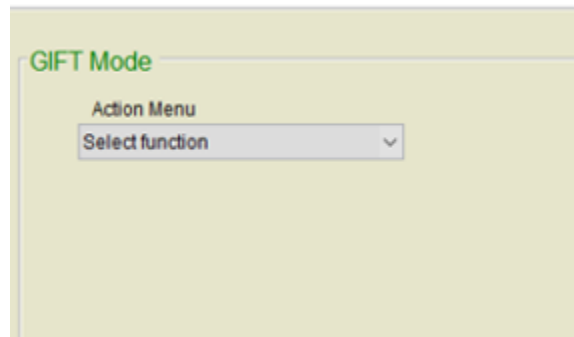


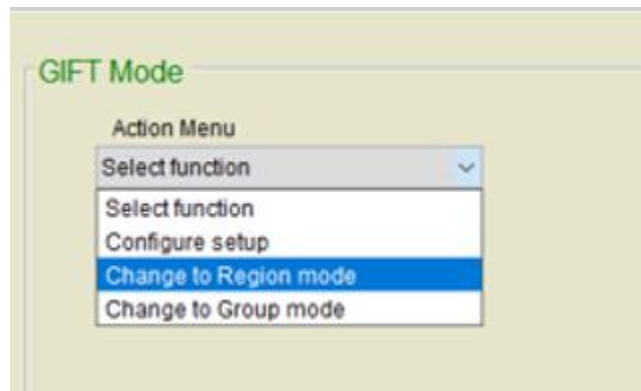
Dynaconn Region Mode Walkthrough

Configure Setup Options

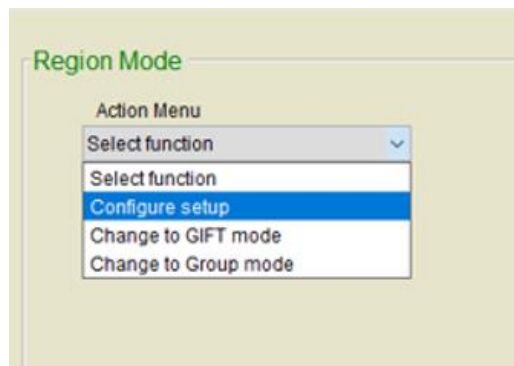
Dynaconn opens in GIFT Mode by default.



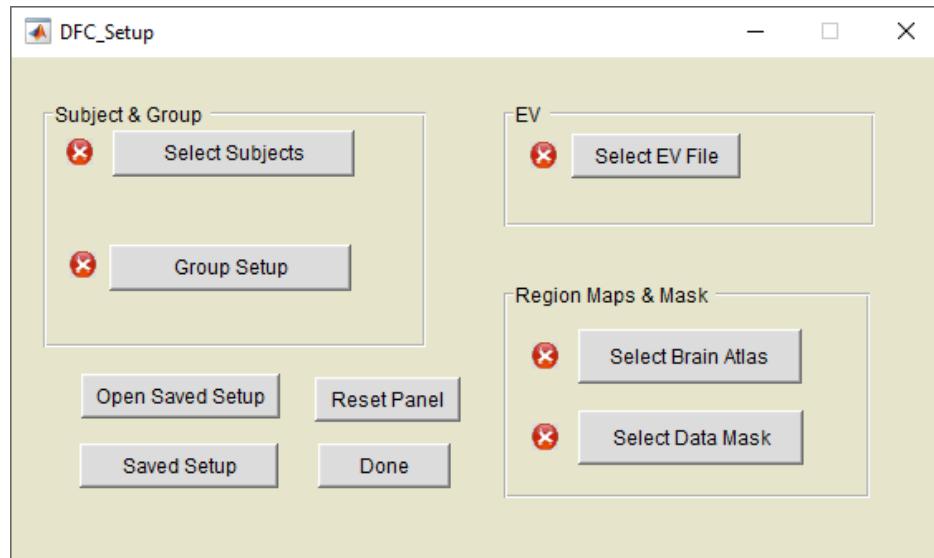
To change to Region mode, select the option from the Action Menu.



Once in Region Mode, select Configure Setup from the Action Menu



A directory selection window will pop-up asking the user to select the directory in which to store any results and previous saved states. If the directory that is selected has a previously saved state, the user will be asked if they wish to use the previous setup.



