Documentation MSPM toolbox

Lucien Gyger

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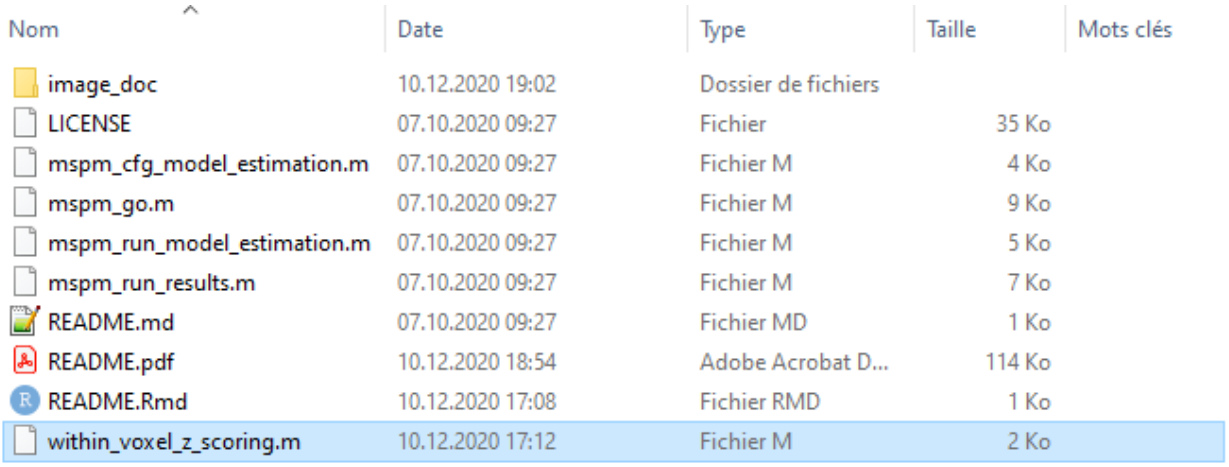
Preparation of the data

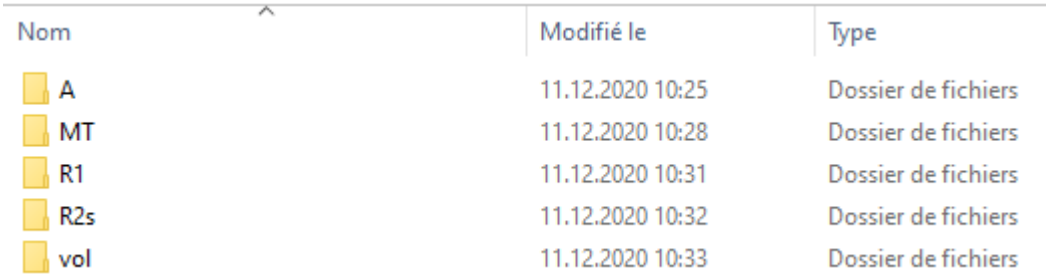
It is strongly adviced to apply z-scoring to your data before the analysis so that the weight of the canonical vectors are interpretable even though the multiple modalities used in the multivariate analysis are not of the same scale. The z-scoring should be applied within each modality and within each voxel. This step can be performed using the function *within_voxel_z_scoring.m* found in the main folder of the MSPM toolbox. It is very important that the mask you use to constrain the space where the z-scoring is performed (second argument of *within_voxel_z_scoring.m* function) is then used as explicit mask for the univariate models.



Nom	Date	Type	Taille	Mots clés
image_doc	10.12.2020 19:02	Dossier de fichiers		
LICENSE	07.10.2020 09:27	Fichier	35 Ko	
mspm_cfg_model_estimation.m	07.10.2020 09:27	Fichier M	4 Ko	
mspm_go.m	07.10.2020 09:27	Fichier M	9 Ko	
mspm_run_model_estimation.m	07.10.2020 09:27	Fichier M	5 Ko	
mspm_run_results.m	07.10.2020 09:27	Fichier M	7 Ko	
README.md	07.10.2020 09:27	Fichier MD	1 Ko	
README.pdf	10.12.2020 18:54	Adobe Acrobat D...	114 Ko	
README.Rmd	10.12.2020 17:08	Fichier RMD	1 Ko	
within_voxel_z_scoring.m	10.12.2020 17:12	Fichier M	2 Ko	

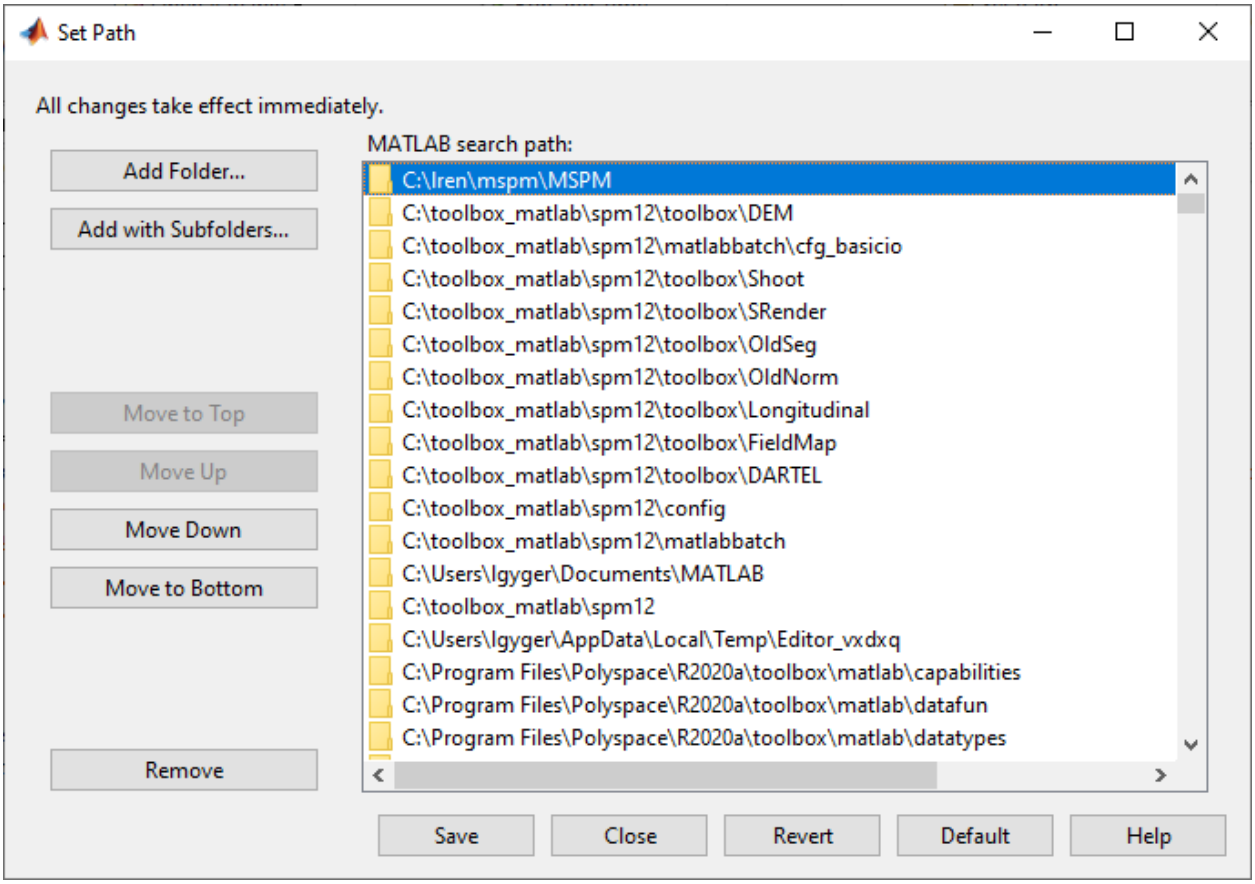
Univariate models

The first step to use the classical interface of SPM12 to estimate one univariate model for each of the modality you would like to input in the multivariate model. It is crucial that the univariate models have the exact same design matrix X, the design matrix you are interested to test in the multivariate model.



Set path MSPM toolbox

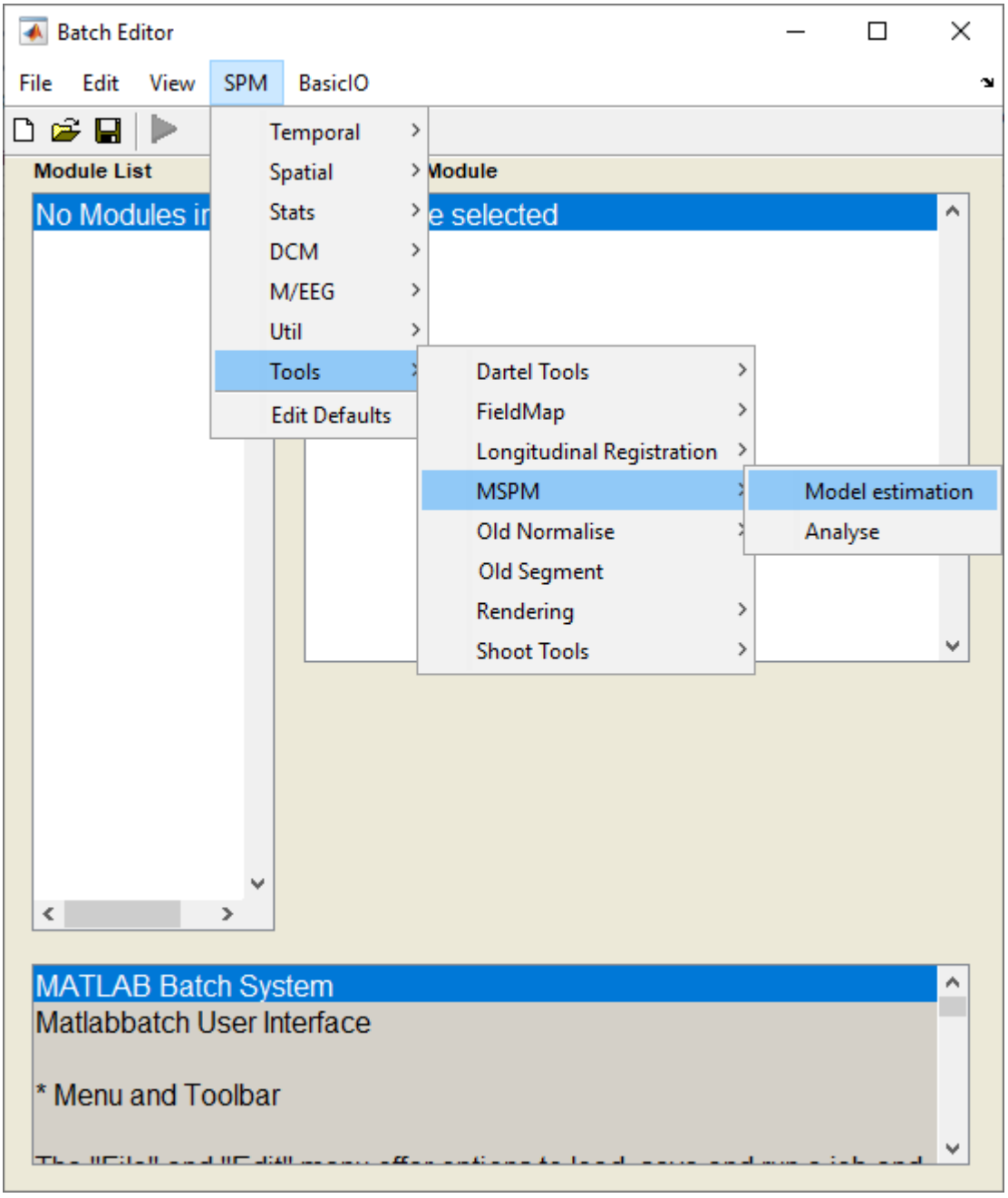
- Add the MSPM toolbox to you matlab path



