CPC Zurich Practical Tutorial H – Dynamic Causal Modeling for fMRI

Installation Guide

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This description guides you through the installation of the code and data needed for the DCM for fMRI tutorial. In case additional files are needed, we will inform you in time, so that you can also download them before the tutorial.

A) MATLAB

Make sure you install MATLAB and that you can open and run it:

https://www.mathworks.com/products/get-matlab.html

We have not fully tested this, but to our knowledge you should be able to run the tutorial with the student version.

B) Download and Setup

Download the folder `cpc_dcm_students.zip`. To do so, go to:

https://www.tnu.ethz.ch/en/team/faculty-and-scientific-staff/heinzle/

Click on the "Download for DCM Tutorial" link under CP Course 2025 at the bottom of the page. You will be asked for a password, which is `CPC2025dcm`. Unzip the folder so that you have (somewhere on your computer) a folder called `cpc_dcm`.

Notes

1. Files that come with this tutorial folder include:
   - `setup_demo_cpc.m` → Under the `code/` folder. Checks whether your installation and all paths are set up correctly.

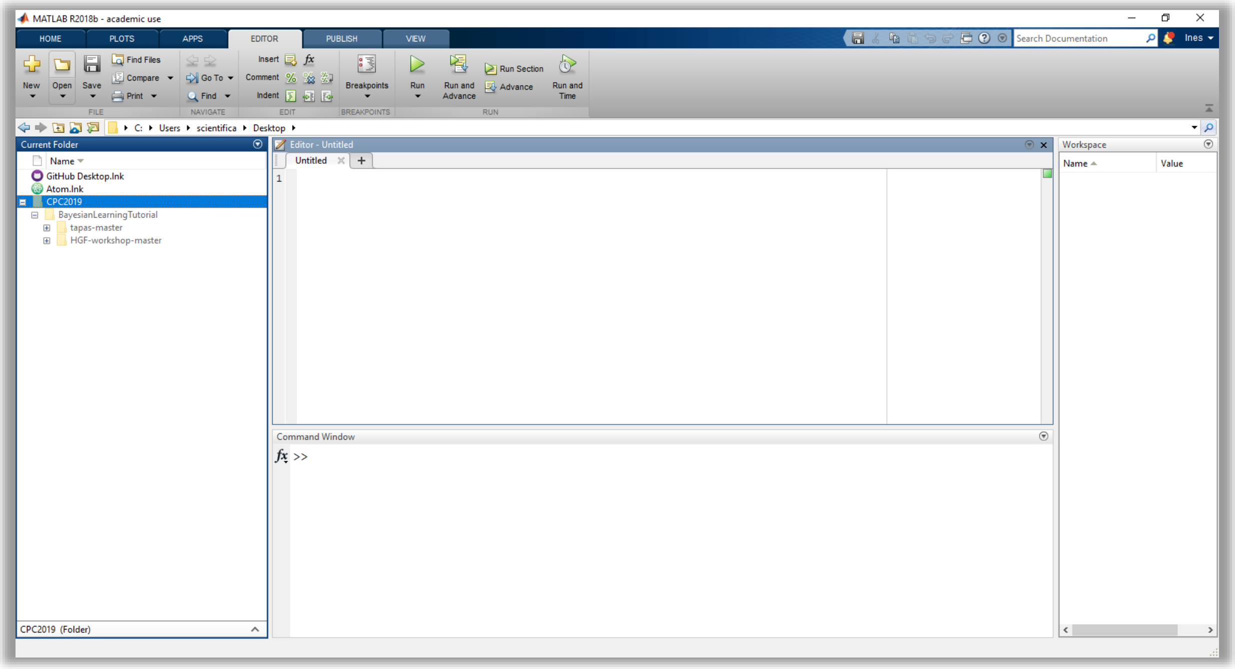
- `cpc_glm_dcm_subject.m` → Under the `code/` folder. Runs an analysis on a visuomotor data set.
- `data/visuomotor/Sub01` → Folder containing preprocessed functional data, behavioral information and movement regressors for a single subject.

2. External sources for software and data **included** in this tutorial folder (**no need** to download separately):
   - SPM12 - SPM 12 can be downloaded from https://github.com/spm/spm12 or from http://www.fil.ion.ucl.ac.uk/spm/software/spm12/ .