The setup configuration window has five configurable sections. Once a section is completed the red X will change to a green check mark showing that the section was completed successfully. If a previous setup is loaded, then the sections that were previously completed will show a green check mark. A small asterisk will appear next to the saved setup button if any of the setup has been modified. This is to remind the user that they need to save the modified setup.

- Select Subject – Enter all of the subjects to be analyzed. This section is required to do any analysis and for any analysis function to become available through the action menu in the main GUI.
- Group Setup – This section is where you choose which group (i.e. class/category) each subject belongs to. This section is not currently supported in Region Mode and the Component Region Matrix function, nor any of the Data Output functions will be available.
- Select EV File – EV File selection links an EV (expected value/task modulation) file with each subject. This section is not mandatory, but the Output EV Modulated data function will not be available. In the bottom component correlation window of the main GUI, the TC or group average will be shown, but not the EV/Task modulation average, if the Select EV File section is not completed.

- Select Brain Atlas – This section allows the introduction of a brain atlas or brain region map in order to give an anatomical label to which parts of the brain are active. This section is mandatory, however if no brain atlas is given, DFC GUI will load the default AAL (Anatomical Automatic Labeling) brain atlas.
- Select Data Mask – The section allows the selection of a binary 3D mask to be applied to the subject files. This section is mandatory, but if no data mask is entered a standard MNI space map will be loaded.
- Saved Setup – The function allows you to save the current setup to a directory.
- Open Saved Setup – This function allows you to open a previously saved setup. All of the setup fields that were previously saved will changed to green check marks.

If you wish to clear the previous setup state, the Reset Panel button will change the state of each setup section to be incomplete.

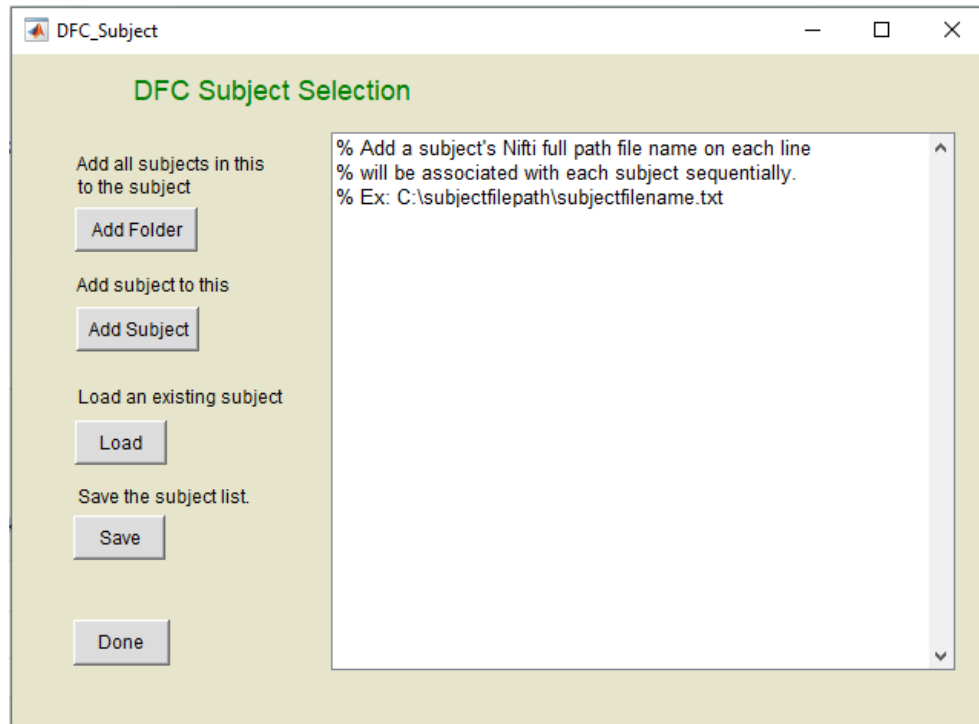
Select Subjects

The select subject menu is where all of the subjects are loaded for analysis. This section is required for any analysis function to become available through the action menu in the main GUI. In this mode there are several ways to add new subjects. The subject list can be created manually in the text box. The subjects in the window will be loaded once the Done button is used.

