2013

Integrated Analysis Platform of Brain Wave Data Operator's Manual

Team Dec13-17

EE/CprE/SE Senior Design

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Table of Contents

Installation and Setup

Download Matlab

If you have not already, download Matlab at the following link:
http://www.mathworks.com/products/matlab/

Note: Running MATLAB requires a Mathworks license.

Download SPCA_MUA_GUI

Download the project from the Github repository at the following link:
https://github.com/cjhicks/492Team17SeniorDesignProject

From this page, click the link in the lower-right corner that displays "Download ZIP" to download the ZIP file. *Note: It may take several minutes to download this file.*

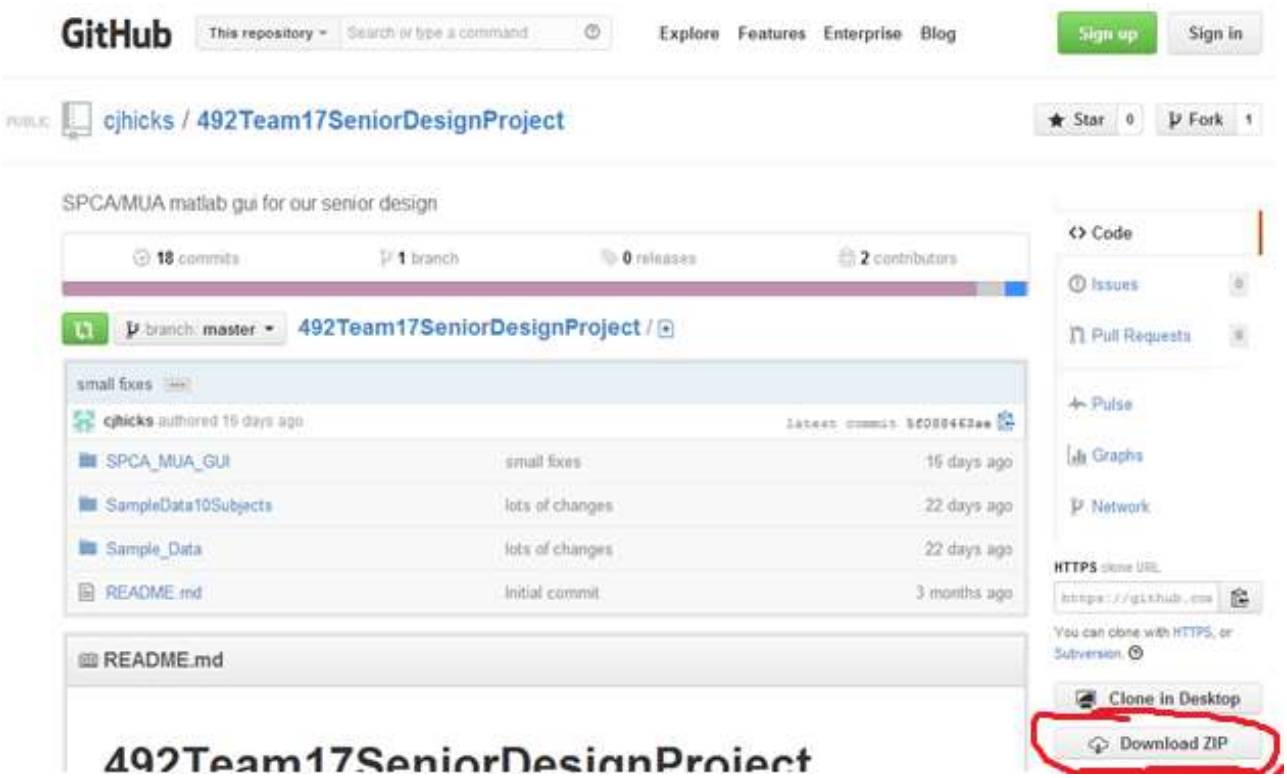

Figure 1.1: Github Repository for SPCA_MUA_GUI

After Downloading the ZIP file, you may extract the file into a directory of your choice. *Note: You will need to reference to the location you extracted SPCA_MUA_GUI during setup.*

Open Project in MATLAB

Open MATLAB and traverse to the SPCA_MUA_GUI folder within MATLAB. *Note: This location is where you extracted the files from the previous step*. Your MATLAB explorer should look like the image below.