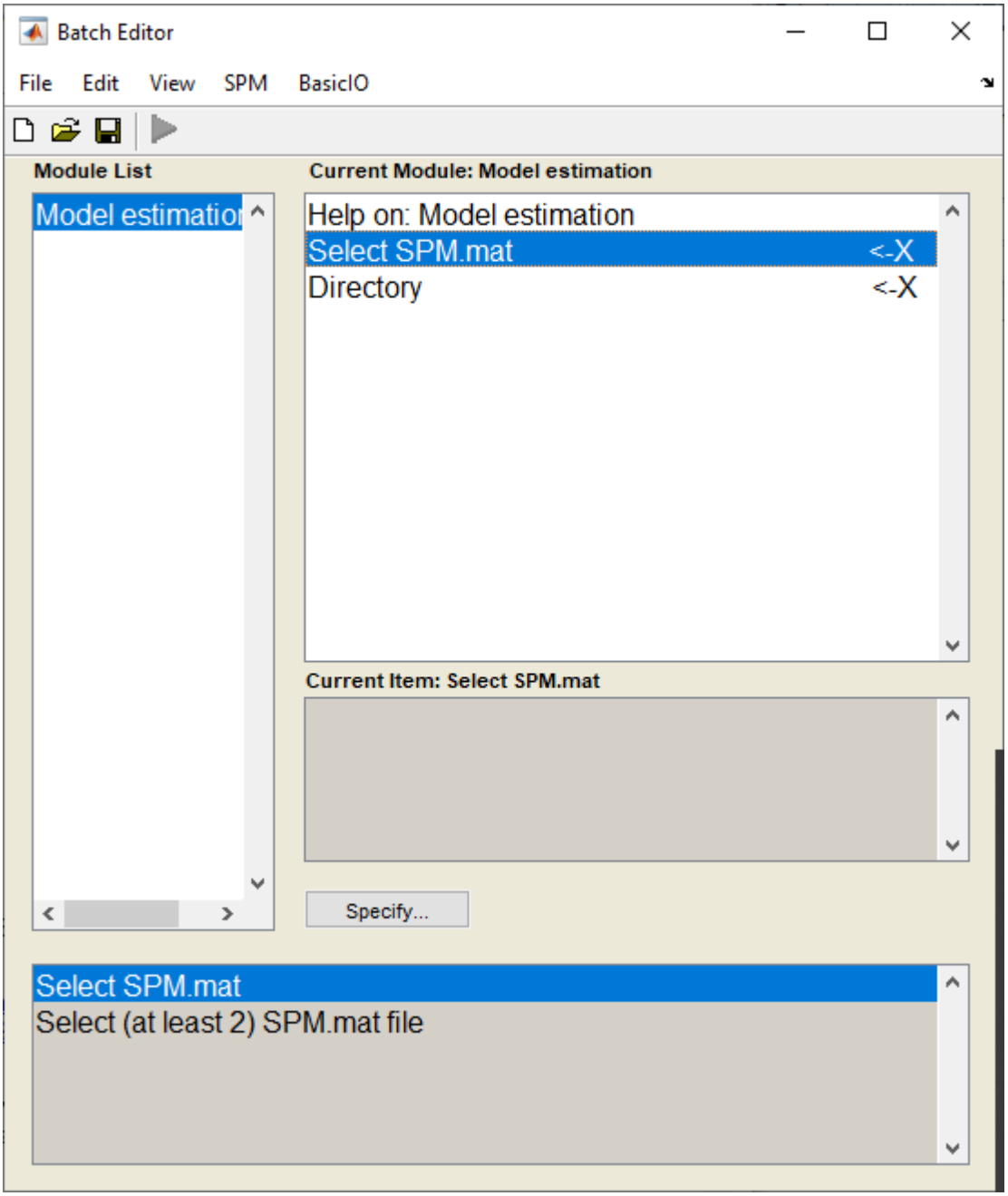
Multivariate model estimation

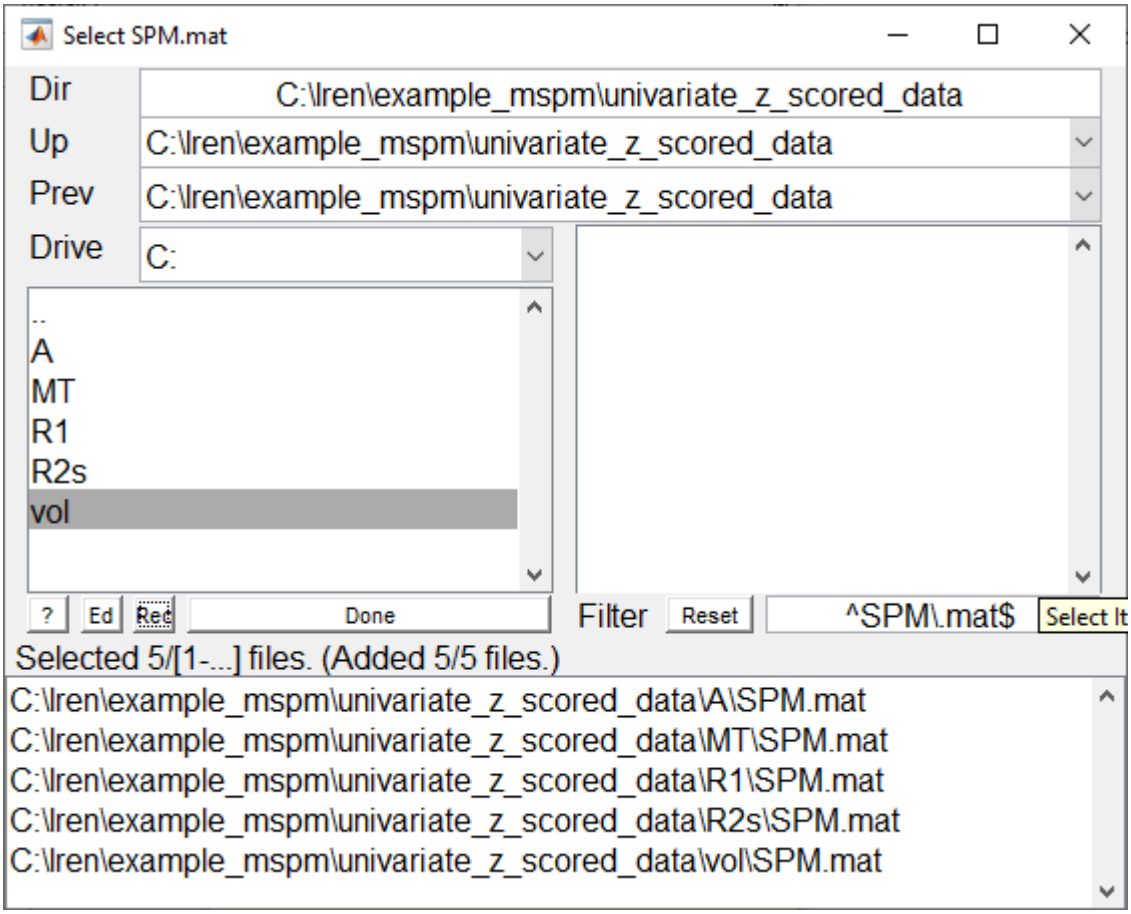
This section describes how to estimate the multivariate model.

