

# MRI HW3-fMRI

Presenter :

M11107309 何柏昇

# OUTLINE

## ● fMRI Analysis

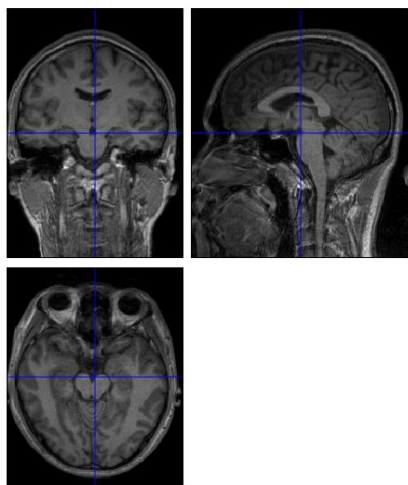
- Introduction
- Method
- Experimental Results

# Introduction - Data

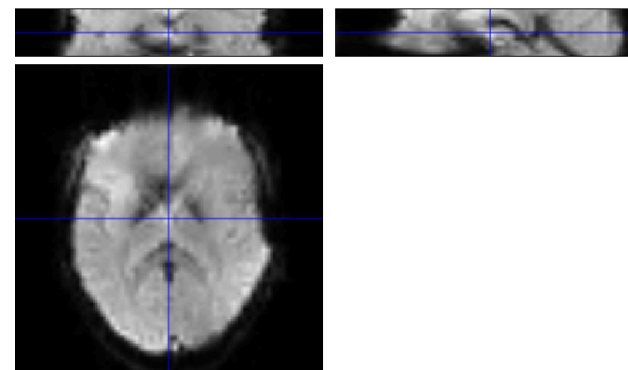
T1: 高解析度3D T1資料

fMRI: 實驗過程共100次掃描，受試者動作過程如下：20off\_20on\_20off\_20on\_20off

T1



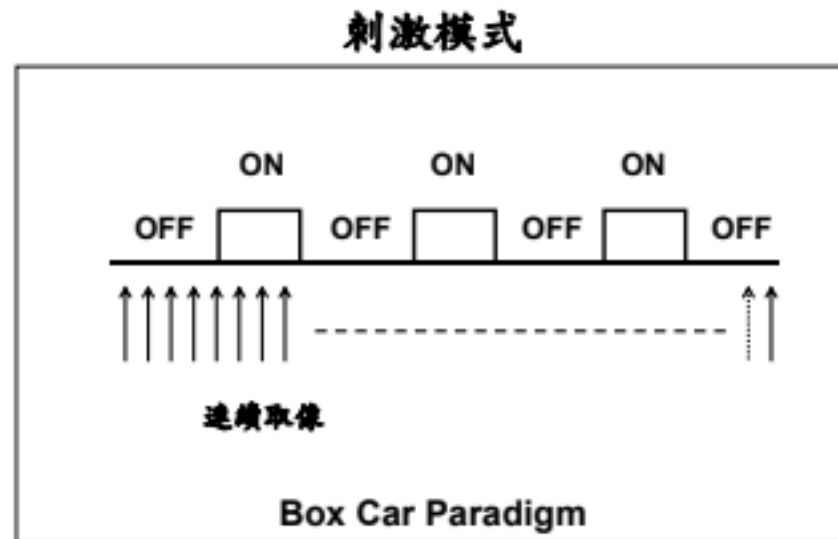
fMRI



# Introduction - Analysis of fMRI

- Direct Subtraction (DS)

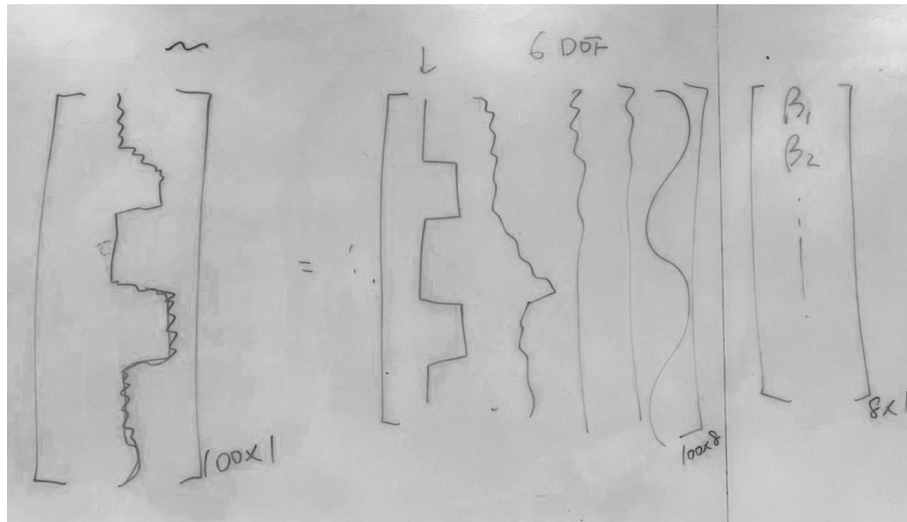
全部刺激後平均 – 全部刺激前平均



$$t = \frac{\bar{y}_{on} - \bar{y}_{off}}{\sqrt{\frac{\sigma_{on}^2}{N_{on} - 1} + \frac{\sigma_{off}^2}{N_{off} - 1}}}$$

