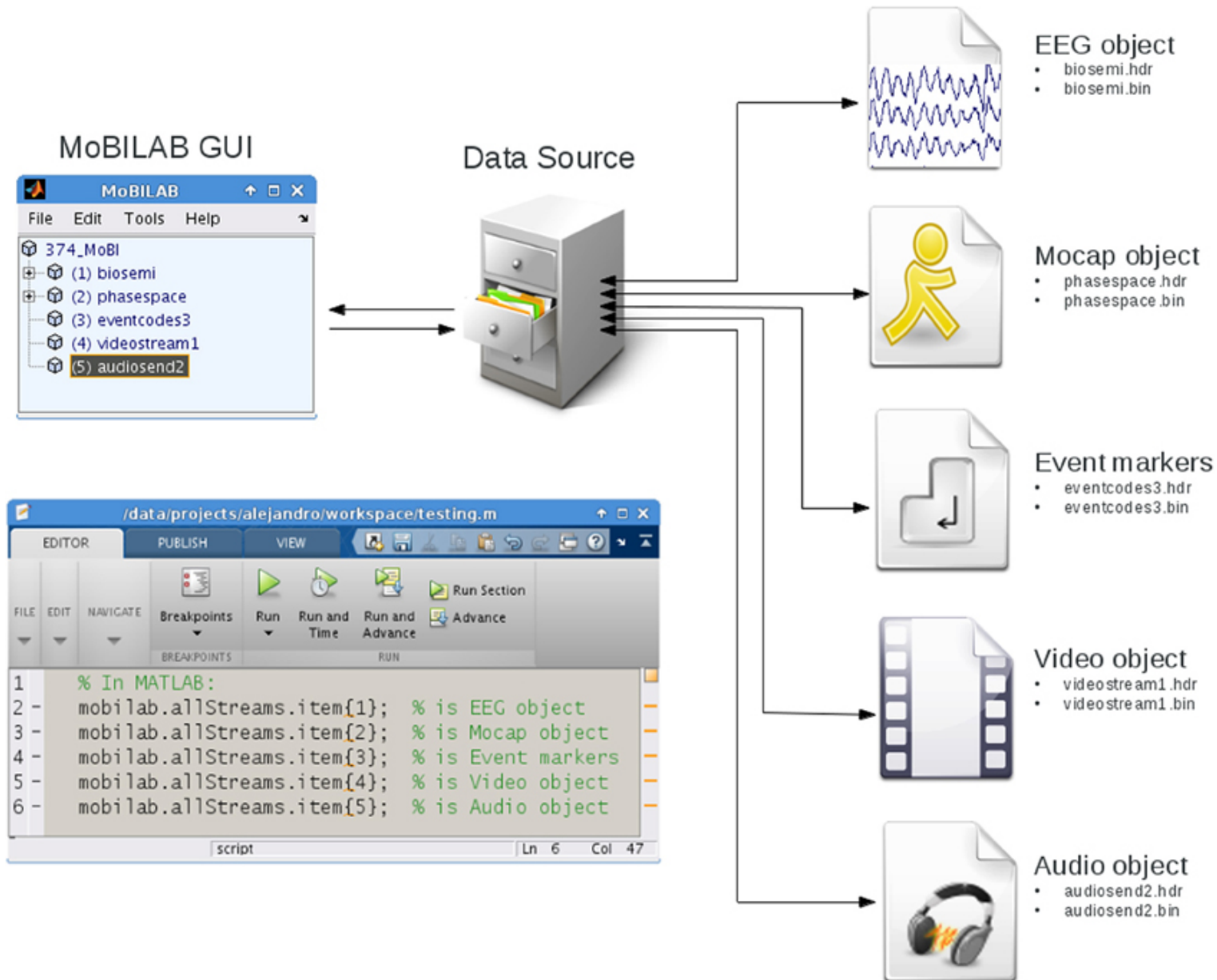
- What is MoBILAB
- GUI and scripting examples
- Challenges in MoBI data analysis
- New directions