The format for the subject list is the full path to each subject, per line. For example, here, subject 2 and 5 will be loaded.

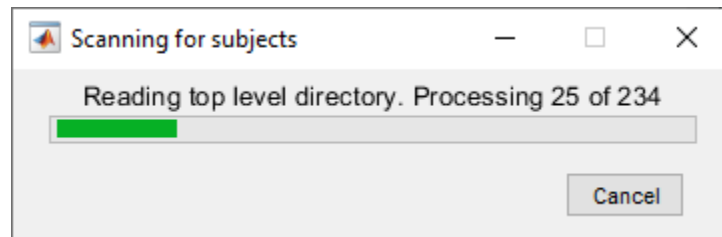
```
C:\filepath\subject2.nii
```

```
C:\filepath\subject5.nii
```



- Add Folder – The add folder button will prompt you to select a directory that contains all of the NIfTI (.nii) subject files that you wish to add to the list of subjects for analysis. The immediate directory and one level down of sub-directories will be searched. Once the folder has been read, the path to each NIfTI file will be added to the text window.
- Add Subject - The add subject button will prompt you to select a single subject NIfTI file. The path to the file will be added to the text window.
- Load – This function allows you to select a text file which has the path to all the subject NIfTI files you wish to load. Once the subject list has been read the paths will be placed in the text window.
- Save – The save function will save all the text from the text window to a text file.
- Done – Once all the subjects that you wish to load are in the text window, click done to have the subjects scanned and return to the setup window.

A dialog pops up when scanning a directory to add subjects and may take some time:



Group Setup

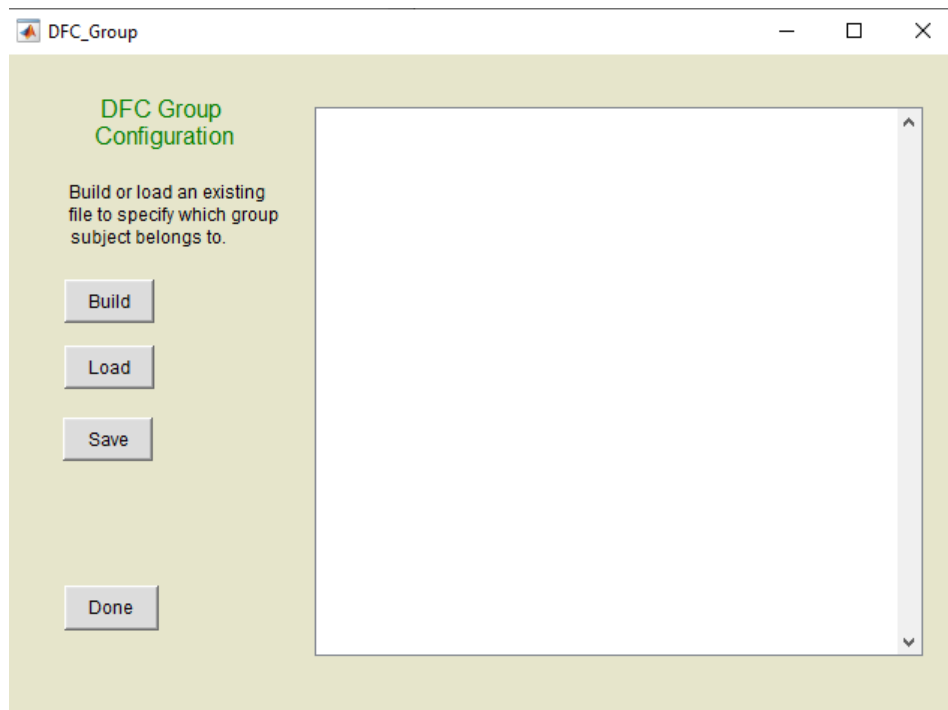
Note: as of Dynaconn v2 group functionality has not been added to Region Mode. Changes made will not affect your results.

The Group setup form determines which group (i.e. class/category) each subject belongs to. The group information is used in data output functions and the component region matrix function.

The format for the group file is a subject on each line followed by a number reference to the associated group. For example, subject2 below will belong to group 1 and subject5 will belong to group 2.