- Open a SPM batch and select *SPM » Tools » MSPM » Model estimation*

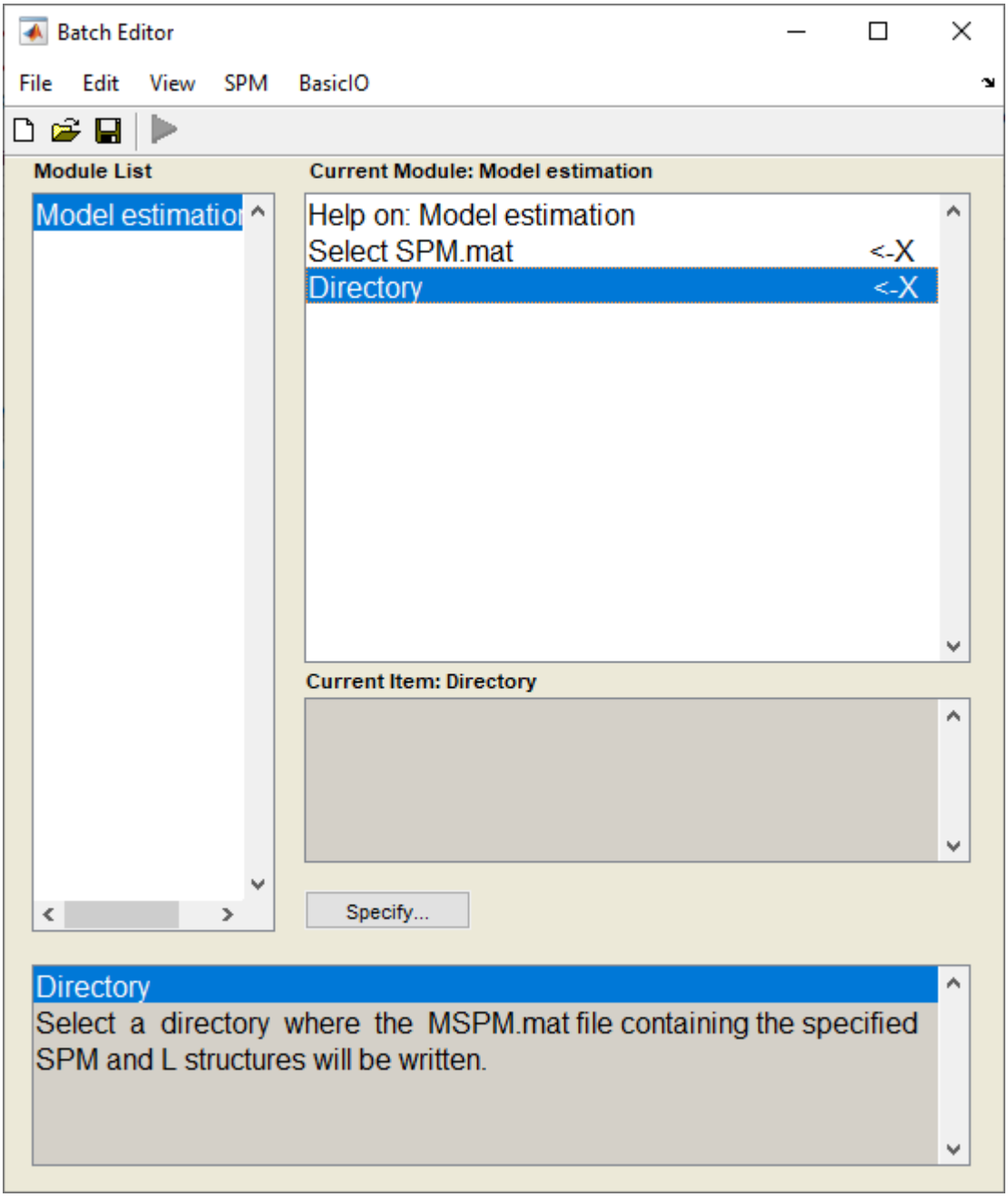


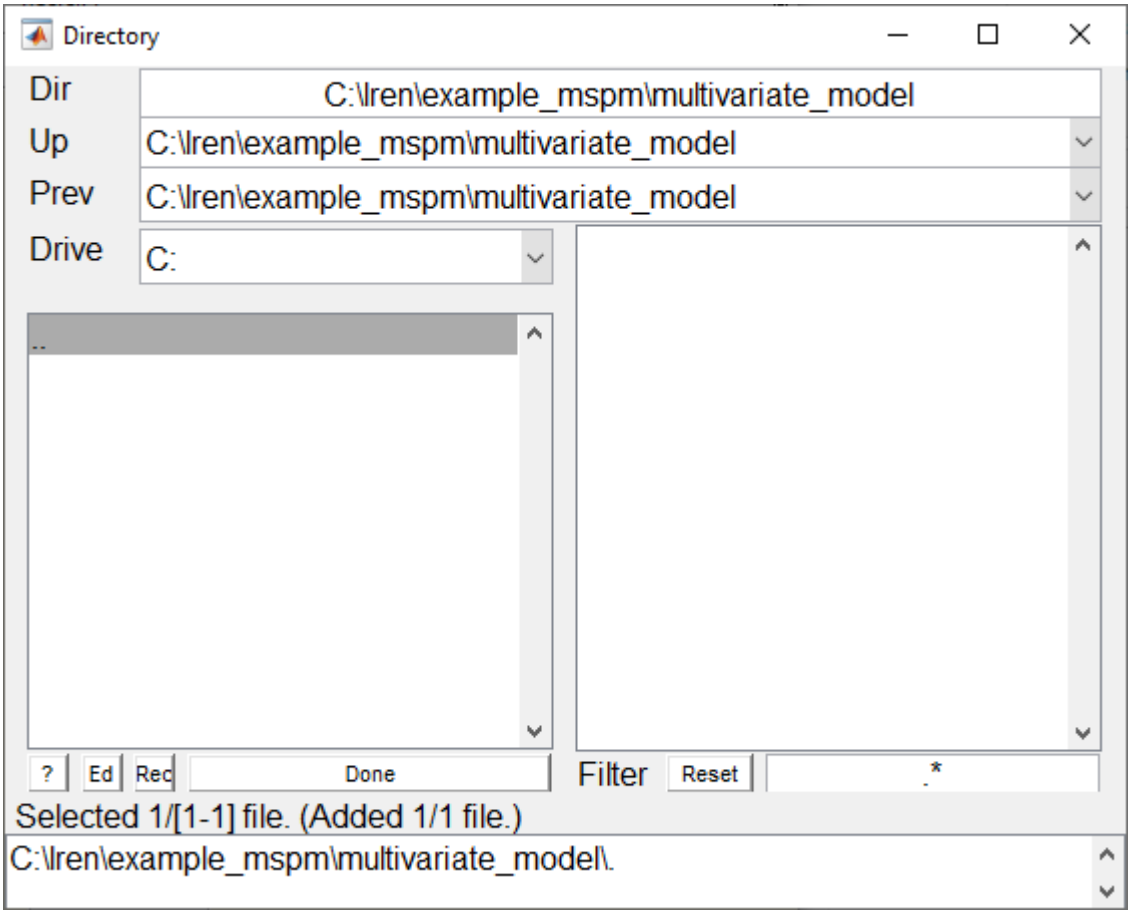
- Input the *SPM.mat* files from the univariate analyses in the batch



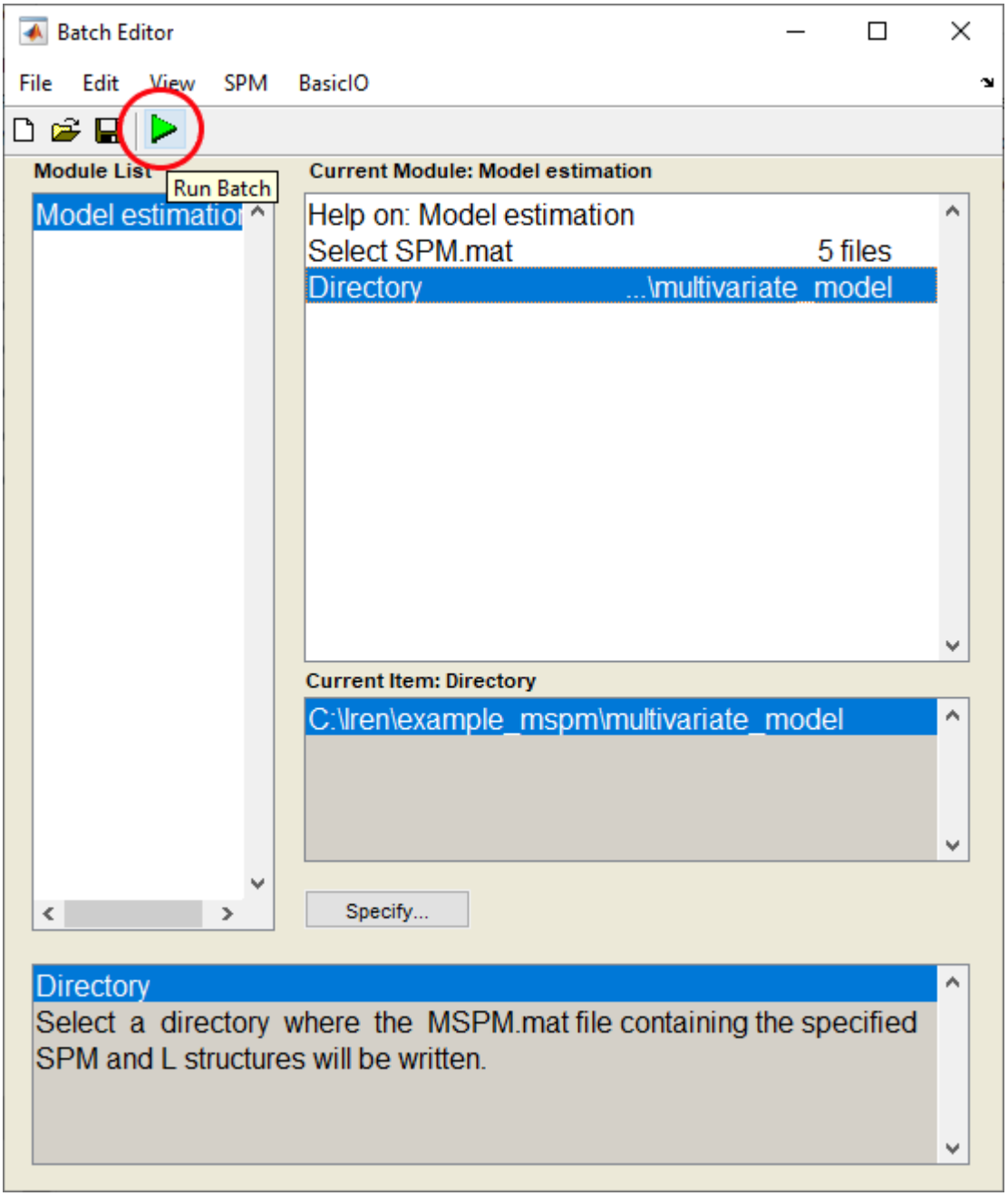

Select SPM.mat
Dir
C:\lren\example_mspm\univariate_z_scored_data
Up
C:\lren\example_mspm\univariate_z_scored_data
Prev
C:\lren\example_mspm\univariate_z_scored_data
Drive
C:
..
A
MT
R1
R2s
vol
?
Ed
Rec
Done
Filter
Reset
^SPM\.mat$
Select It
Selected 5/[1-...] files. (Added 5/5 files.)
C:\lren\example_mspm\univariate_z_scored_data\A\SPM.mat
C:\lren\example_mspm\univariate_z_scored_data\MT\SPM.mat
C:\lren\example_mspm\univariate_z_scored_data\R1\SPM.mat
C:\lren\example_mspm\univariate_z_scored_data\R2s\SPM.mat
C:\lren\example_mspm\univariate_z_scored_data\vol\SPM.mat