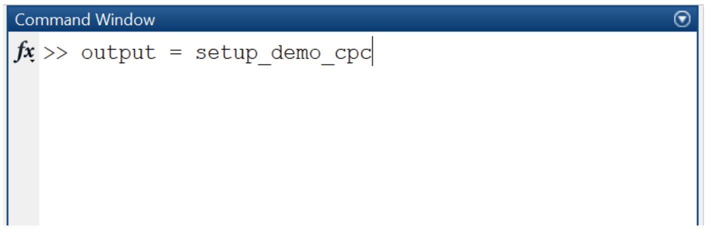
C) Test the installation

Check your SPM installation and the files:

1. Open Matlab. You will see an interface similar to this:



1. Make sure the file `setup_demo_cpc.m` is in your `code/` folder.
2. Go to the `code/` folder using the Current Folder window.
3. Run `output = setup_demo_cpc()` in the Command Window.

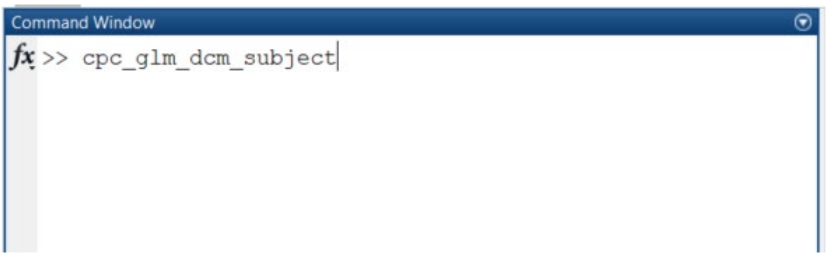


```
fx >> output = setup_demo_cpc
```

You will get some feedback on the screen and output should be a vector [1 1].

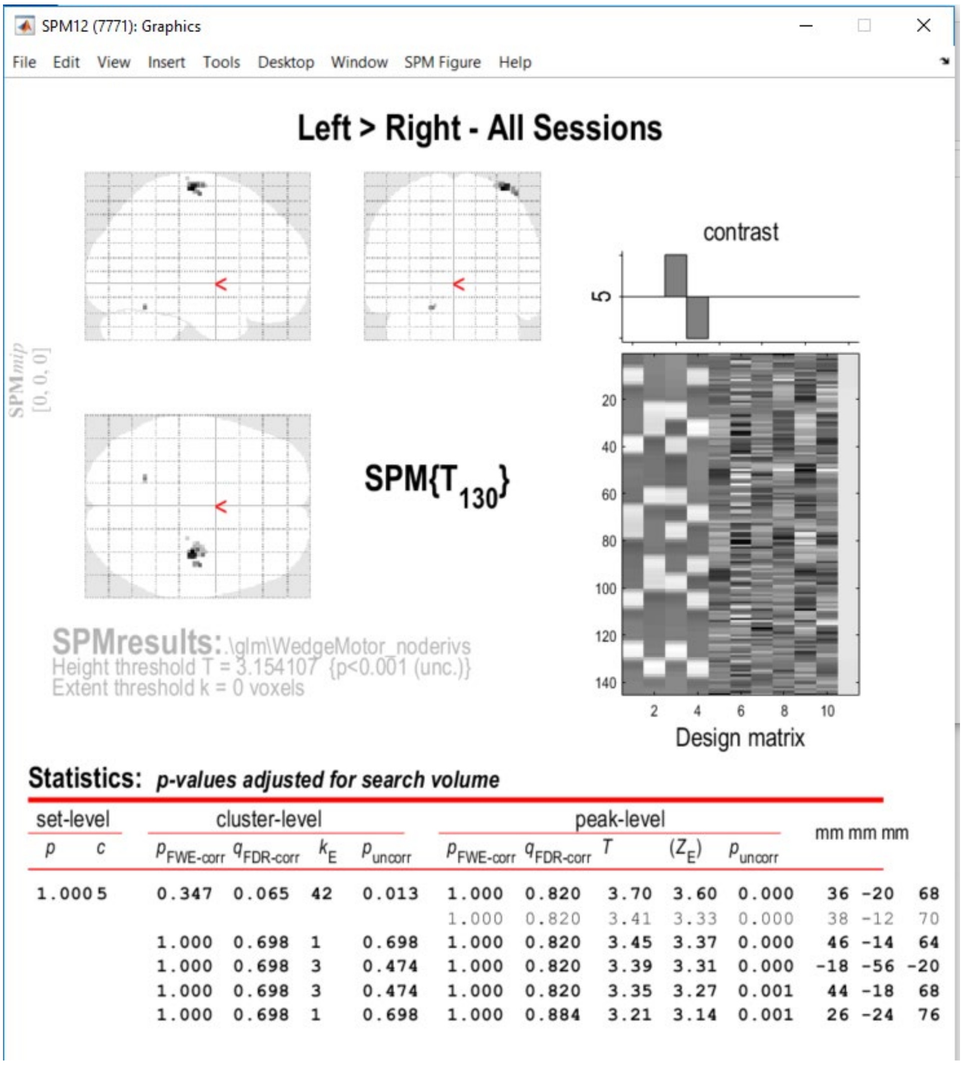
D) Run the first-level analysis on the tutorial data