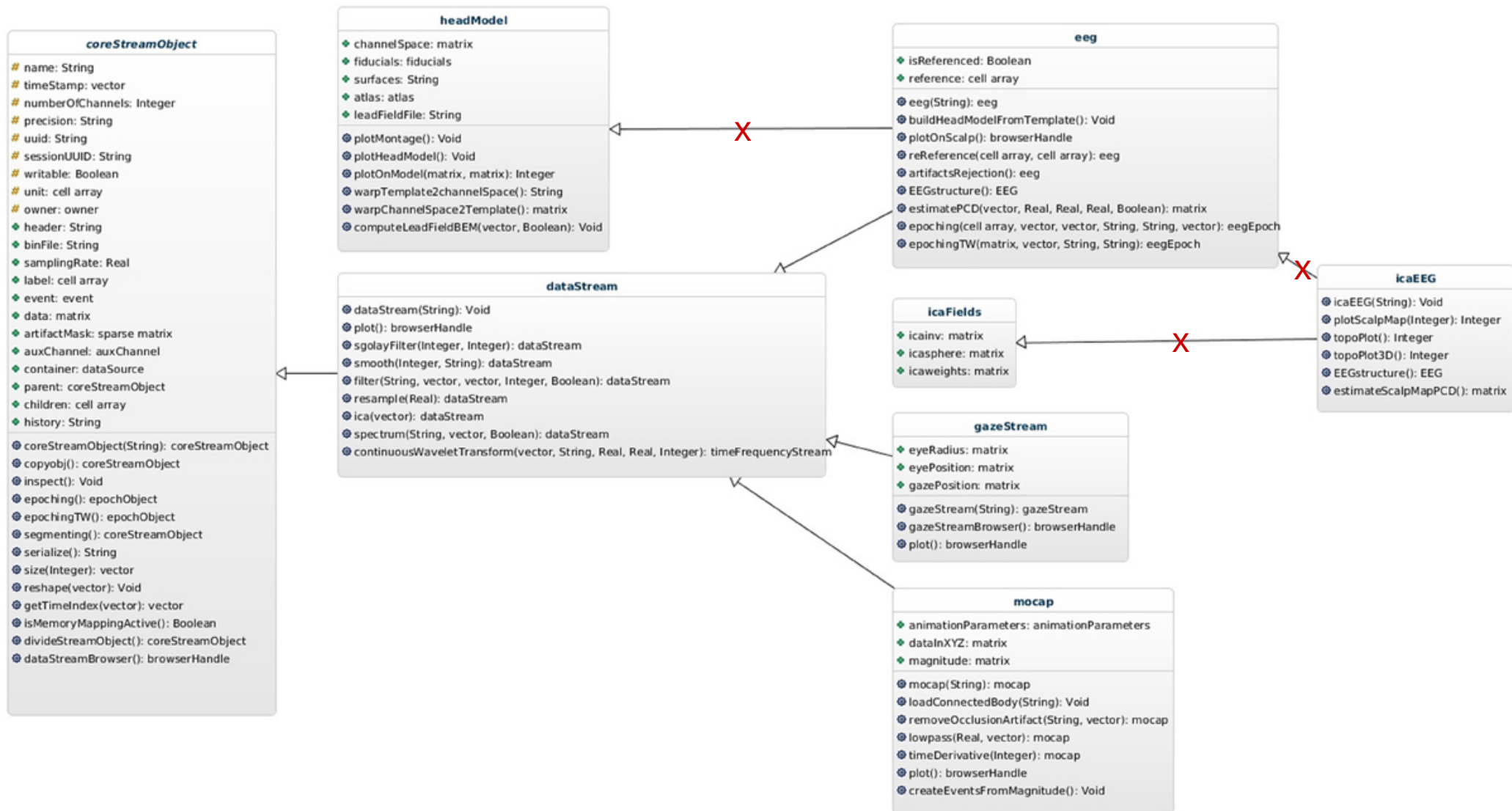
What is MoBILAB

- Open source plugin for EEGLAB.
- Analysis and visualization of synchronously recorded brain, behavioral, and environmental time series.
- MoBILAB can serve as a pre-processing environment for adding behavioral and other event markers to EEG data for further processing.
- Is designed to handle arbitrary large data arrays.