- Select the output directory

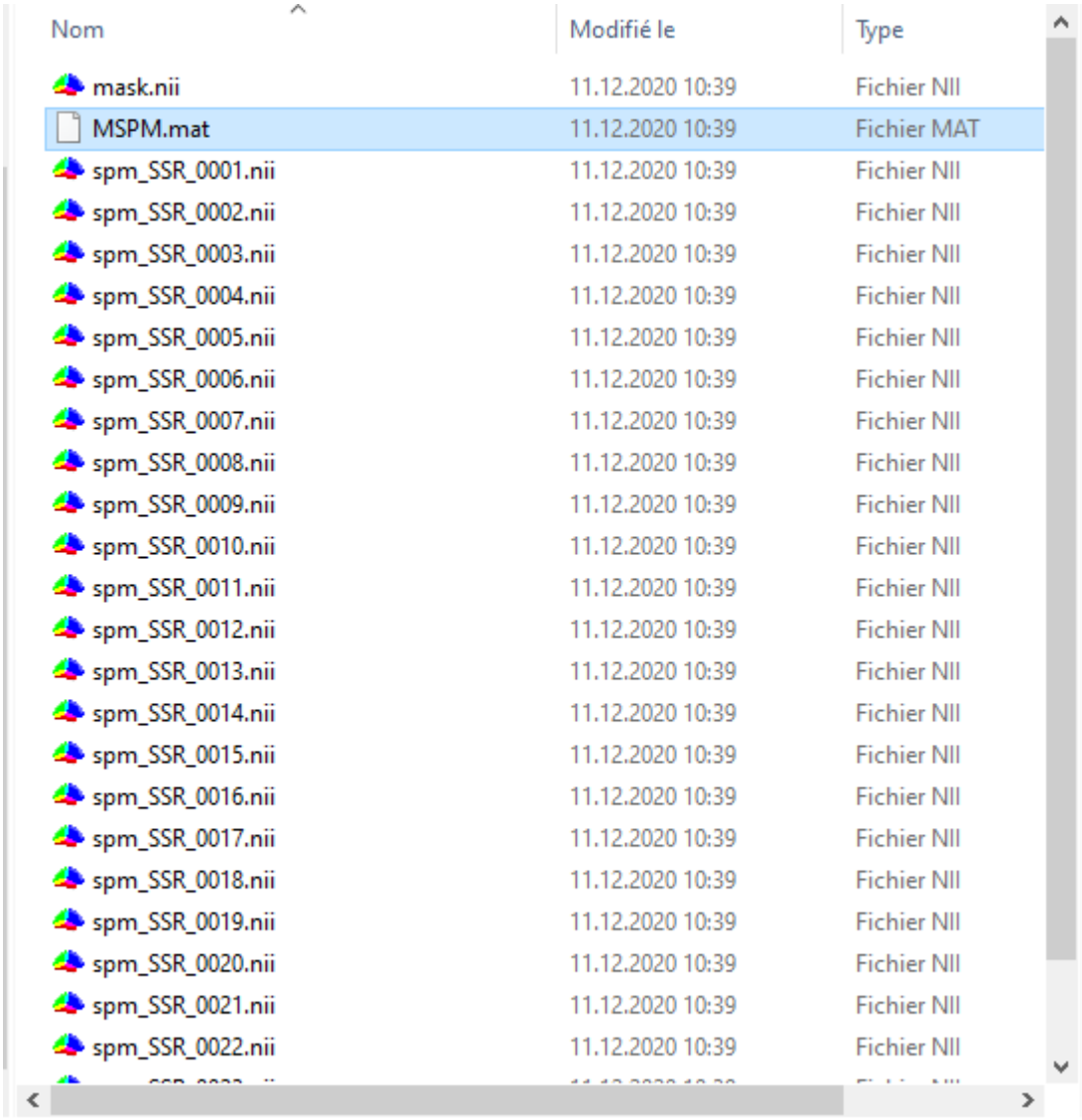



Directory
Dir
C:\lren\example_mspm\multivariate_model
Up
C:\lren\example_mspm\multivariate_model
Prev
C:\lren\example_mspm\multivariate_model
Drive
C:
..
?
Ed
Rec
Done
Filter
Reset
.*
Selected 1/[1-1] file. (Added 1/1 file.)
C:\lren\example_mspm\multivariate_model\.

- Run batch to estimate the model



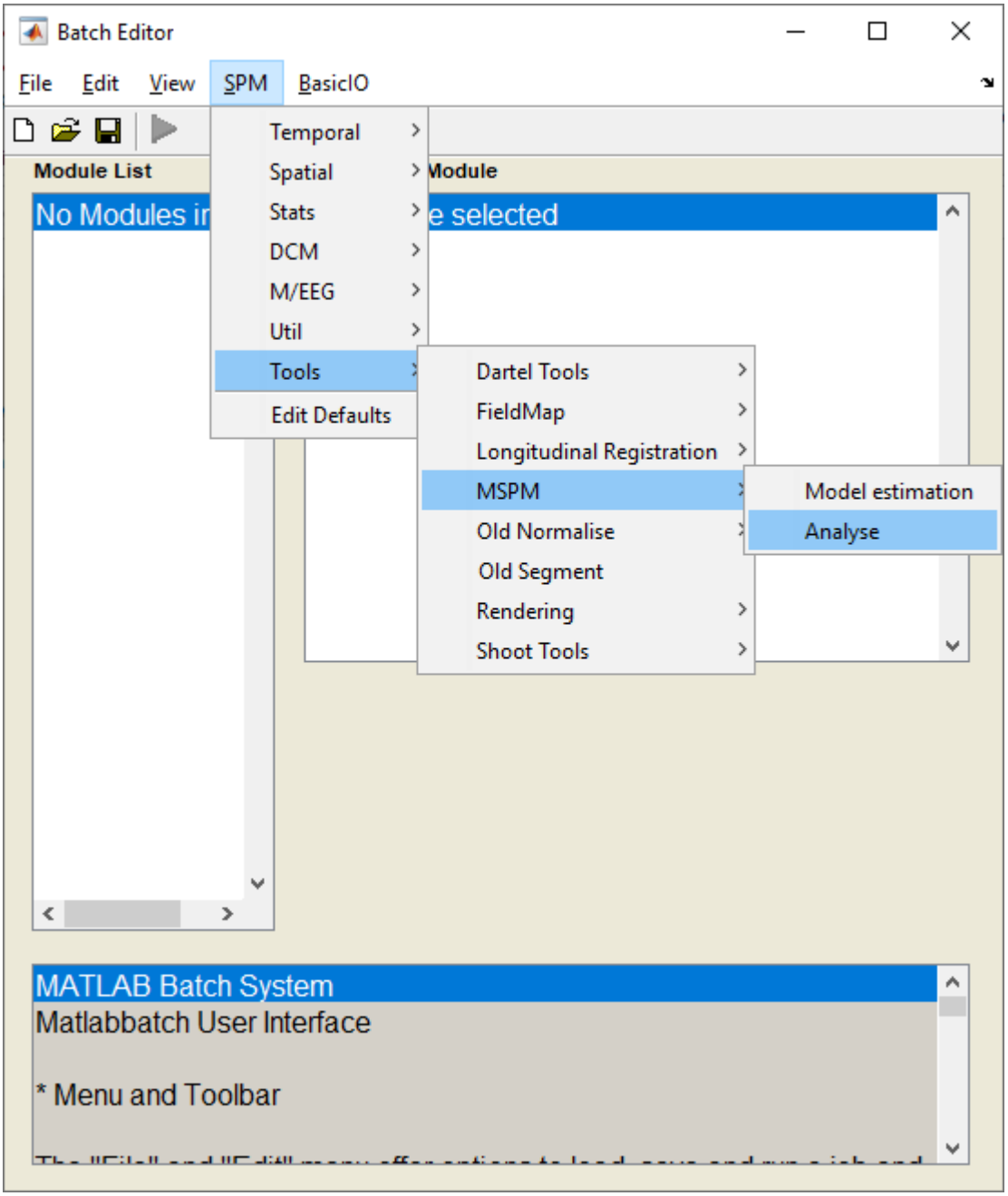
- In the output directory you defined just above, there is now a *MSPM.mat* file.