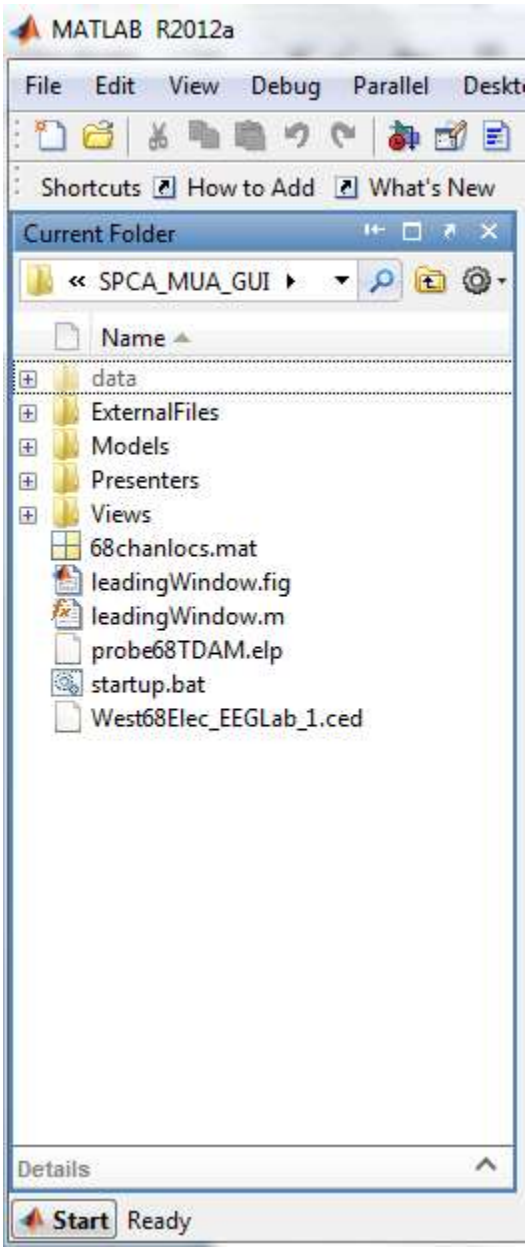

Figure 1.2: SPCA_MUA_GUI folder in MATLAB explorer

Add Folders to Search Path

Before you can run SPCA_MUA_GUI, you must add all the project folders (with subfolders) to the MATLAB search path. To do this, first select *File -> Set Path*. The Set Path dialog should appear. Click *Add With Subfolders…* and a File browser should appear. Select the SPCA_MUA_GUI and click *OK*. The application should be ready to run after this step.

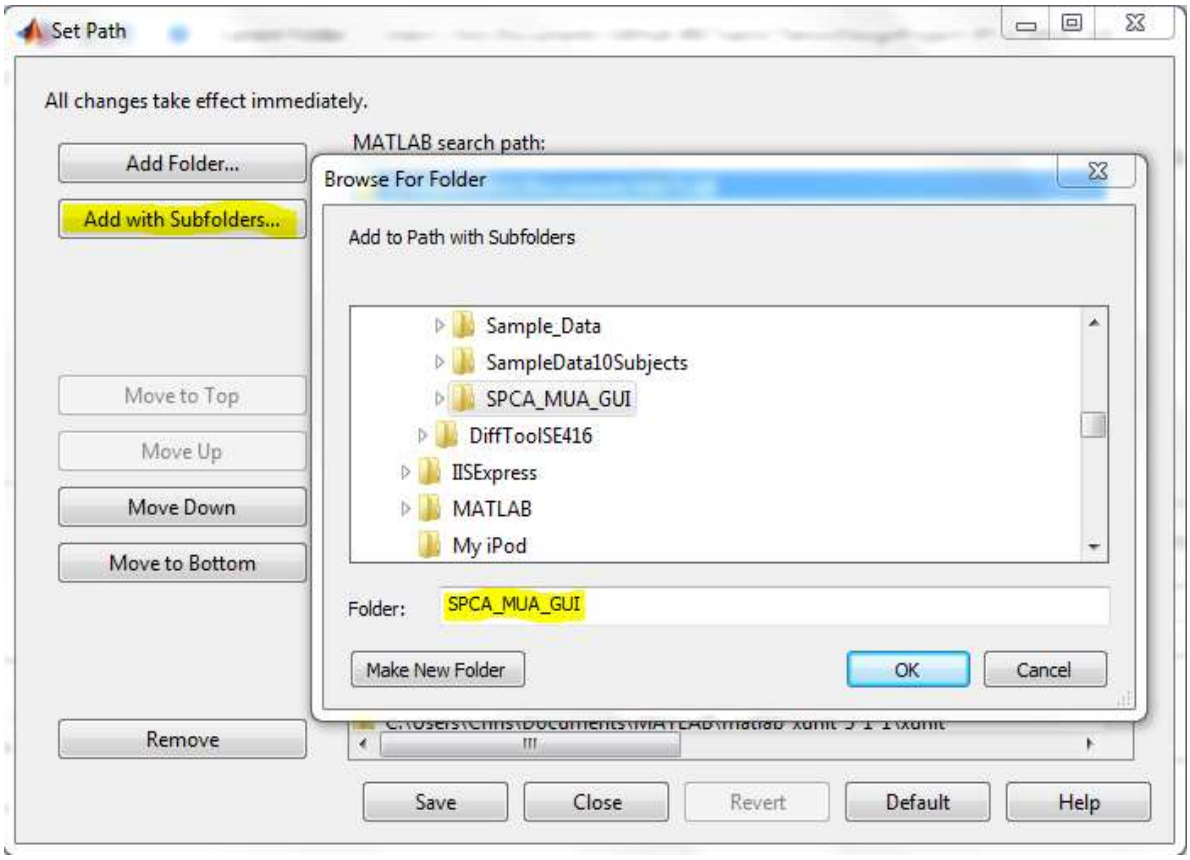

Figure 1.3: Adding SPCA_MUA_GUI to search path (with subfolders)