# Introduction - Analysis of fMRI

- General Linear Model (GLM)

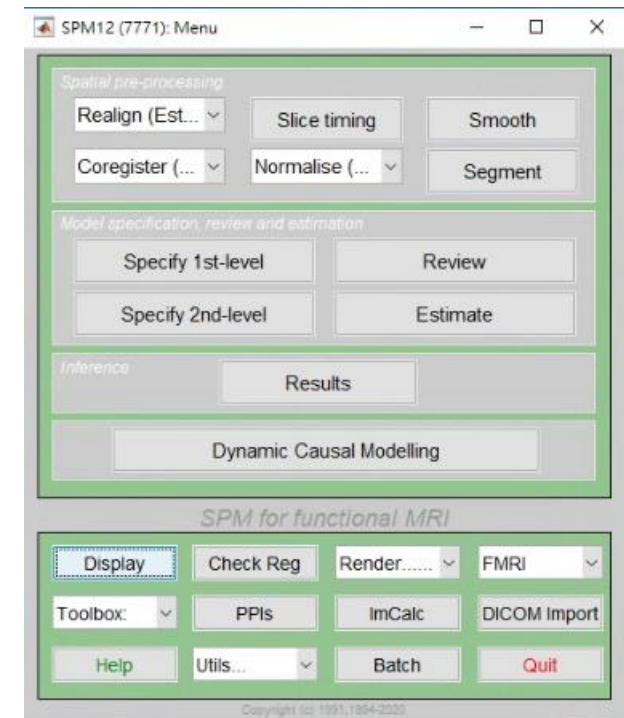


$$Y = X\beta + \epsilon$$

$$Y = \begin{bmatrix} x_{11} & \cdots & x_{1J} \\ \vdots & \ddots & \vdots \\ x_{T1} & \cdots & x_{TJ} \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{bmatrix} + \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \vdots \\ \epsilon_n \end{bmatrix}$$