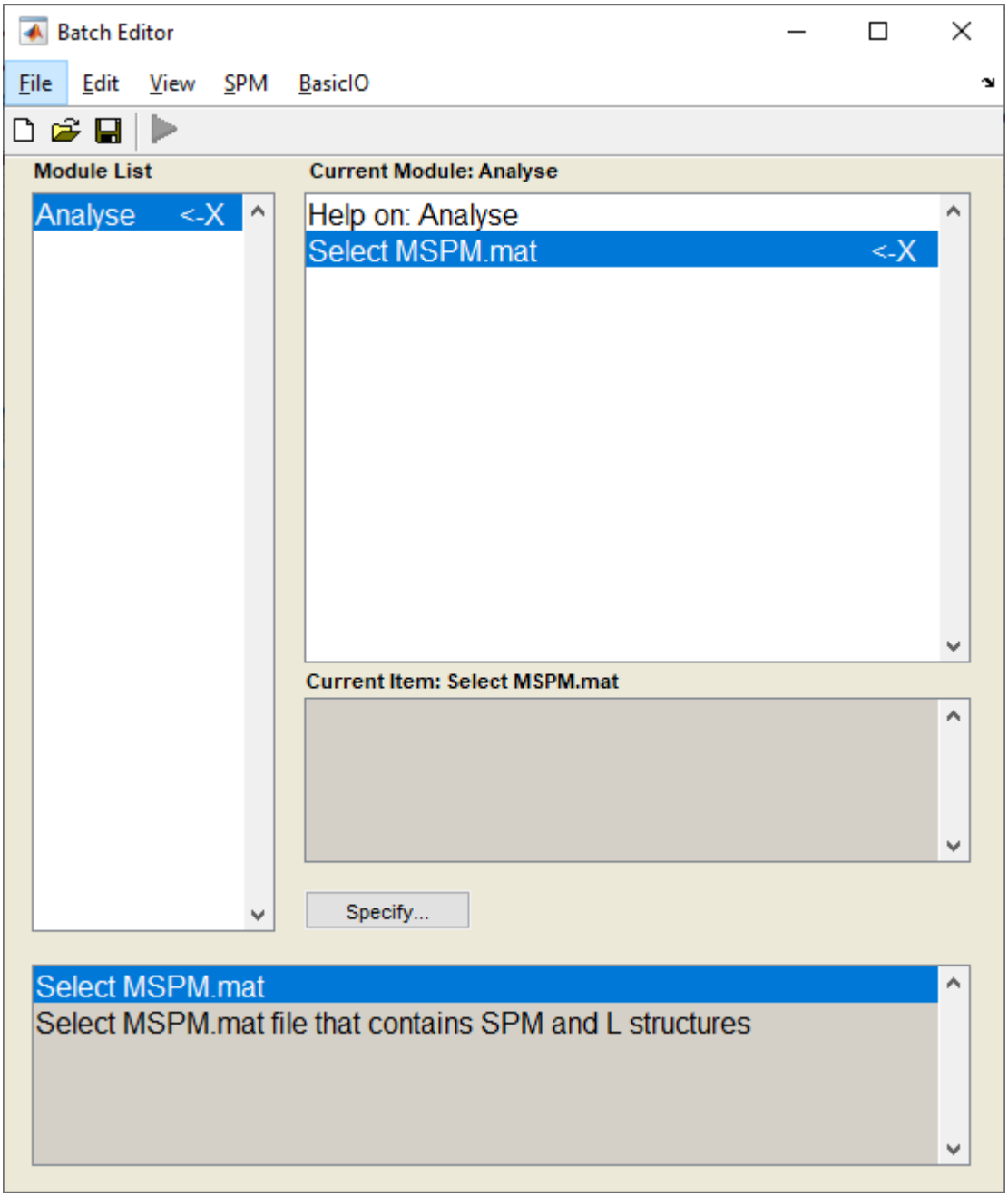
Testing hypothesess on the multivariate model

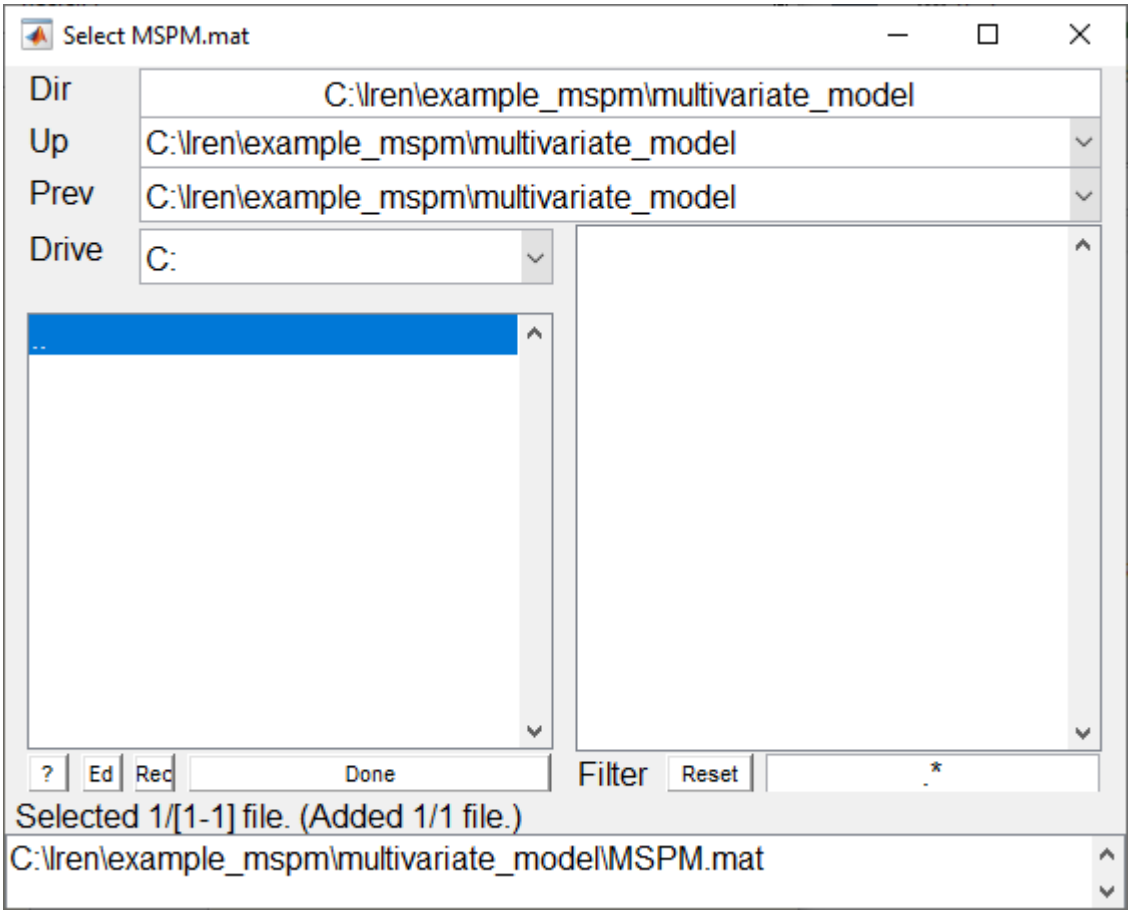
This section describes how to test hypotheses on the multivariate model. This essentially reduces to define L contrasts on the data matrix and c contrasts on the design matrix.