Run SPCA_MUA_GUI

Startup

There are two ways to start the application. The first can be done on a Windows PC without MATLAB command prompt. The second will work on all platforms, but must be done via MATLAB command prompt.

Windows Batch Startup

If you are on a Windows system you can navigate to the SPCA_MUA_GUI Folder and double-click the *startup.bat* file. It's that easy!

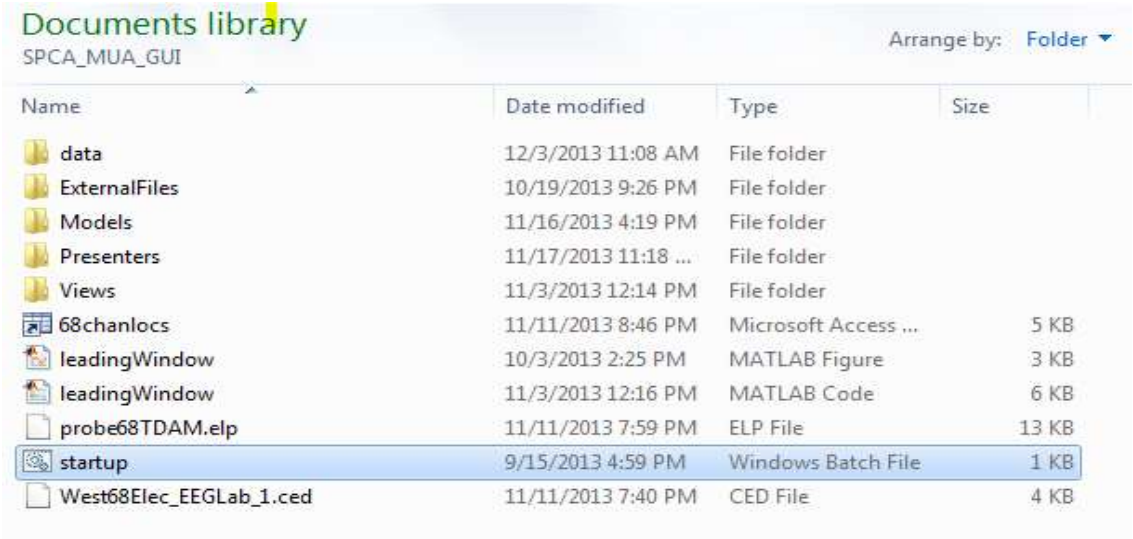

Figure 2.1: Startup Batch file for Windows PC's

Cross-Platform Startup via MATLAB Command Window

Alternatively, on any other platform you may open the application from MATLAB. Simply type *leadingWindow* into the MATLAB Command Window to start the application.

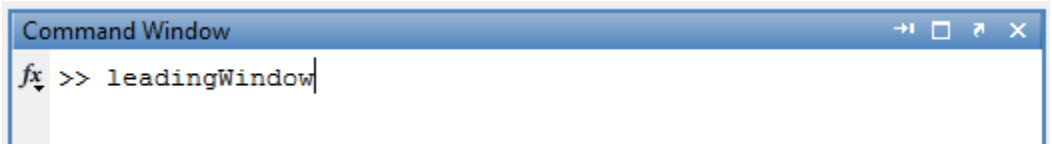

Figure 2.2: Starting SPCA_MUA_GUI in MATLAB

Either way you start your application, the leading window will appear as the image below.