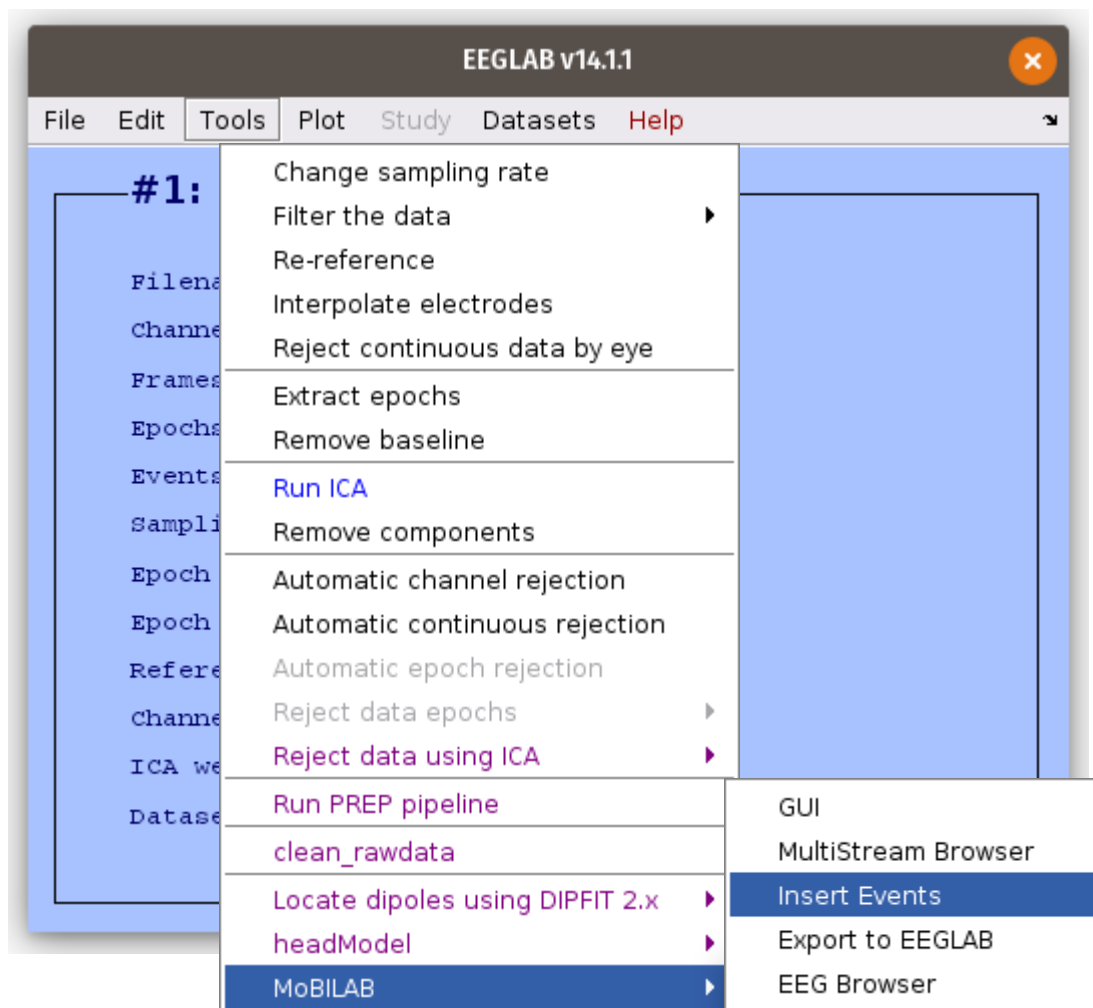
What is MoBILAB



What is MoBILAB



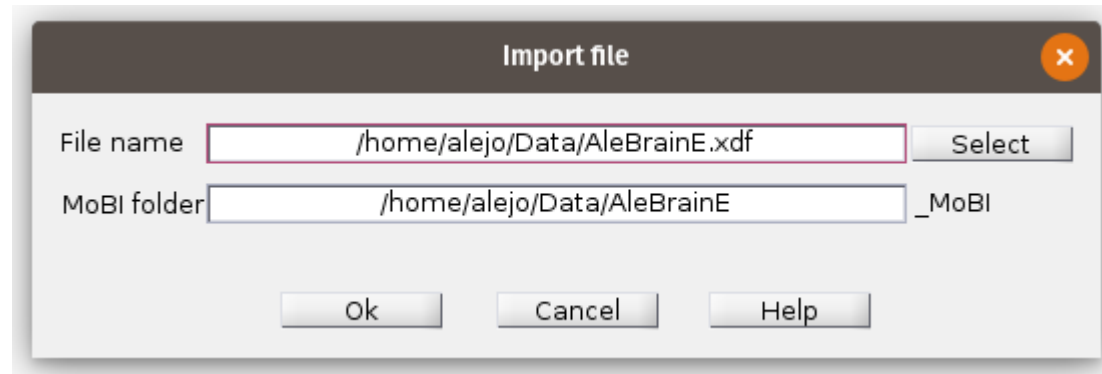
MoBILAB GUI



Command for launching the GUI: >> runmobilab;

How to import data

File → Import file



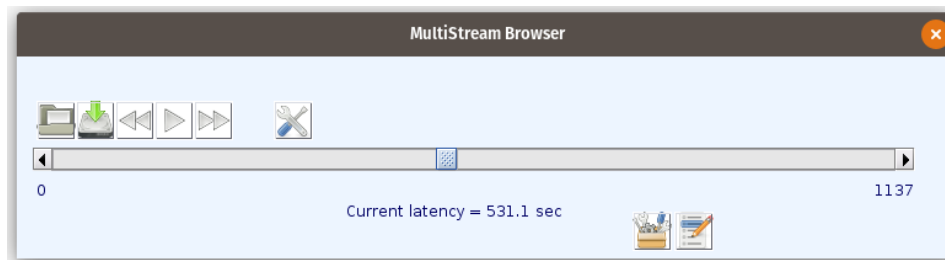
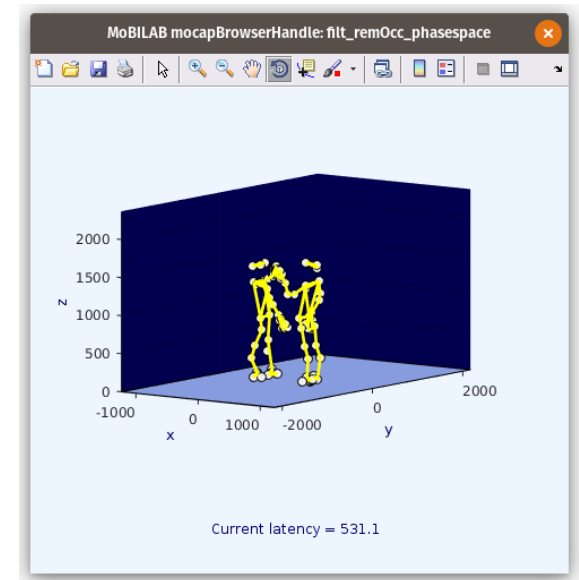
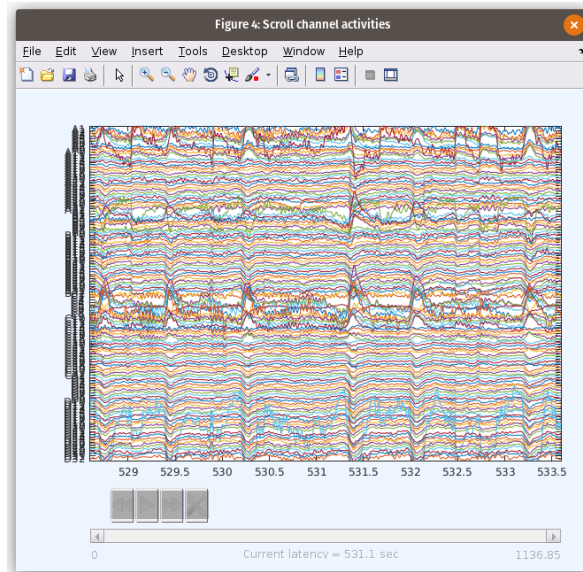
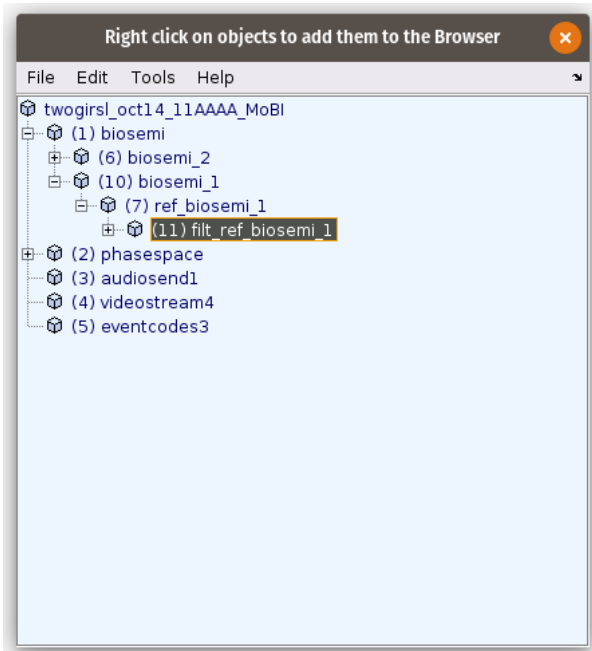
MATLAB code

```
>> xdfFile = '/home/alejo/Data/AleBrainE.xdf';
```

```
>> MoBIFolder = '/home/alejo/Data/AleBrainE_MoBI';
```