- Open a SPM batch and select *SPM » Tools » MSPM » Analyse*

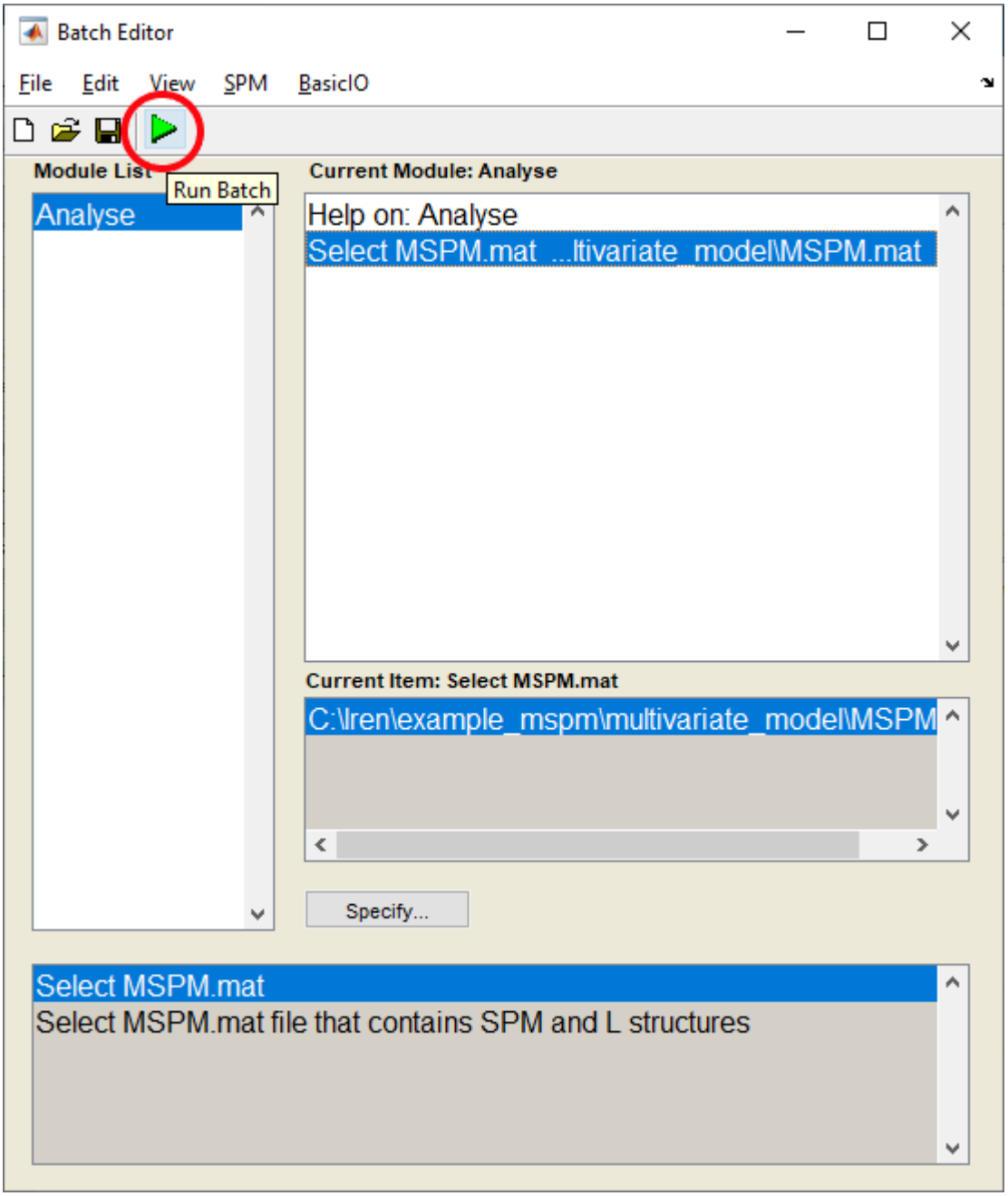


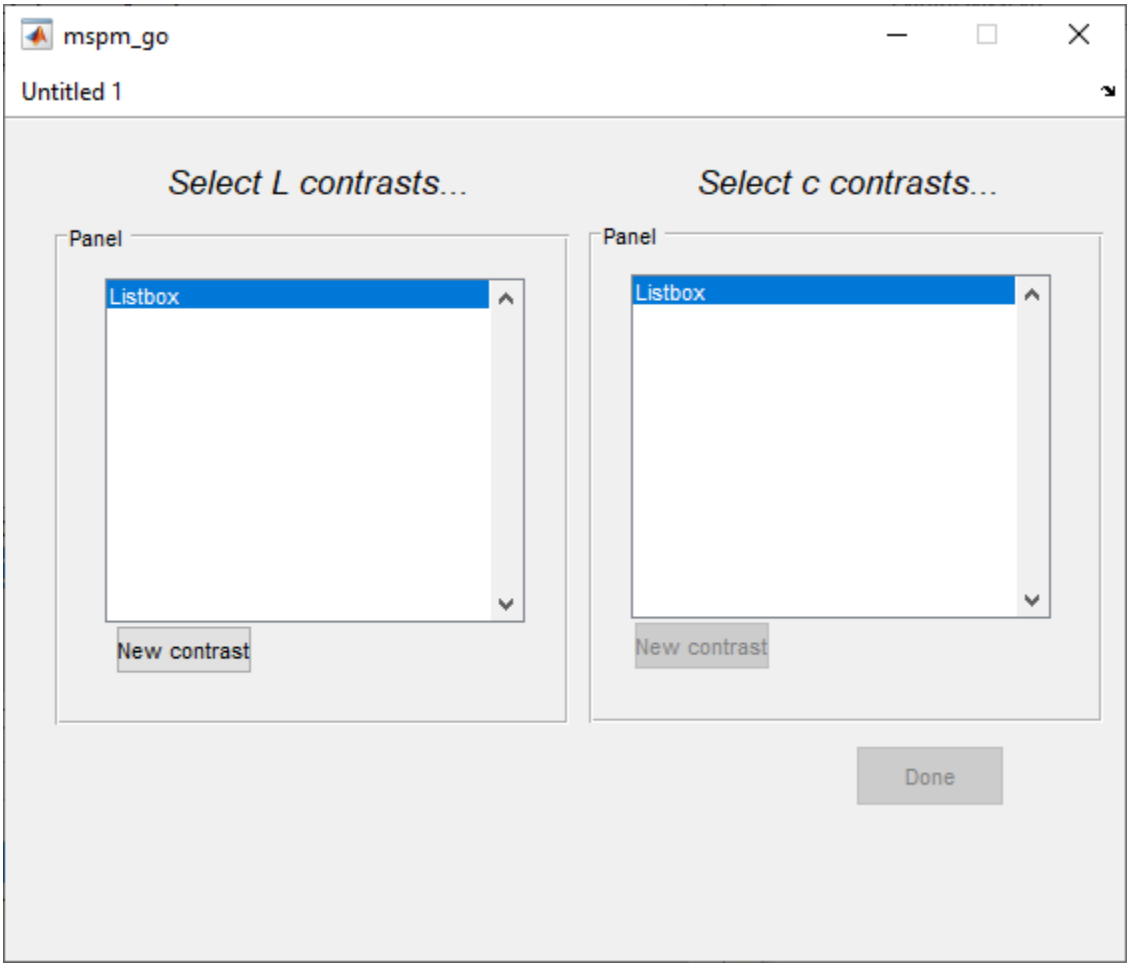
- select the *MSPM.mat* file produced by the the previous step



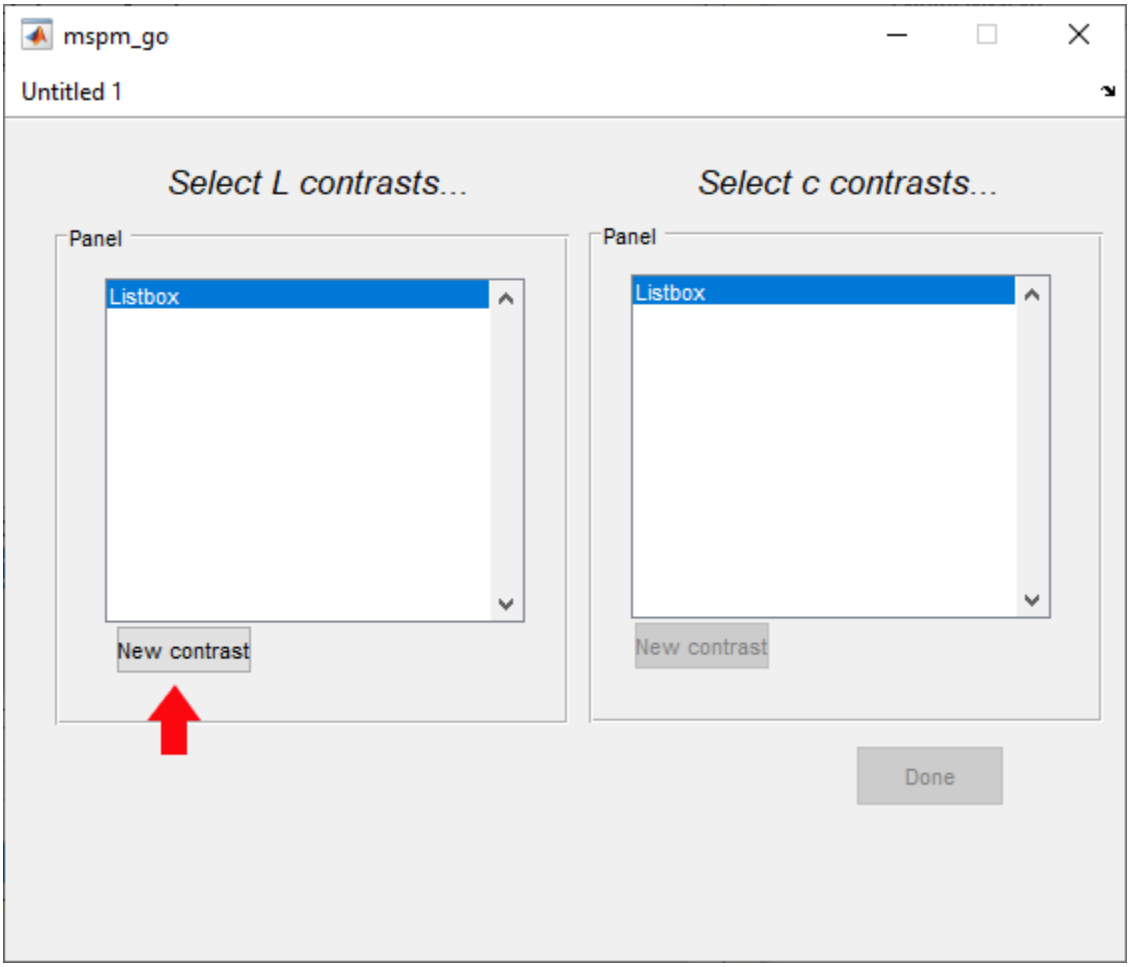

Select MSPM.mat
Dir
C:\lren\example_mspm\multivariate_model
Up
C:\lren\example_mspm\multivariate_model
Prev
C:\lren\example_mspm\multivariate_model
Drive
C:
..
?
Ed
Rec
Done
Filter
Reset
.*
Selected 1/[1-1] file. (Added 1/1 file.)
C:\lren\example_mspm\multivariate_model\MSPM.mat

- Run batch to open interface to input L and c contrasts

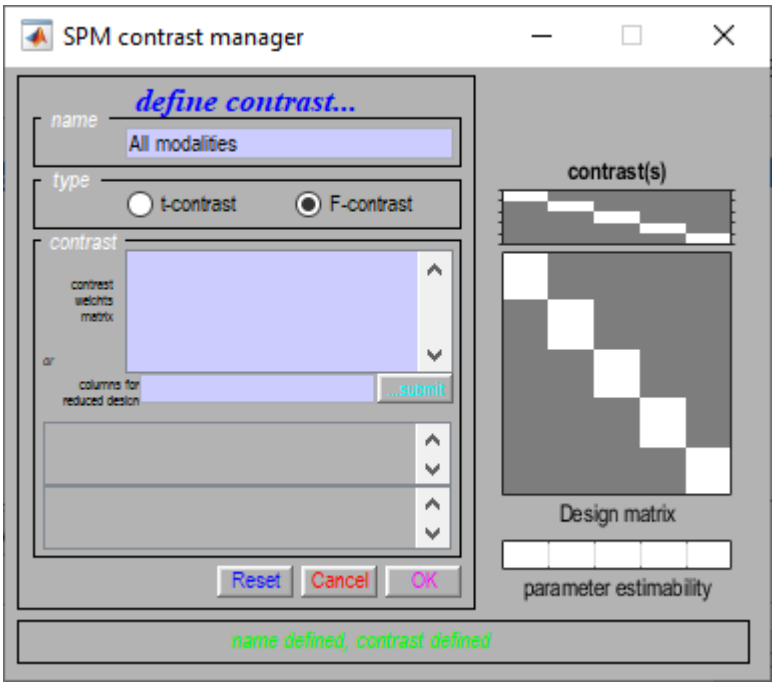



mspm_go
Untitled 1
Select L contrasts...
Select c contrasts...
Panel
Listbox
New contrast
Panel
Listbox
New contrast
Done