In order to be ready for the tutorial, you need to run a first-level model analysis (GLM) with spm. In Matlab, go again to your `code/` folder and type `cpc_glm_dcm_subject`. (If you encounter any issues with MEX files on macOS, please refer to the additional information below.)



```
fx >> cpc_glm_dcm_subject
```

Running this program will take a bit of time and you will see things appearing in the command window. At the end, there should be a window showing you the following:



Left > Right - All Sessions

SPMresults: .\glm\WedgeMotor_noderivs
Height threshold T = 3.154107 {p<0.001 (unc.)}
Extent threshold k = 0 voxels

Statistics: *p-values adjusted for search volume*

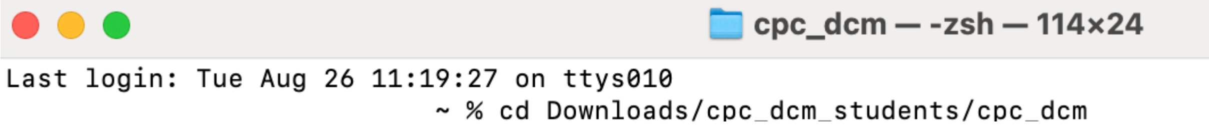
set-level		cluster-level				peak-level					mm mm mm		
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	(Z_E)	p_{uncorr}			
1.000	5	0.347	0.065	42	0.013	1.000	0.820	3.70	3.60	0.000	36	-20	68
						1.000	0.820	3.41	3.33	0.000	38	-12	70
		1.000	0.698	1	0.698	1.000	0.820	3.45	3.37	0.000	46	-14	64
		1.000	0.698	3	0.474	1.000	0.820	3.39	3.31	0.000	-18	-56	-20
		1.000	0.698	3	0.474	1.000	0.820	3.35	3.27	0.001	44	-18	68
		1.000	0.698	1	0.698	1.000	0.884	3.21	3.14	0.001	26	-24	76

You are all set and ready for the tutorial now ☺ !

If you have the following issues with MEX files on macOS (e.g. with Catalina):

`"*.mexmaci64" cannot be opened because the developer cannot be verified. macOS cannot verify that this app is free from malware"` or `"Code signature not valid for use in process using Library Validation: library load disallowed by system policy"`

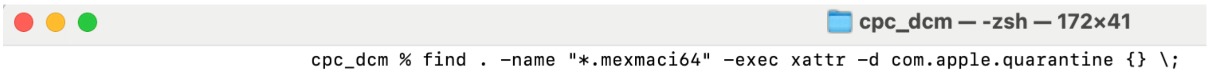
Please open a Terminal and navigate to the folder where you placed your **`cpc_dcm`** folder. In the following example, the **`cpc_dcm`** folder was placed in the **`Downloads`** folder.



```
Last login: Tue Aug 26 11:19:27 on ttys010
                                   ~ % cd Downloads/cpc_dcm_students/cpc_dcm
```

If you are using **Apple Intel**, type the following command:

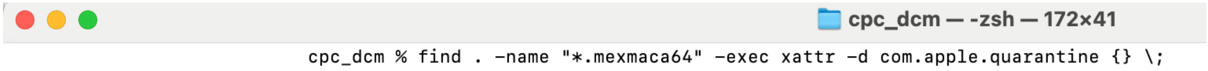
```
find . -name "*.mexmaci64" -exec xattr -d com.apple.quarantine {} \;
```



```
cpc_dcm % find . -name "*.mexmaci64" -exec xattr -d com.apple.quarantine {} \;
```

If you are using **Apple Silicon** (ARM), type the following command (targeting .mexmaca64 files instead of .mexmaci64):

```
find . -name "*.mexmaca64" -exec xattr -d com.apple.quarantine {} \;
```



```
cpc_dcm % find . -name "*.mexmaca64" -exec xattr -d com.apple.quarantine {} \;
```

This should solve the problem and allow you to run `cpc_glm_dcm_subject.m`

This solution was taken from the SPM Wiki:

https://en.wikibooks.org/wiki/SPM/Installation_on_64bit_Mac_OS_(Intel)#macOS_Catalina