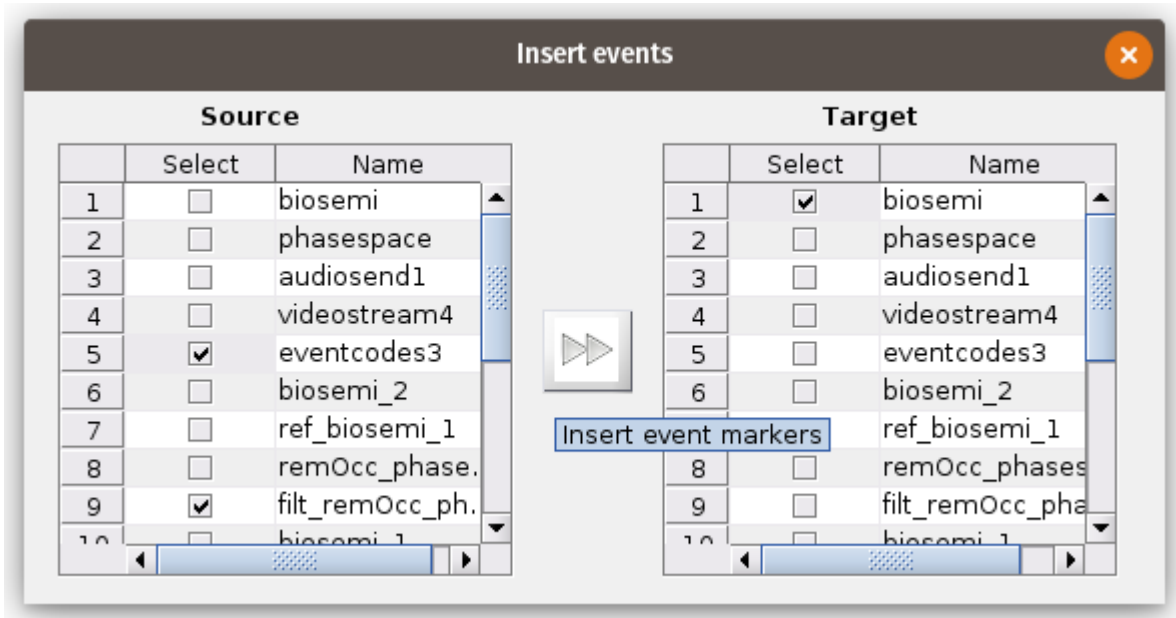
```
>> mobilab.allStreams = dataSourceXDF( xdfFile , MoBIFolder);
```

How to review MoBI data



How to handle event markers

Tools → Insert Event Markers

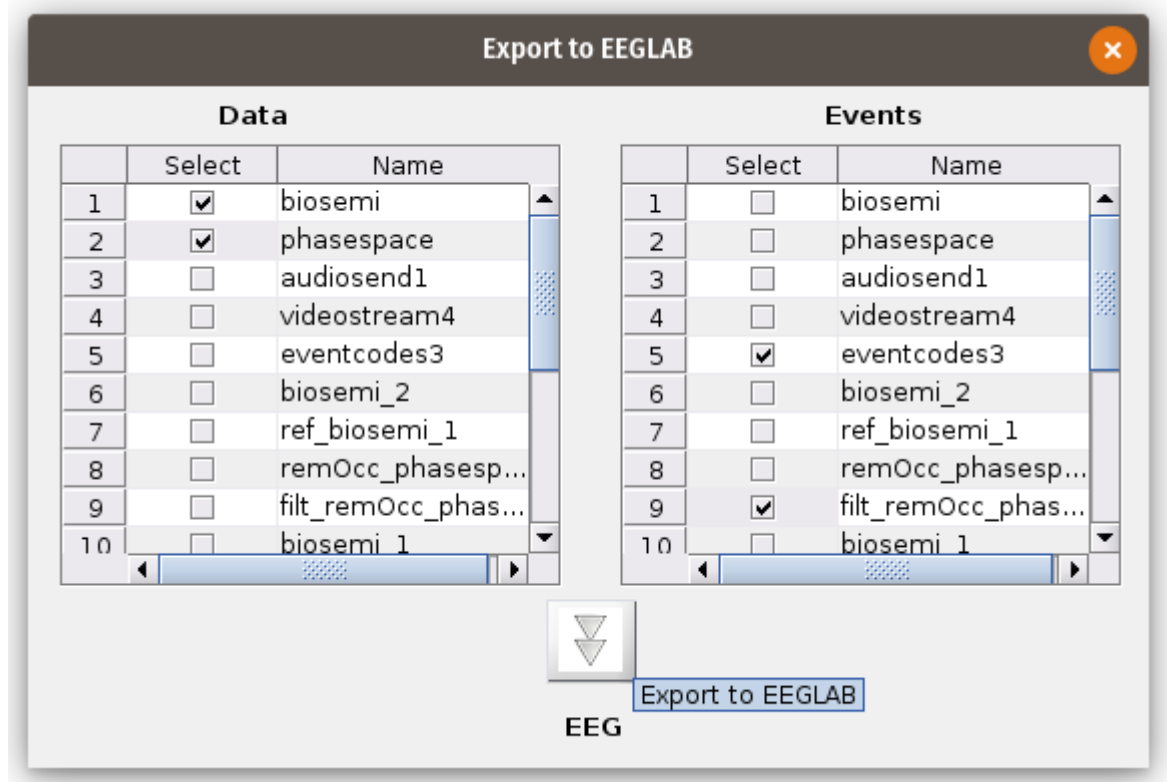


MATLAB code

```
>> indexSourceObj = [5 9];  
>> srcObj = mobilab.allStreams.item{indexSourceObj};  
>> srcLatency = srcObj.timeStamp(srcObj.event.latencyInFrame);  
>> indexTargetObj = 1;  
>> trgObj = mobilab.allStreams.item{indexTargetObj};  
>> trgLatency = trgObj.getTimeIndex(srcLatency);  
>> trgObj.event = trgObj.event.addEvent(trgLatency, srcObj.event.label);
```