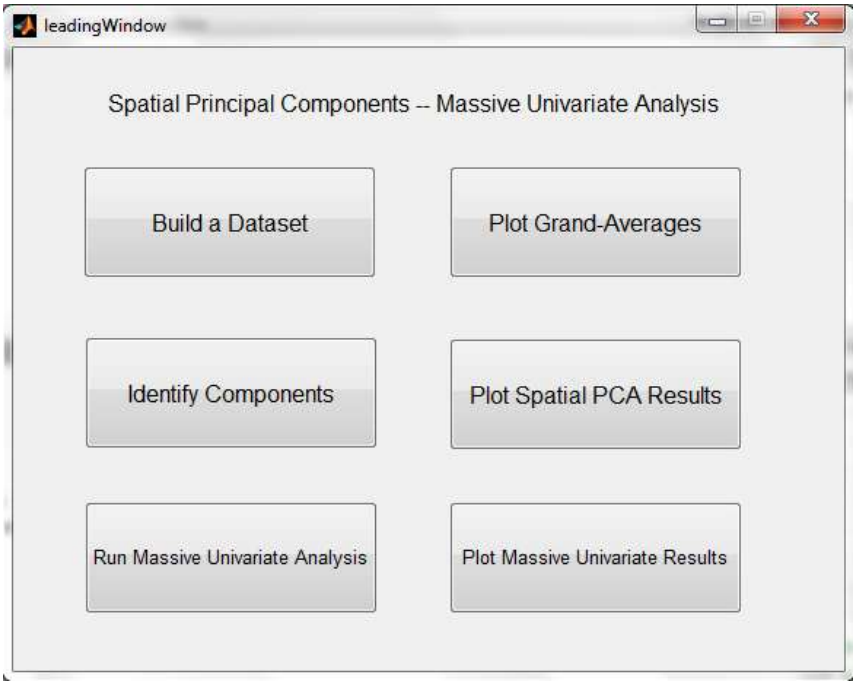

Figure 2.3: Leading Window from MATLAB startup

Build a Dataset

Select *Build Dataset* from the Leading Window to build a dataset. You will be prompted with the following window.

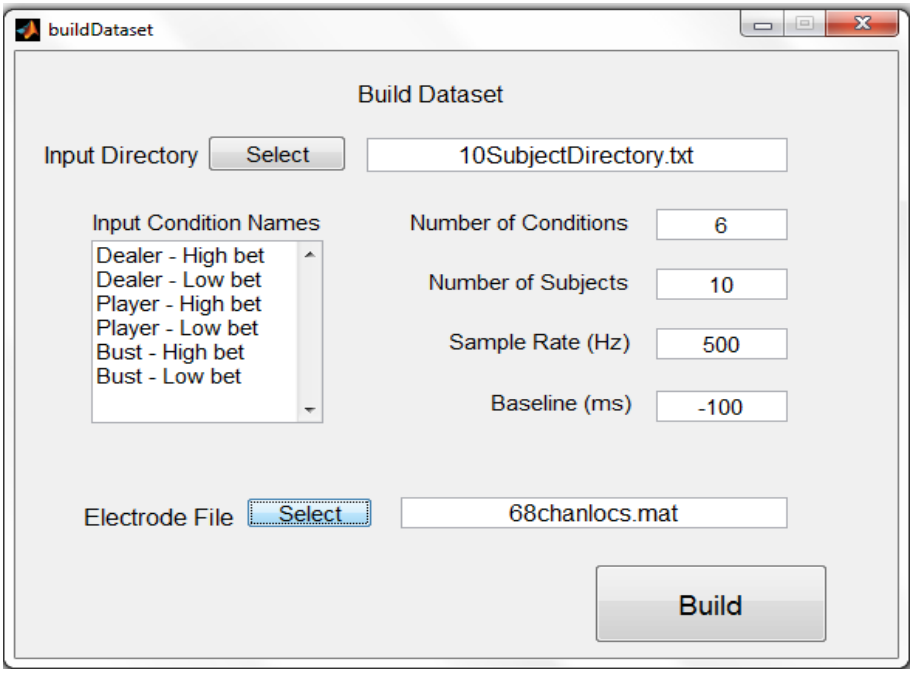

Figure 2.4: Build Dataset Window

Input all parameters in order to perform the build. Note that Sample Rate is in Hertz and baseline is in milliseconds. Also note that Number of Conditions and the total number of Input Condition Names must be the same.

For the Input Directory, you must write a text file containing a concatenated list of all the files you want to include into the dataset in order. A sample is shown below. You may use relative or absolute file locations.

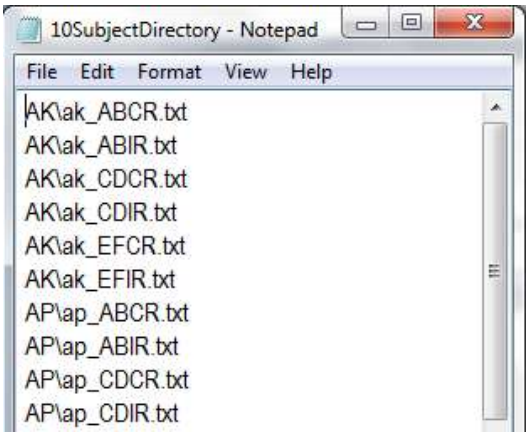

Figure 2.5: Input Directory Format with Relative File Locations

After you input all parameters, select *Build* to save your dataset as a .MAT file. You will use this file in the next steps. *Note: You may also save the Spatial PCA results as a separate .MAT file.*