C:\filepath\subject2.nii 1

C:\filepath\subject5.nii 2



Below is a list of the functions available in the Group Configuration form:

- Build – This function creates a list of all subjects previously loaded and adds a default group number after the subject path. The user may then change the group number manually.
- Load – Prompts the user to select a text file that has a list of subjects and group numbers. The text file contents will be loaded into the text window.
- Save – This function saves the text in the text window to a text file.

Note that you can manually enter the path to any subjects along with the group number into the text window before clicking the Done button

Select EV File

An EV file or expected value file is a text file that has a minimum of one column and a maximum of three columns. The first column is the time that a task occurs. The time can be either time in milliseconds or scan number. The optional second column is the scan duration. The optional 3rd column is a binary successful test identifier. Only the first column of the EV file is used by Dynaconn.

The screenshot shows the 'EV Map Setup' form. At the top, it says 'EV Map Setup' in green. Below that, there's a dropdown menu set to 'EV file units are seconds.' with a small up/down arrow. To the right of this are two input fields: 'TR' with the value '1.7' and 'TA' which is empty. Below these is a checkbox labeled 'Use one EV file for all subjects.' which is currently unchecked. To the right of the checkbox is the label 'EV File List'. Below the checkbox are five buttons stacked vertically: 'Add', 'Load', 'Save', 'View subject list', and 'Done'. To the right of these buttons is a large text area containing the following text: '% Add a EV full path file name on each line manually, % Will be associated with each subject sequentially. % Ex: /evfilepath/evfilename.txt'.

The Select EV File form, is used to input a list of EV or expected value files for each subject. The format is a full path to an EV file per line. Once completed and the Done button is pressed, each EV file will be associated with each previously loaded subject in sequential order. There must be the same amount of EV file listings as there are subjects unless the one EV file for all subjects is used.

Below is a list of the options for the EV map setup:

- EV file units are seconds – Use this option if the first column of the EV file lists the event times in milliseconds.
- EV file units are scan numbers - Use this option if the first column of the EV file lists the event times in scan number.
- TR – Repeat time in milliseconds. DFC GUI uses TR to convert scan number into seconds and vice versa.
- TA – For future use: Acquisition time in milliseconds.
- Use one EV file for all subjects – This option associates all subjects with the one EV file listed in the EV file list text window as opposed to listing a different file for each subject. There must be only one EV file listed in the EV file list text window if this option is selected or there must be as many EV files listed as there are subjects if the option is not selected.
- Add – Prompts the user to select an EV file, which will then be added to the EV file list text window.
- Load – Prompts the user to select a previously populated text EV file list. The EV file list will be loaded into the EV file list text window.
- Save – Saves the text in the EV file list text window into a text file for later retrieval.
- View subject list – This function retrieves a list of the currently loaded subjects so that the EV files can be matched against.
- Done – Once all the desired EV files are loaded, clicking the Done button will parse and load the EV files from the EV file text window. The number of EV files will also be checked to match the number of subjects unless the “Use one EV file for all subjects” option is selected.

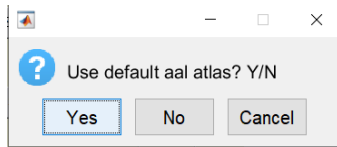
Select Brain Atlas

Note: Select Brain Atlas menu item discontinued beginning with Dynaconn 2.0.

The Brain Atlas Selection form is used for including brain atlas / region maps with associated brain region legend. The format of the brain atlas map is either 3D NIfTI in which the regions do not overlap (AAL atlas for example) or 4D NIfTI where there is a 3D map for each region (HarvardOxford probability map for example). The associated brain region legend, which names each region must be in XML format. DFC GUI uses 2mm space; however, if the map being imported is not 2mm it will automatically be rescaled to 2mm.