How to export MoBI data to EEGLAB

Tools → Export to EEGLAB



```
>> indDataObj = [1 2];
```

MATLAB code

```
>> indEventObj = [5 9];
```

```
>> mobilab.allStreams.export2eeglab(indDataObj, indEventObj);
```



Challenges in MoBI data analysis

ERP paradigm:

- Design a task in which motor behavior is collapsed to its minimal expression (e.g., button press)
- EEG is time-locked to one or more experimental events
- Collect trials of a few seconds around the events of interest
- Do pre-processing and ICA
- Compute statistics across trials: ERP, ERSP, ITC, etc.
- Cluster ICs, group analysis

Assumptions:

- EEG dynamics are mostly stationary within the trial
- EEG dynamics are mostly a linear function of background activity and experimental conditions



Challenges in MoBI data analysis

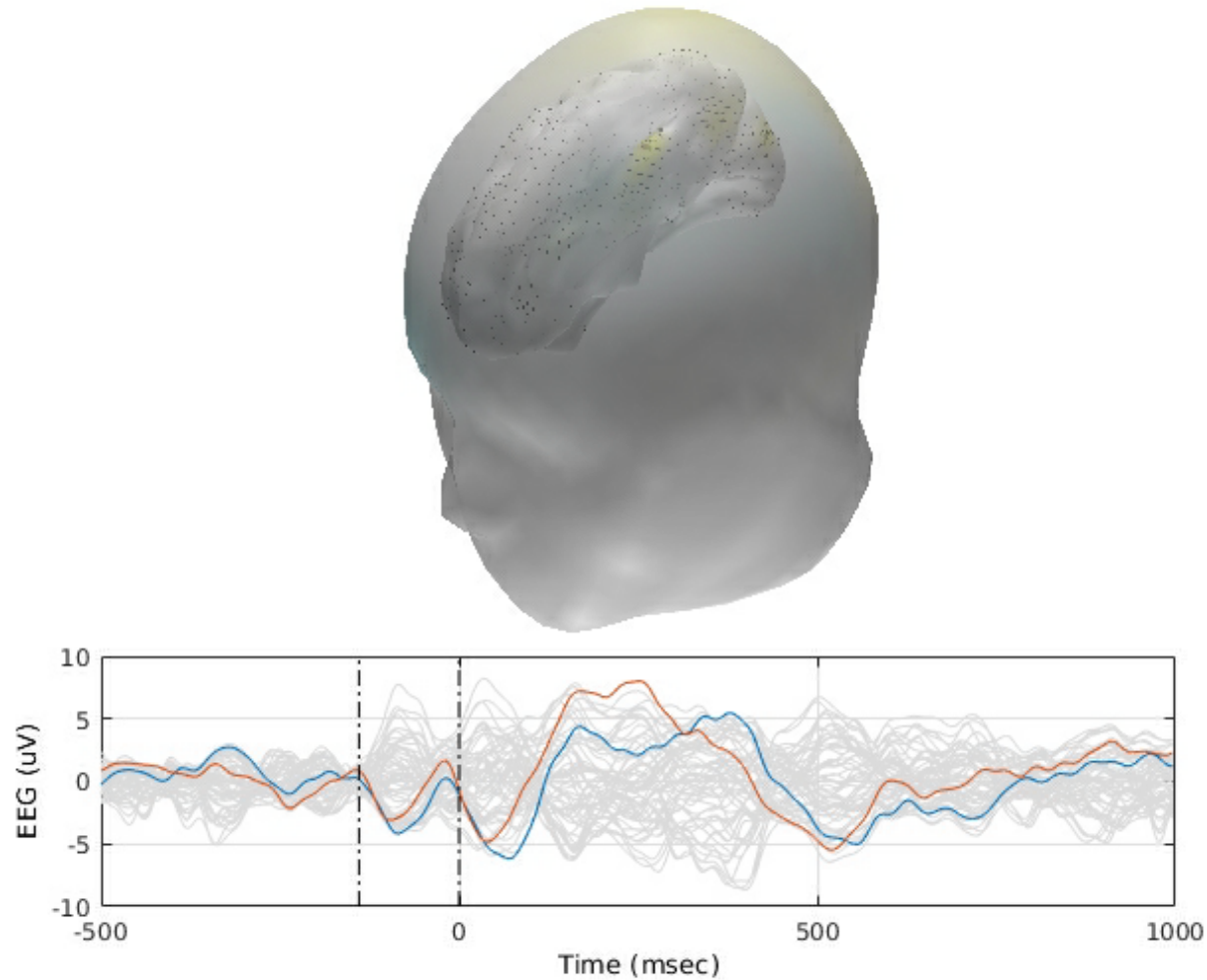
MoBI paradigm:

- Design a task in which the subject expresses rich motor behaviors
- Time-lock the EEG to one or more experimental events
- Collect trials of usually several seconds around events of interest
- Often need to time-warp trials so that the results can be interpreted in the context of a movement cycle
- EEG and body dynamics evolve over temporal scales orders of magnitude apart.