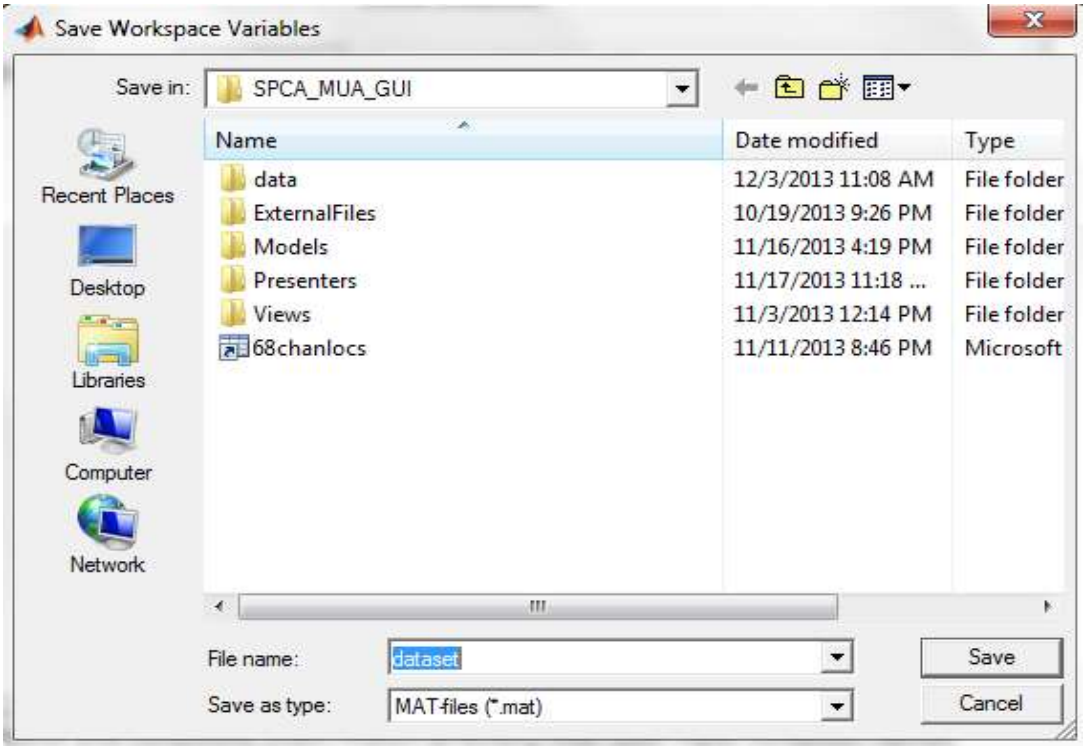

Figure 2.6: Saving Dataset as a .MAT file

Plot Grand Averages

After building a dataset, you may view the two-dimensional grand-averaged electrode locations by clicking *Plot Grand Averages* in the Leading Window.

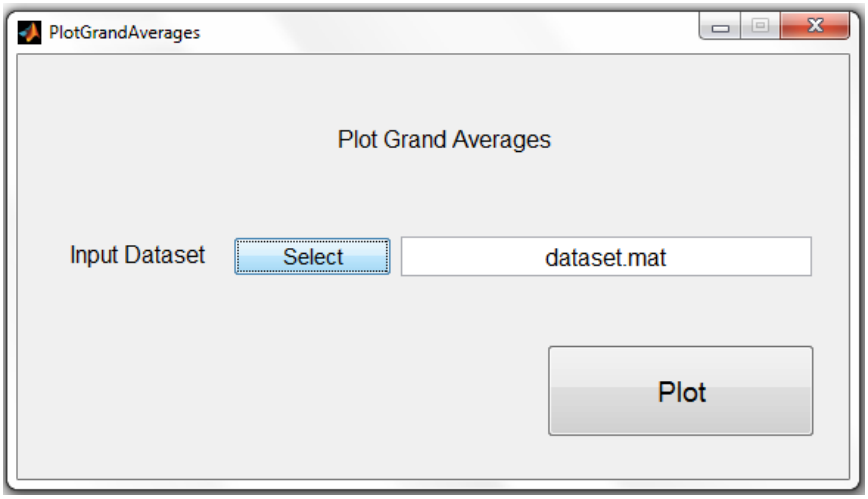

Figure 2.7: Plot Grand Averages Window

To create the plot, click *Select* and select the dataset file you created in the previous step. The plot will appear similar to the image below.