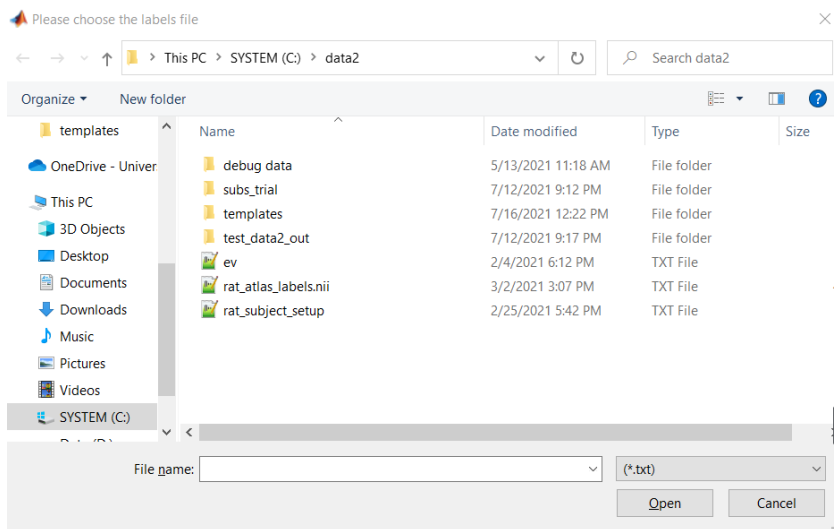
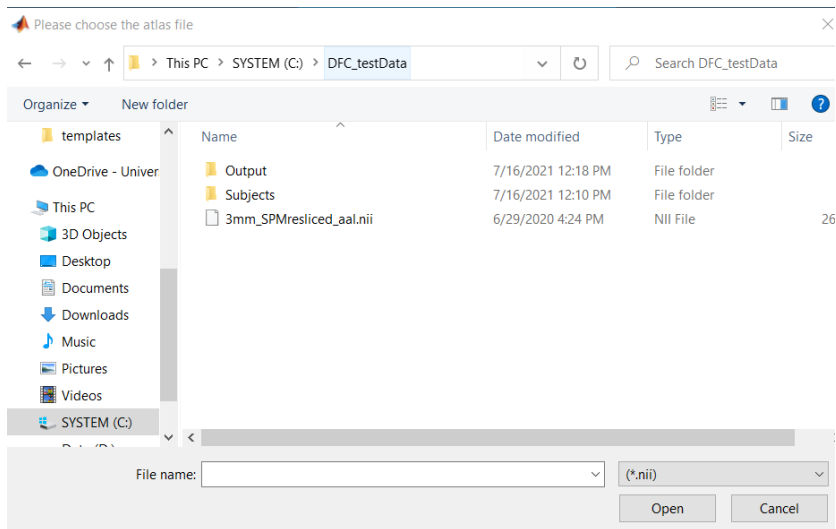
New for Dynaconn 2.0:

After completing the Subject, Group and EV sections of the Setup Menu, press “Done”. Dynaconn will then prompt the user on which atlas to load.



Selecting Yes will load the default atlas and labels and will begin generating the region averages for the subjects.

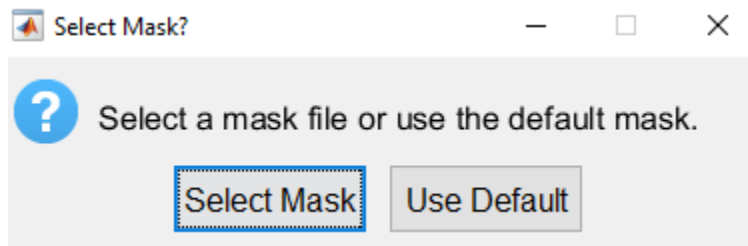
If the user selects “No”, the user will be prompted to provide custom atlas (.nii) and labels (.txt) files.



Note that more than one set of region labels and map can be used. For instance, the user could load 20 label HarvardOxford cortical file followed by a 20 region HarvardOxford cortical probability map, then load a 30 label HarvardOxford sub-cortical file followed by a 30 region Harvard Oxford sub-cortical probability map. DFC GUI would then use 50 regions in its analysis.