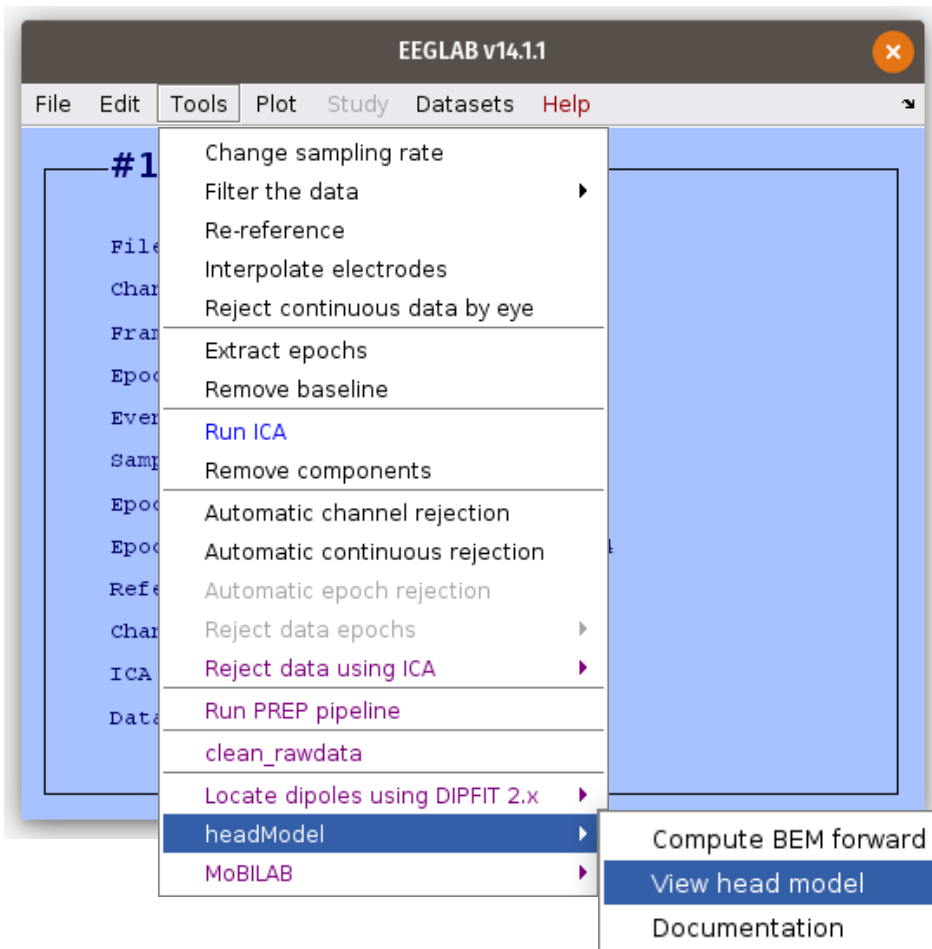
Can we stretch ERP assumptions to MoBI?

- Are EEG dynamics are mostly stationary within the trial?
- Are EEG dynamics a linear function of background activity and experimental conditions?

Distributed sparse source dynamics



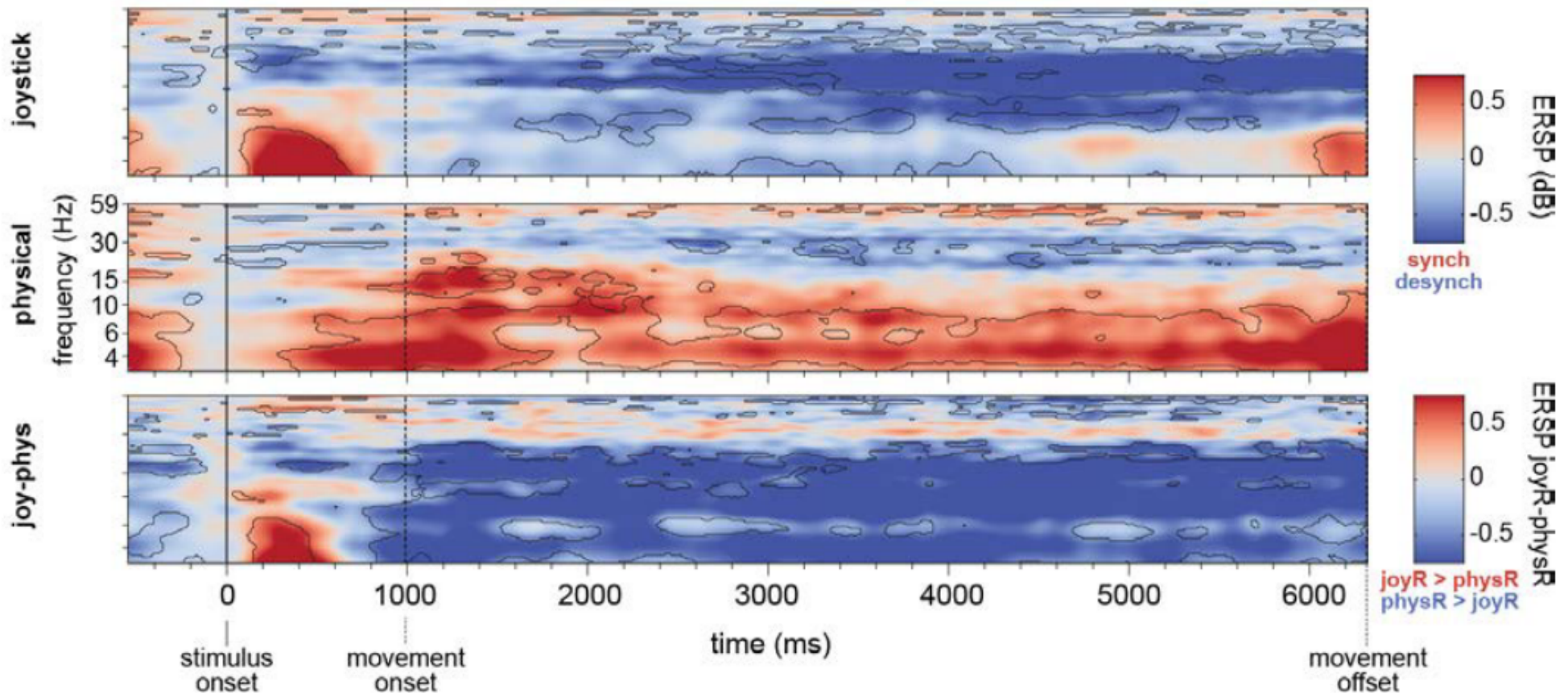
New directions: towards distributed source MoBI analysis