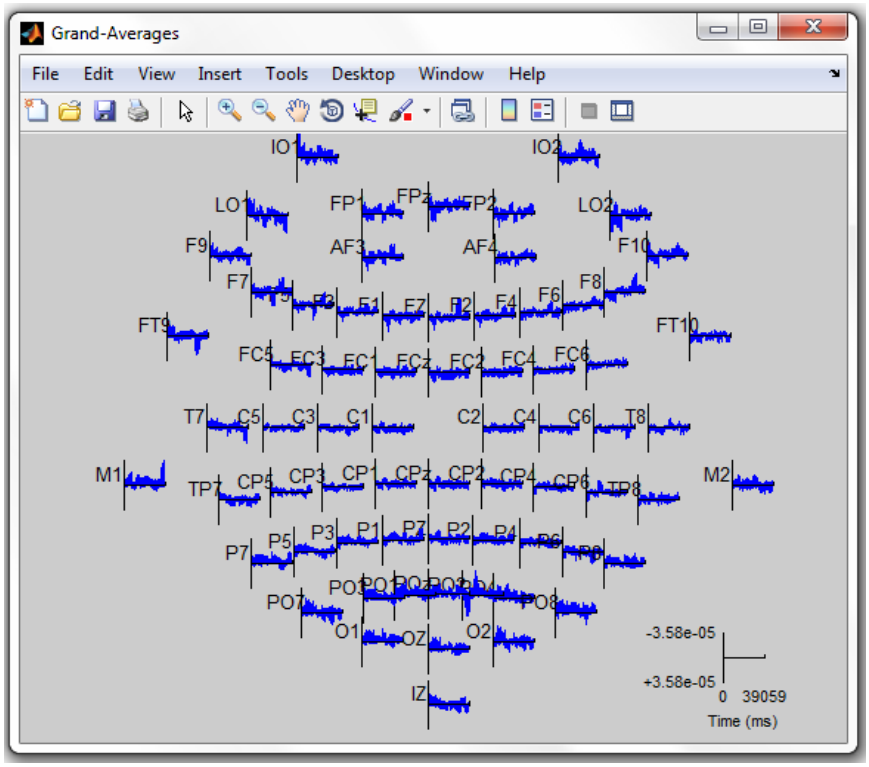

Figure 2.8: Grand-Averages Electrode Locations

Furthermore, you may double-click any electrode to see a zoomed-in version of its grand-averaged values.

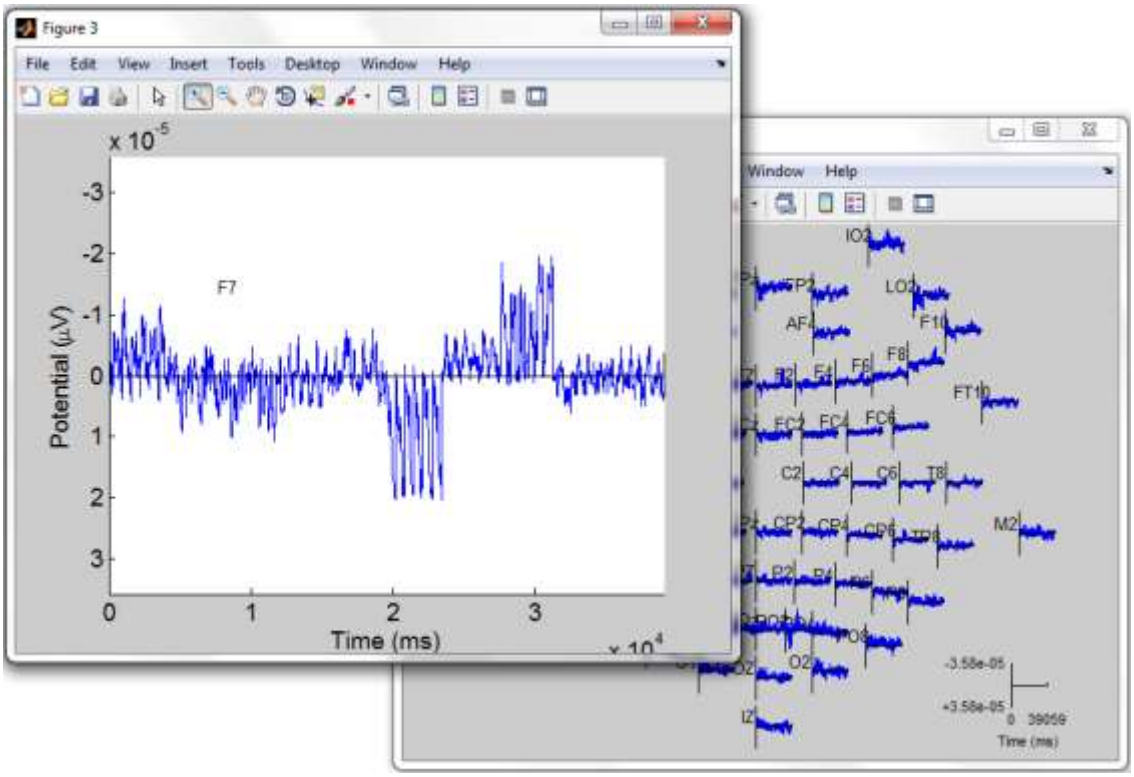

Figure 2.9: Zoomed-In Grand-Averages Electrode

Identify Components

To Identify Spatial Components, select *Identify Components* from the Leading Window. You will be prompted with the following window.