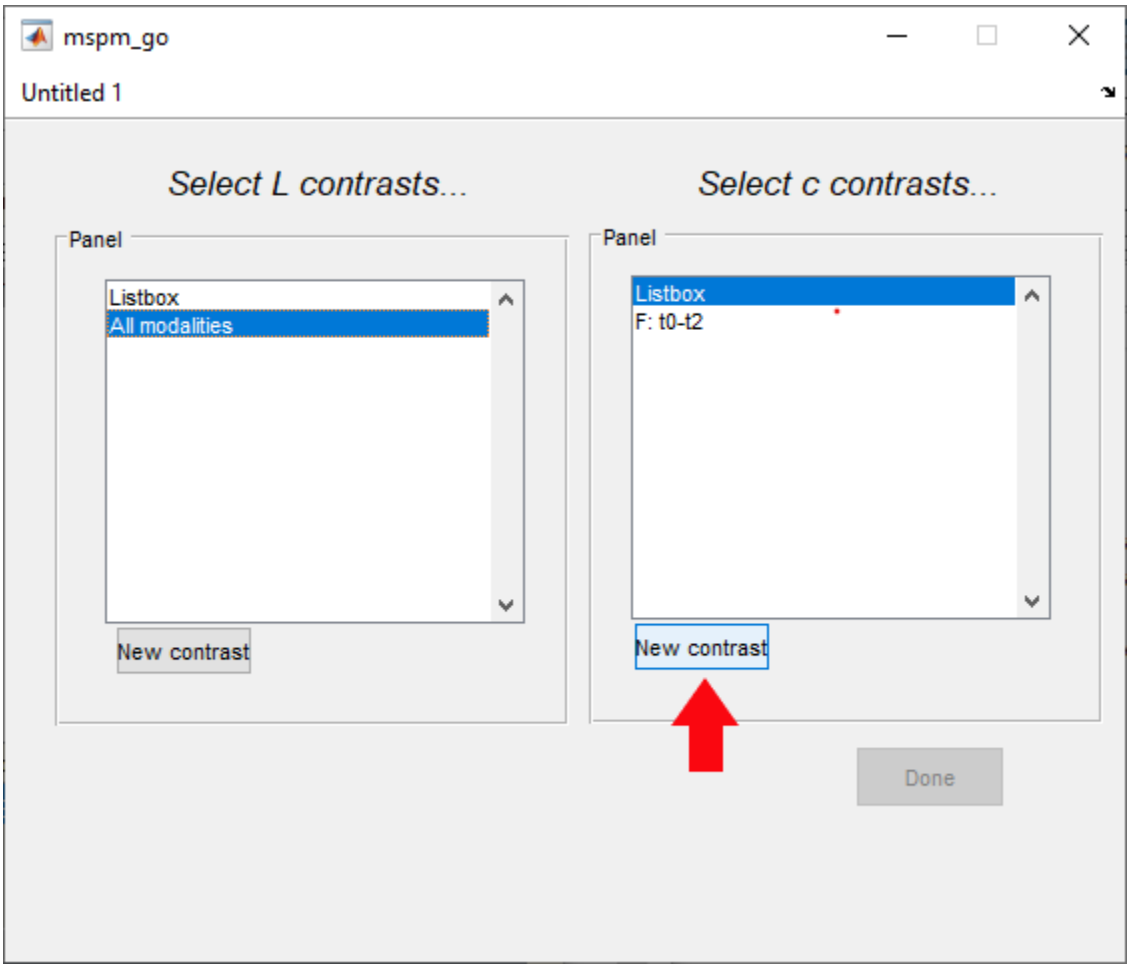
- To enter a new L contrast on the **data matrix**, press "New contrast" in the Panel L contrast



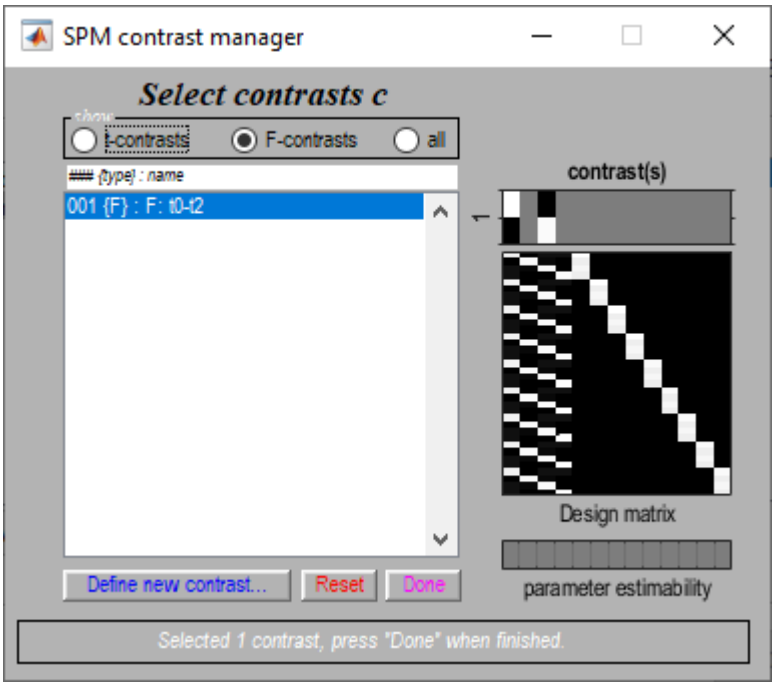
- Enter your matrix of contrast (in this example the matrix $eye(5)$ was entered to test an hypothesis on all the modalities of the data matrix Y)



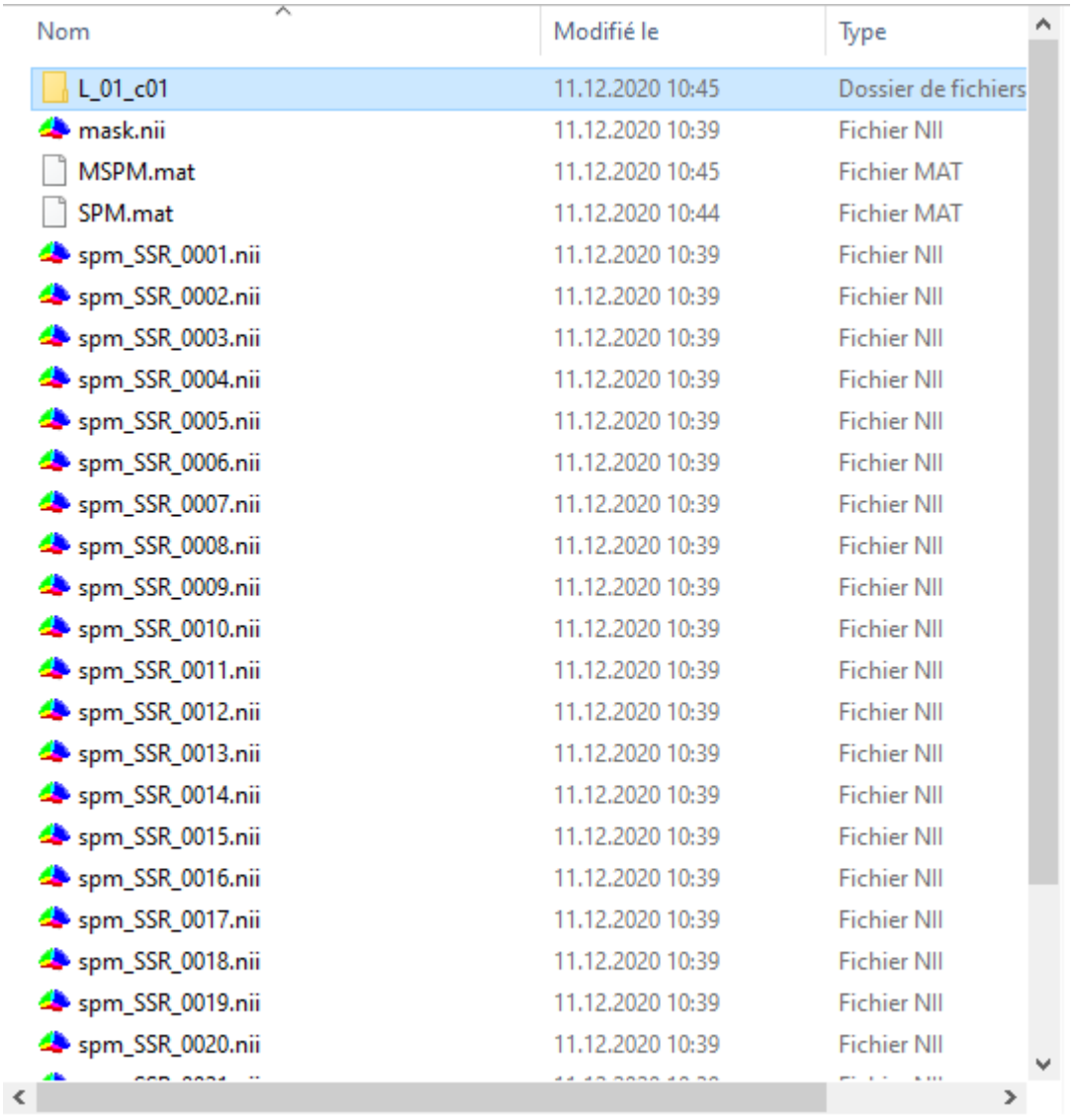
- To enter a new c contrast on the **design matrix**, press "New contrast" in the Panel c contrast. Note that you can enter a new contrast (or select a pre-existing contrast) only if a L contrast is selected on the left panel.



- Enter your matrix of contrast (*Note: wether you enter a t- or an F- contrast, the toolbox will always treat it as an F contrast and the output will be a F-map. So to avoid confusion, make sure to always use F-contrast.*)



- The output of the specific combination of L and c contrast you just entered above is now in a newly created folder in the exact same path where the MSPM.mat file is. Note that the folder name L_XX_cYY is composed accordingly to the list of L and c contrast you have created (XX = number of the L contrast, YY = number of the c contrast).