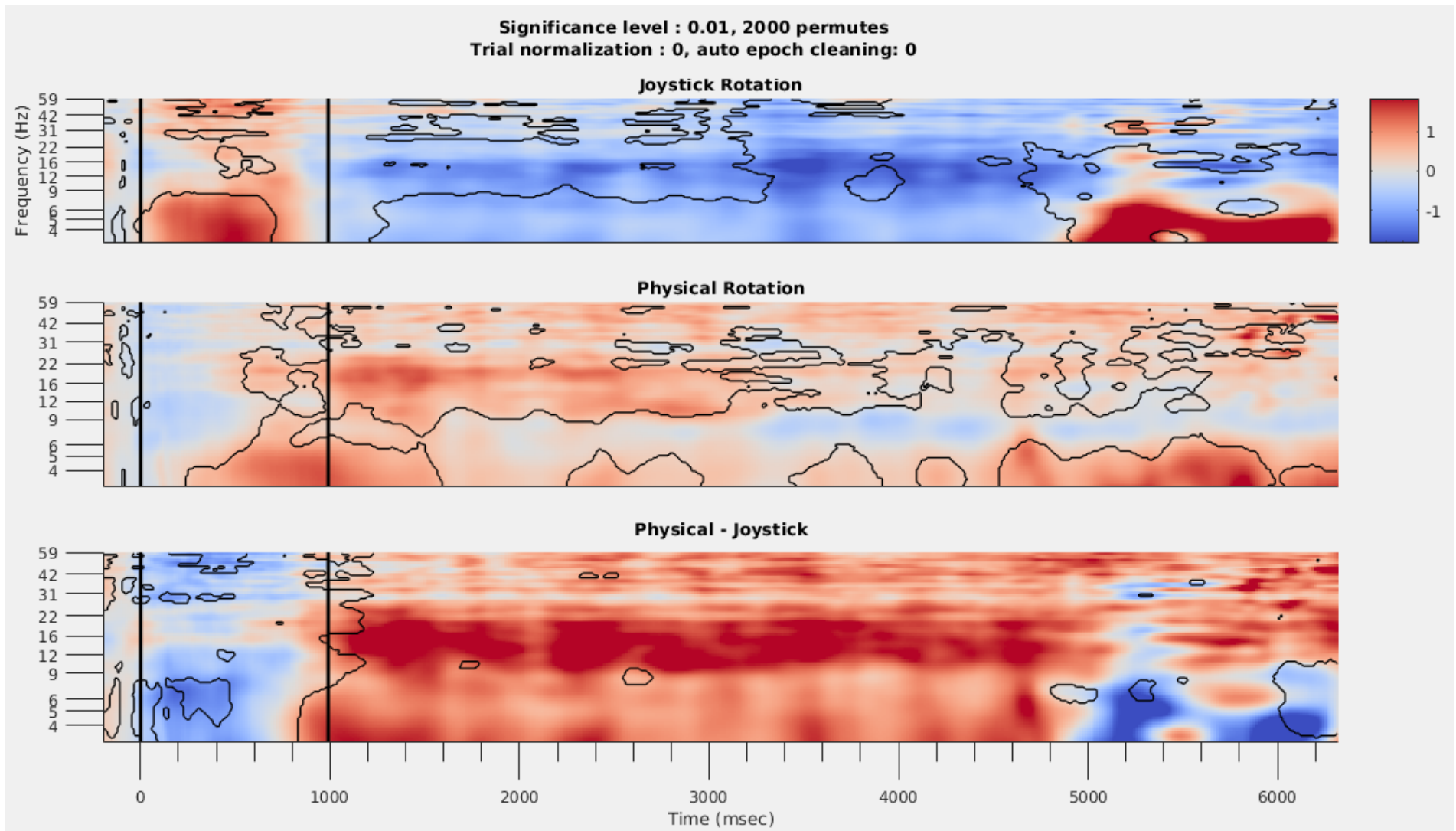
```
>> template = headModel.getDefaultTemplateFilename();  
>> conductivity = [0.33, 0.022, 0.33];  
>> orientation = false;  
>> EEG = pop_forwardModel(EEG, template,...  
    conductivity , orientation);  
  
>> hm = headModel.loadFromFile(EEG.etc.src.hmfile);  
  
>> hm.plot();  
  
>> solverType = 'bsbl';  
>> windowSize = 10;  
>> overlap = 25;  
>> EEG = pop_inverseSolution(EEG, 20, 25, solverType);  
  
>> pop_eegbrowserx(EEG);
```