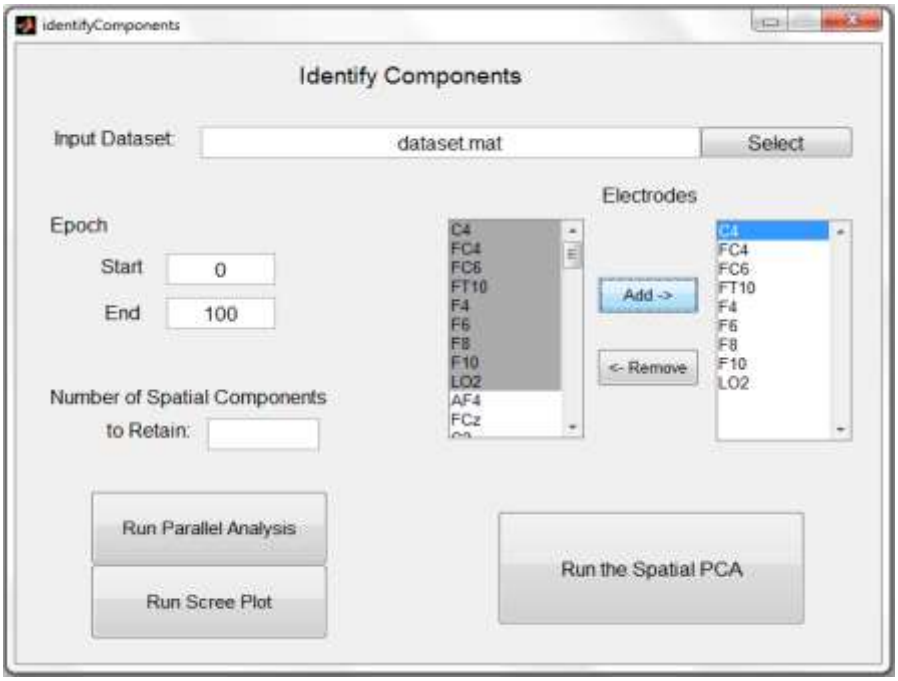

Figure 2.10: Identify Components Window

Input all parameters in order to run the Spatial PCA. Note that Epoch Start and End are in milliseconds. Also note that you may add and remove multiple electrodes at a time.

Determine Number of Spatial Components

Before running Spatial PCA, you must determine how many Spatial Components you wish to retain. You may run a Parallel Analysis and generate a Scree Plot to help with this task. Ultimately, the Spatial PCA will retain the number stored in the text box below.

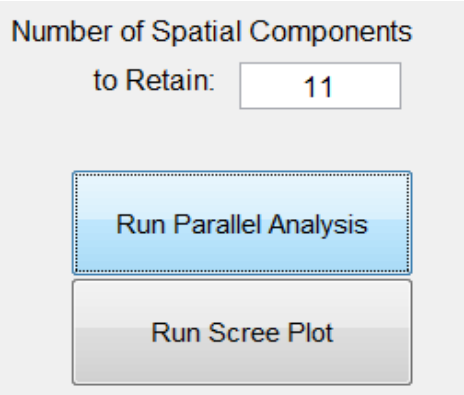

Figure 2.11: Determining Number of Spatial Components

Plot SPCA Results

After running Spatial PCA, you may view the results by clicking *Plot SPCA Results* in the Leading Window. From there, select the SPCA .MAT file you wish to generate results for.

Figure 2.12: Plot SPCA Results Window

You may view the results in Raw form, or with Variamax or Promax rotation. The result will generate a topography and ERP for each spatial component.