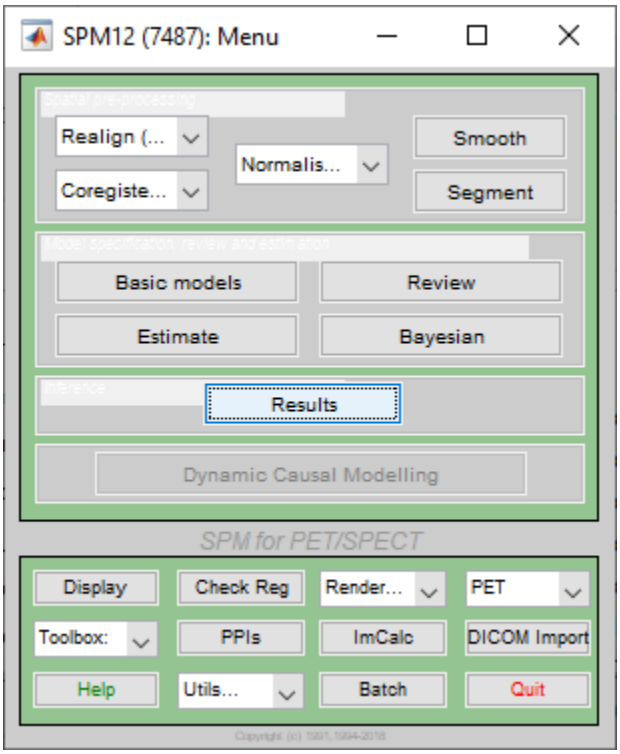


Visualize results

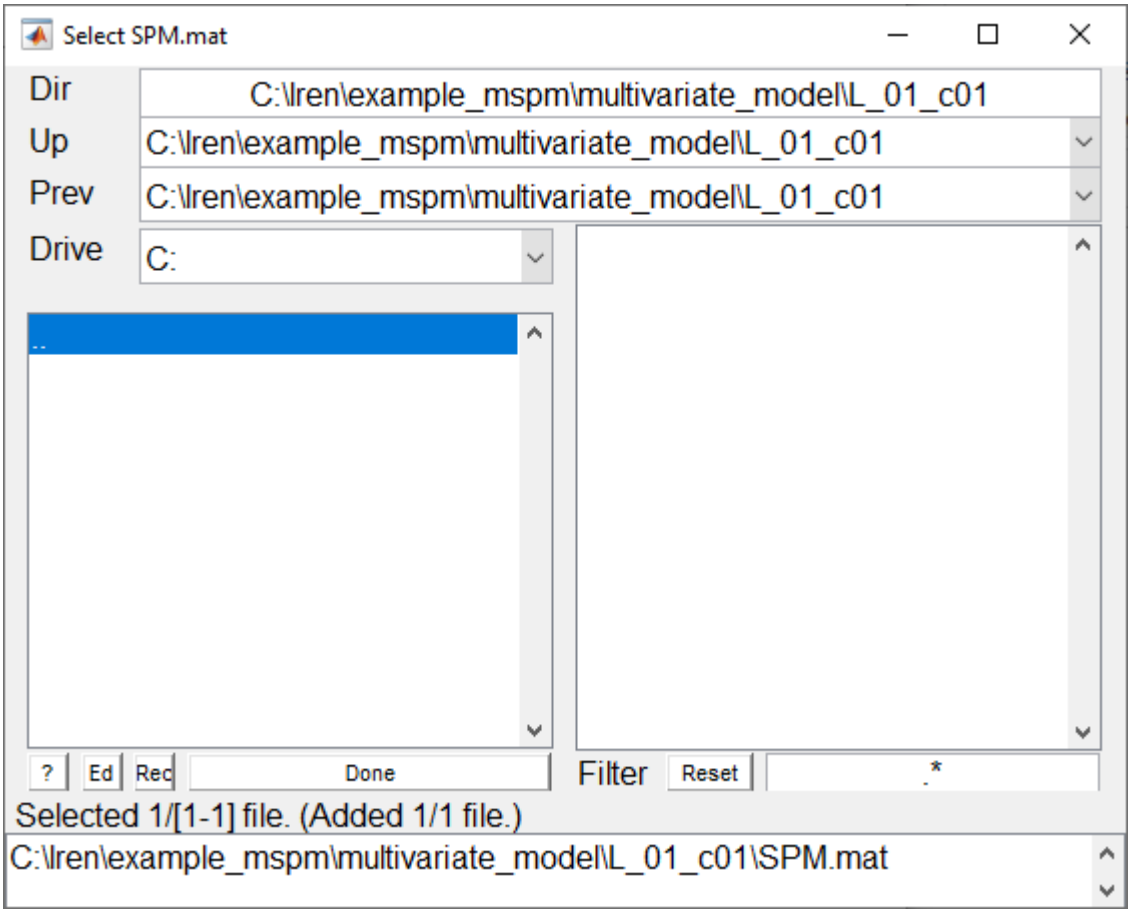
This section describes how to visualize the statistical map of a specific combination of L and c contrasts and how to visualize the canonical vectors.

Visualize statistical F-map

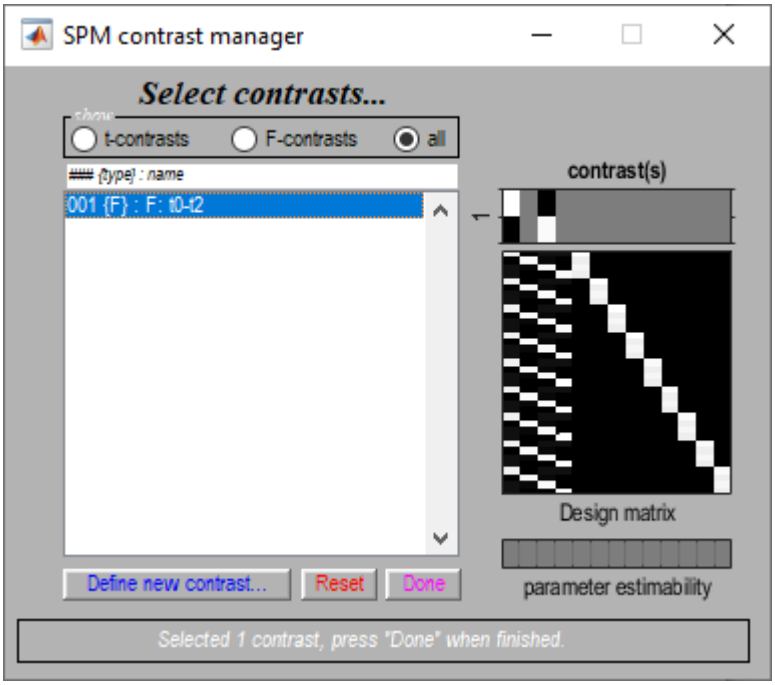
- The statistical map of a specific combination of L and c contrasts can be simply visualized by using the Results button of SPM12 Menu



- Input the SPM.mat file contained in the L_XX_cYY folder of your interest

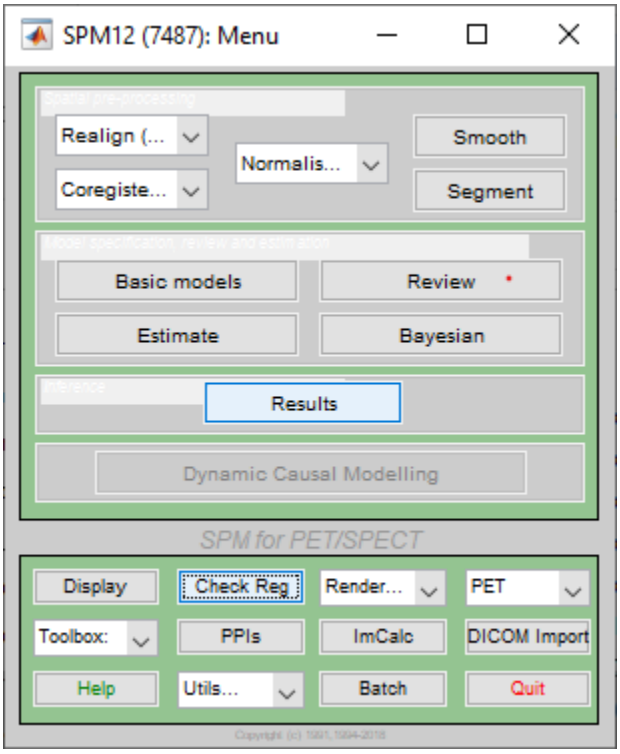


- Select the corresponding c contrast

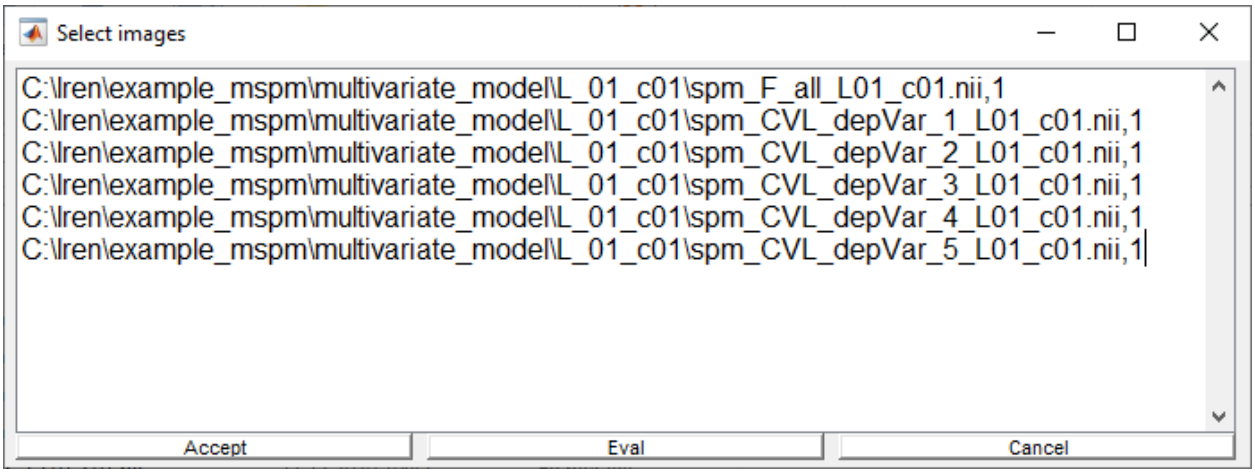


Visualize canonical vectors

- To visualize canonical vectors simply used the *Check Registration* funcion of SPM12 Menu. You can also add the statistical map to locate global and local maximum.



- The name of the canonical vector image contains information about which column (X) of the data matrix the canonical vector is related (depVar_X)



- use *Right-click » Display » Intensites* to display the numerical value of the canonical vectors