Select Data Mask

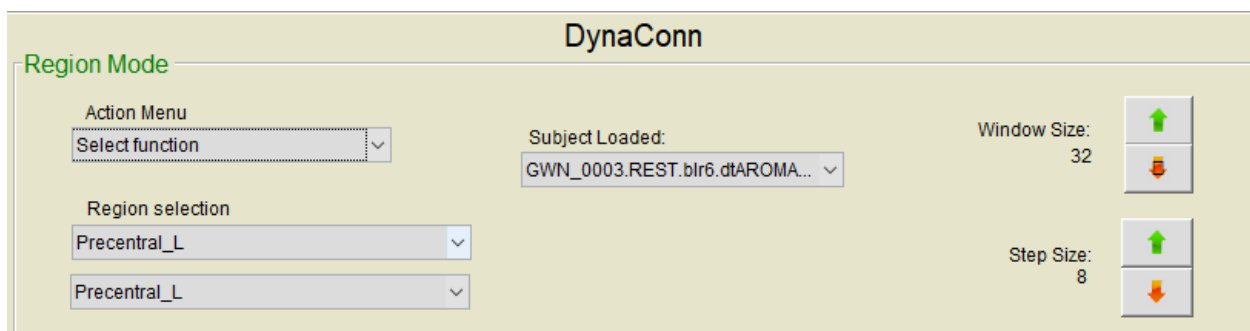
The Select Data Mask function is a prompt to either select a data mask or used the default 2mm MNI mask.



- Select Mask – This function prompts the user to select a NIfTI data mask. The mask must be a 3D binary MNI mask. If the selected mask is not 2mm it will automatically be rescaled to 2mm.
- Use Default – This function loads a standard 2mm MNI mask.

Main GUI

Note: Region Average and Correlation graphs may not appear initially and will load when a different subject in the Subject Loaded list is selected.



Below is a brief description of each available function in the main GUI.

- Action Menu – This dropdown box has various functions to analyze the current data set such as showing a matrix of component combination correlation and showing the components or regions selected in a graphical window. There are also options for outputting the data and changing the mode to either GIFT or Group mode.
- Subject Loaded – This dropdown box allows you to change current subject to any of the other subjects that were previously loaded during setup.
- Component/Region selection – These dropdown boxes show which two components or regions are currently going to be shown in the graph section of the Main GUI. Note that initially nothing is shown in the graph area but once a component or region is selected, the graph will be updated.
- Window size – The window size is the size in data points of the sliding correlation window used to calculate dynamic functional connectivity (DFC). The result of changing the window size can be immediately seen in the bottom (Region Correlation) window.
- Step Size – The step size is the size in data points that the sliding correlation window move to the left after every correlation in order to calculate dynamic functional connectivity (DFNC). The result of changing the window step size can be immediately seen in the bottom (Region Correlation) window.