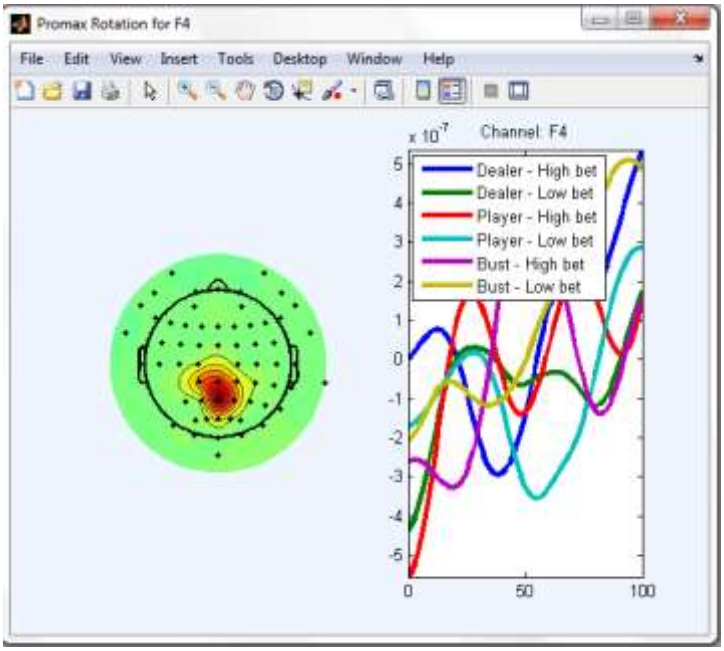

Figure 2.13: Sample SPCA result with Promax rotation

Run Mass Univariate Analysis

To Run the Mass Univariate Analysis, select *Run Massive Univariate Analysis* from the Leading Window. You will be prompted with the following window.

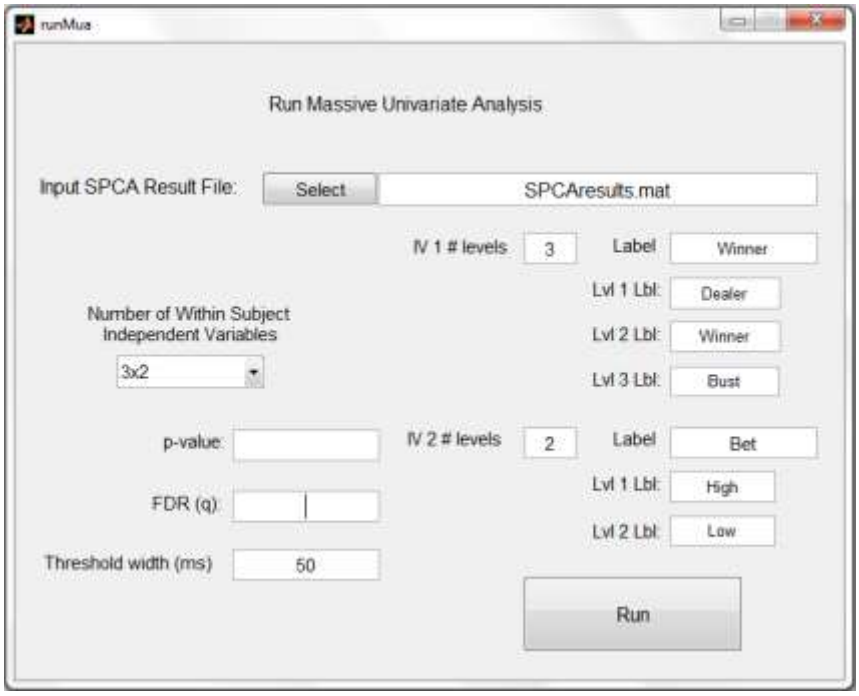

Figure 2.14: Run MUA Window

Input all parameters in order to run the MUA. Once you are ready to generate results, click *Run*. The result will generate ERP's for each spatial component.

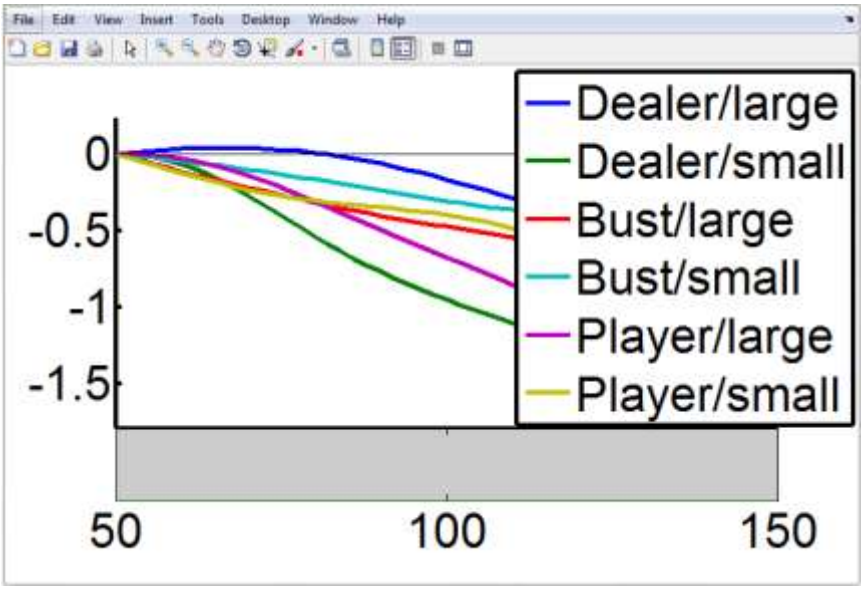

Figure 2.15: Sample MUA Result