Heading computation in the human RSC during full-body rotation

Collaboration with the BeMoBIL group at TU Berlin



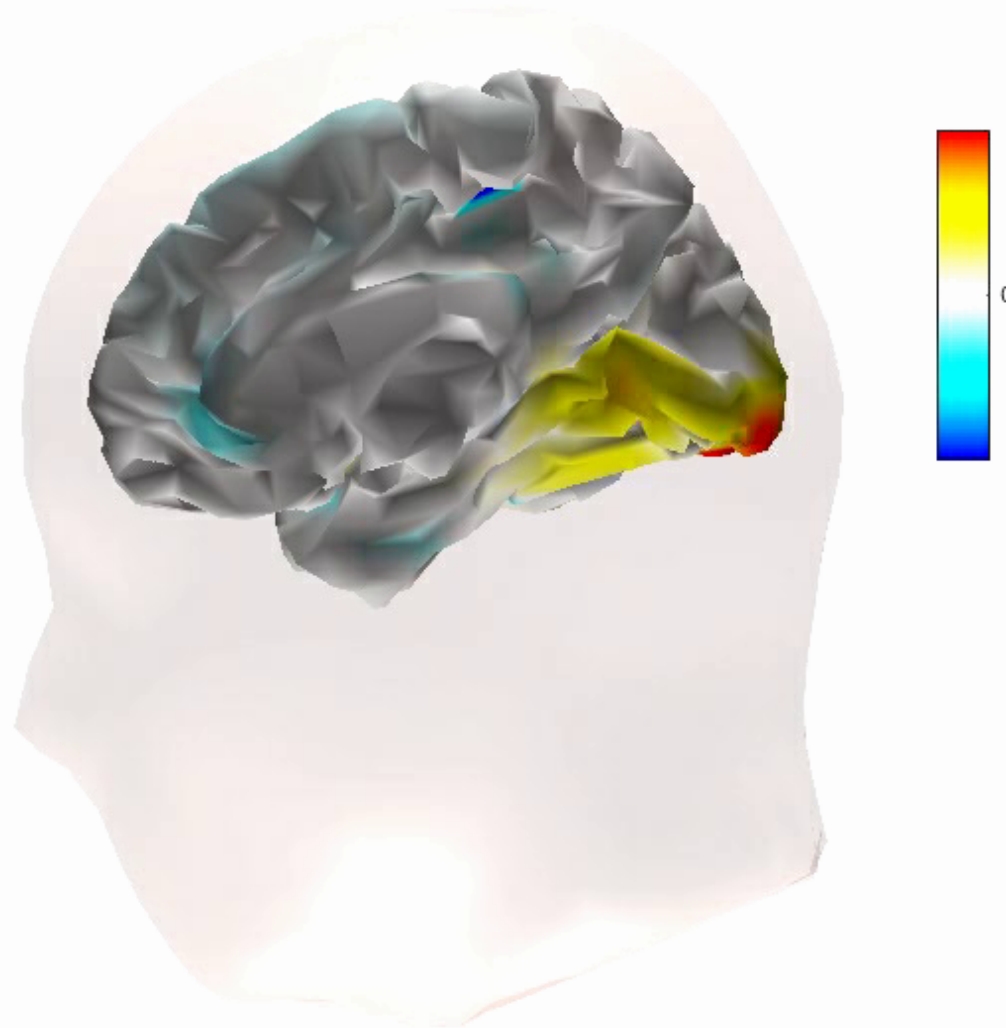
Distributed source estimation of RSC dynamics



Dist RSC

T-Student -740.000000 msec (66/3500)

of



Cortex Transparency



Scalp Transparency

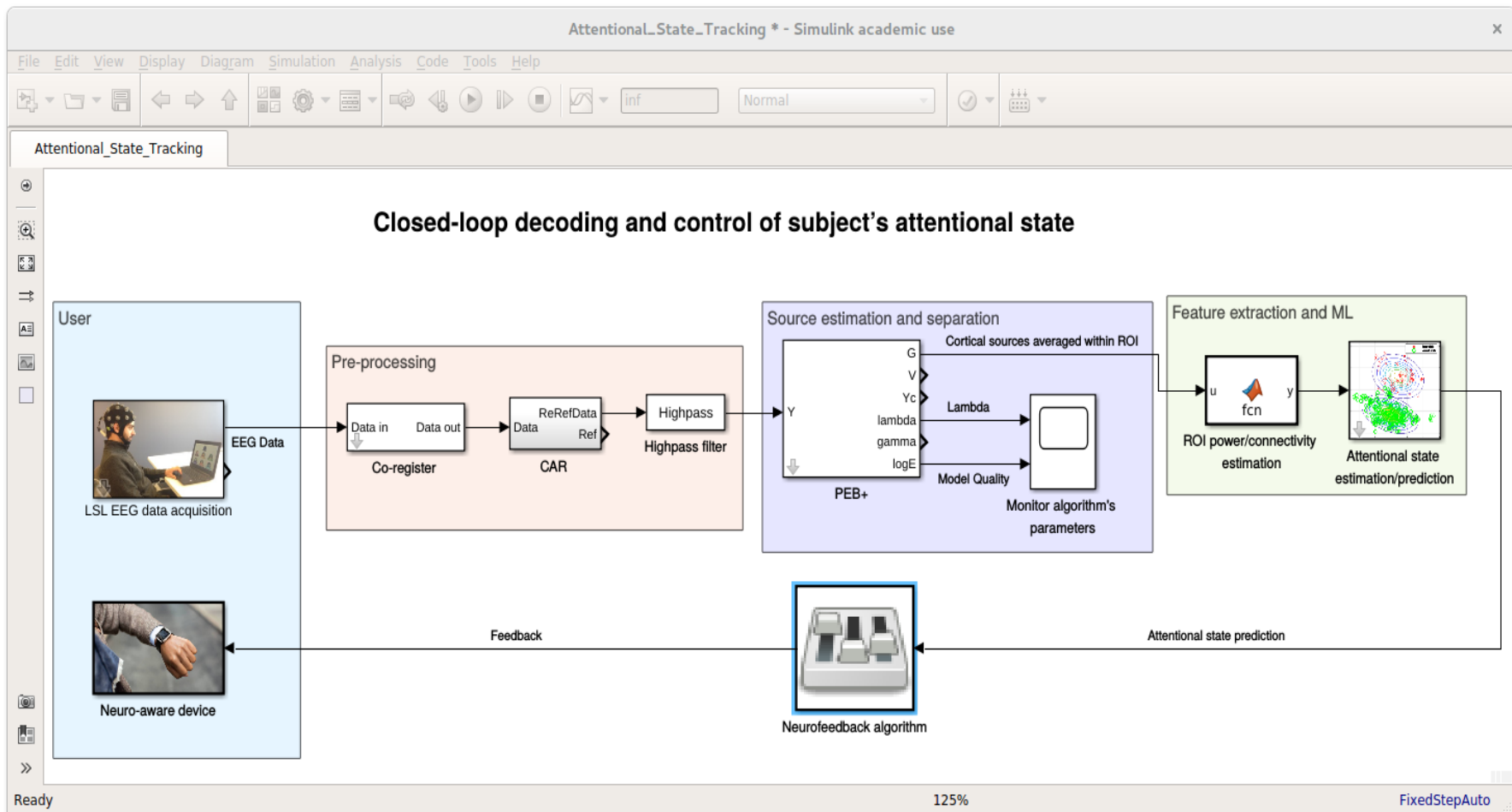


Time Cursor



Thinking about translation? Where do I take my research?

Simulink Brain Source Interface (SimBSI): <https://bitbucket.org/neatlabs/simbsi/wiki/Home>





That's all for now

Thanks for listening!