Component Region Matrix

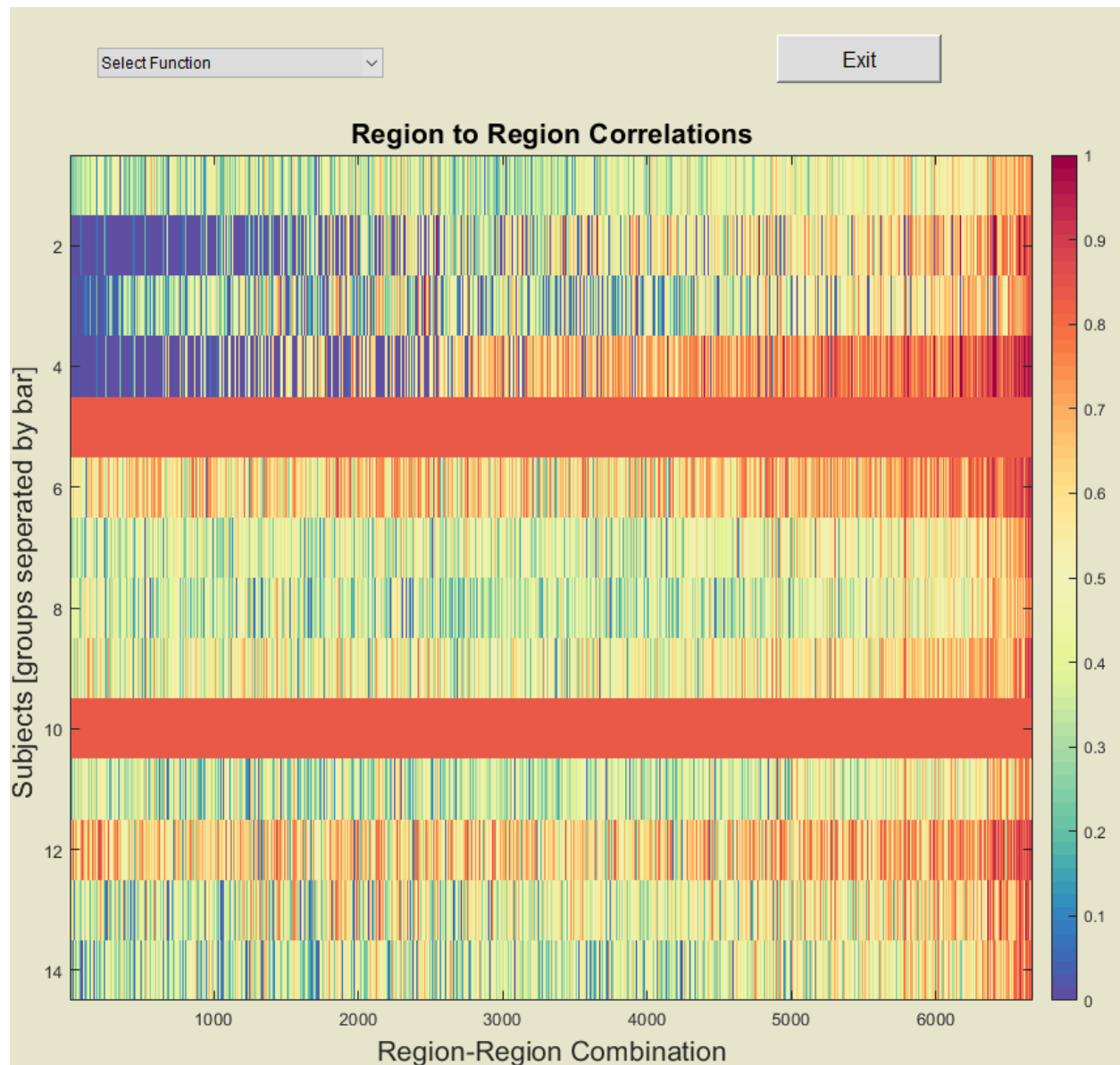
The Region Average Matrix Display provides a method to view the Region-to-Region correlation results for all of the subject and component or region combinations. Each cell in the matrix is an average of all the ccs from the region average correlation. The result will always be positive since the higher of the positive and negative correlation is used.

Display is to illustrate any differences in the DFC results between groups. The arrangement to support this objective is to place all of the subjects from a group together. Then all IC or region combinations are sorted based on the average from the first group. Therefore, if there is a difference between the first group and any other group, then it may be observable in the matrix plot. The first group is at the top of

the plot and the second larger group is below the purple separating line. In the figure there are only two groups, but DynaConn can support any number of groups. Each group will be separated with a purple line.

The DFC Matrix Display has two supporting functions. The first function allows the user to select any of the points on the plot. Once the user clicks on one of the data points, the display will close and will update the Main GUI with the subject and component or region combination that was selected. The EV file will also change to the selected subject. If the Component Viewer is open, it will close and reopen with the user selected subject components. This function gives the user the ability to navigate through a possibly large amount of data to find a data point of higher significance. If the dataset is large, seeing and especially being able to select the data points can be difficult. Therefore, this GUI was designed to allow the user to expand and maximize the window. In addition, a user can use the magnifier in the MATLAB toolbar to zoom in on a group of data points before selecting a single data point. These features add to improving the clarity and usability of the GUI.

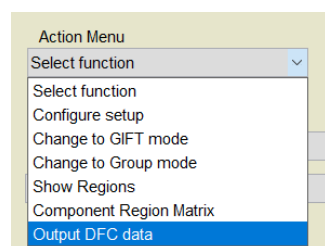
The second supporting function can change the color map used to display the correlation matrix. The default color map in MATLAB is the Jet color map, which is synonymous with the rainbow color map in other plotting and mapping tools. The issue with using the rainbow color map is that the hues in the color map match well to the electromagnetic spectrum but not well with human perceptual order. The DFC Matrix Display allows changing the color map to gray scale, copper, rainbow, or Color Brewer. DynaConn will recall the previously used color map if the setup has been saved.



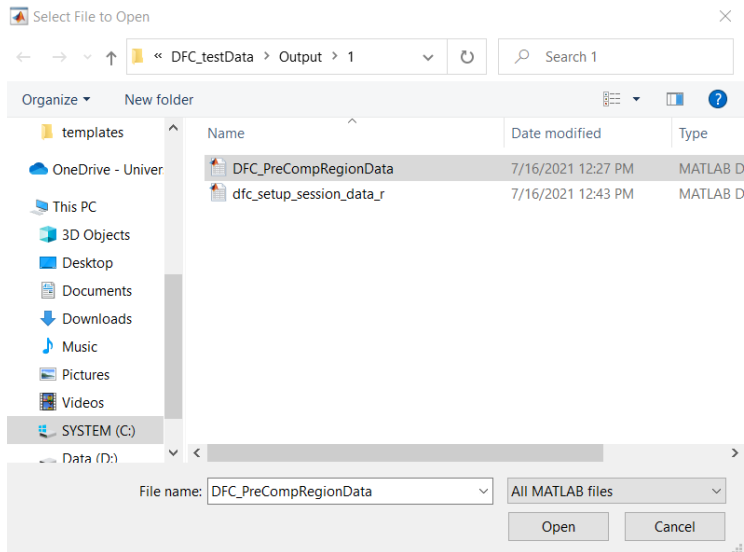
Generate Dynamic Functional Connectivity Matrix

Note: Groups must be defined.

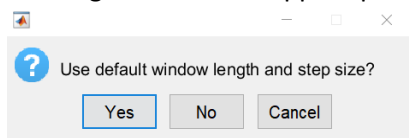
To generate the DFC matrix, select “Output DFC Data” from the action menu.



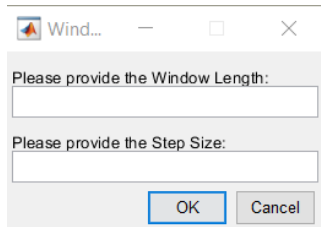
Choose the Region Average file generated by Dynaconn. File will be named DFC_PreCompRegionData.



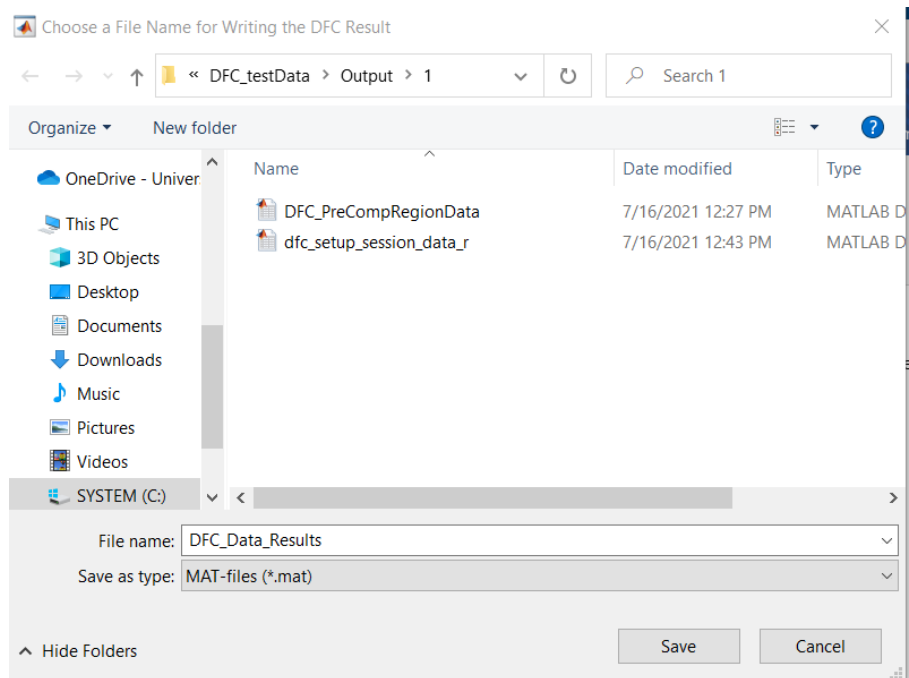
A dialog box will then appear prompting the user for the window length and step size.



To use custom parameters, select no and input the new parameters in the next window:



Select "OK" and the matrix will be generated. Dynaconn will prompt the user to provide a file name for the matrix. This data can be saved as various file types, .mat is recommended.



The 4D DFC Matrix will then be generated and will be found in the output directory.