# Method

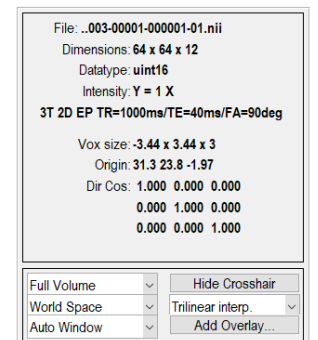
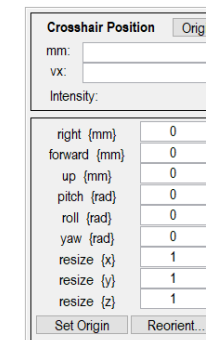
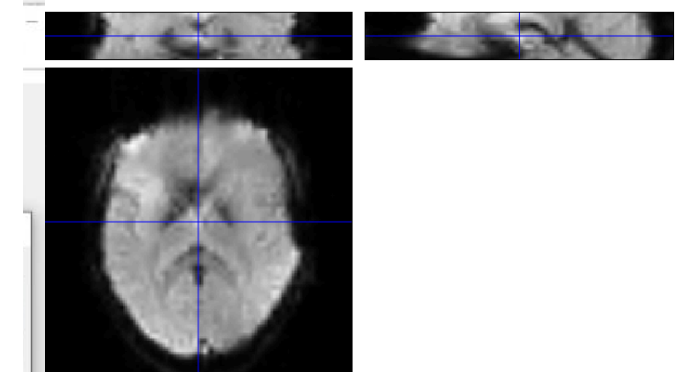
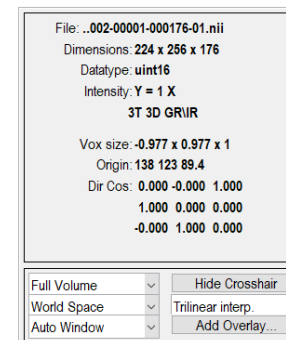
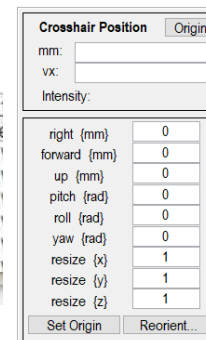
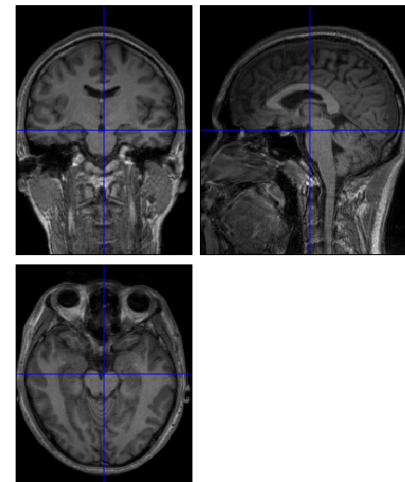
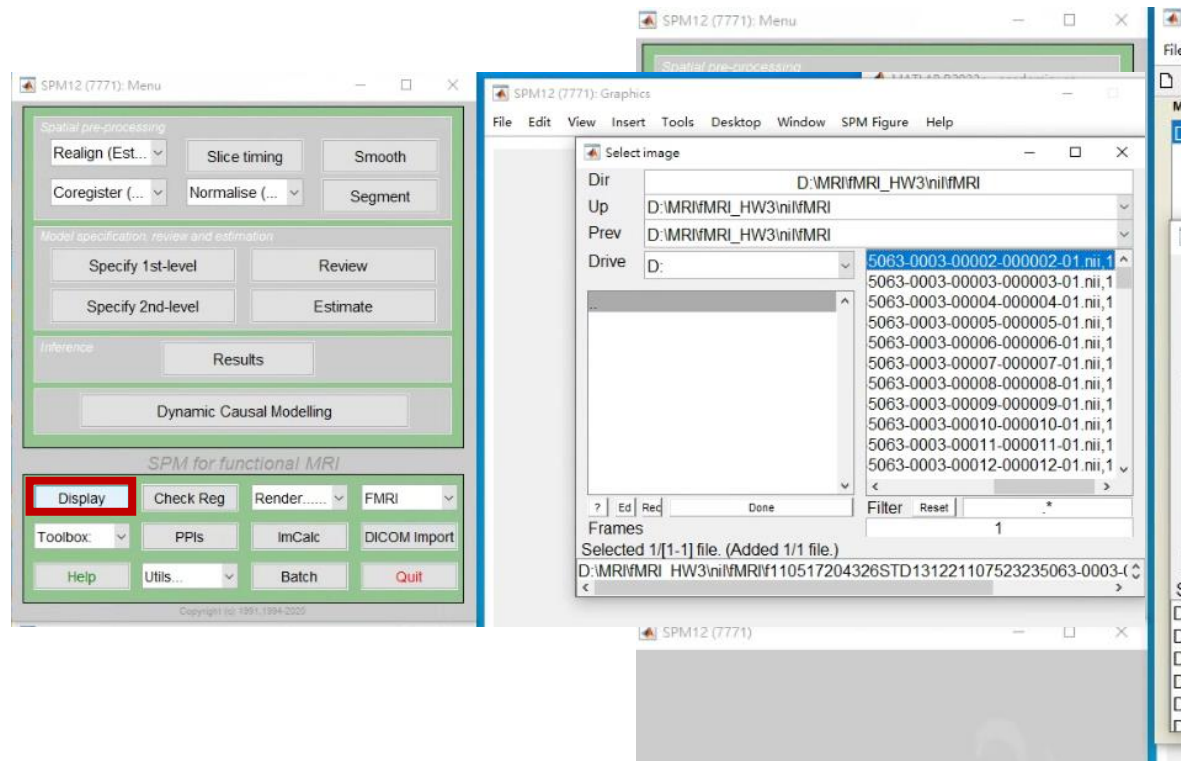
- SPM
  1. Load T1 and fMRI(EPI) files: DICOM to nii
  2. Slice Timing
  3. Realign: Estimate & Reaslice
  4. Coregister: Estimate
  5. Normalise: Estimate and Write
  6. Smooth
  7. fMRI Model Specification
  8. Model Estimation
  9. Result Review



# Method

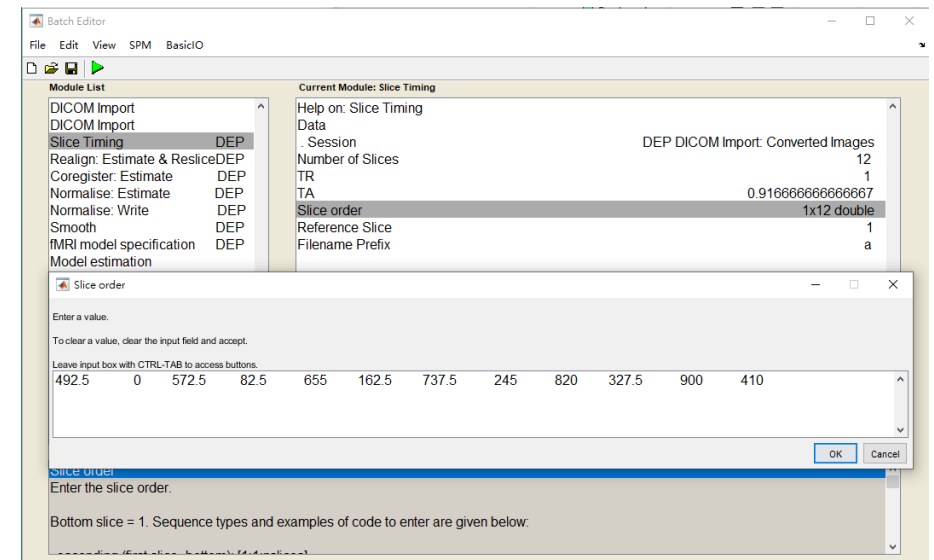
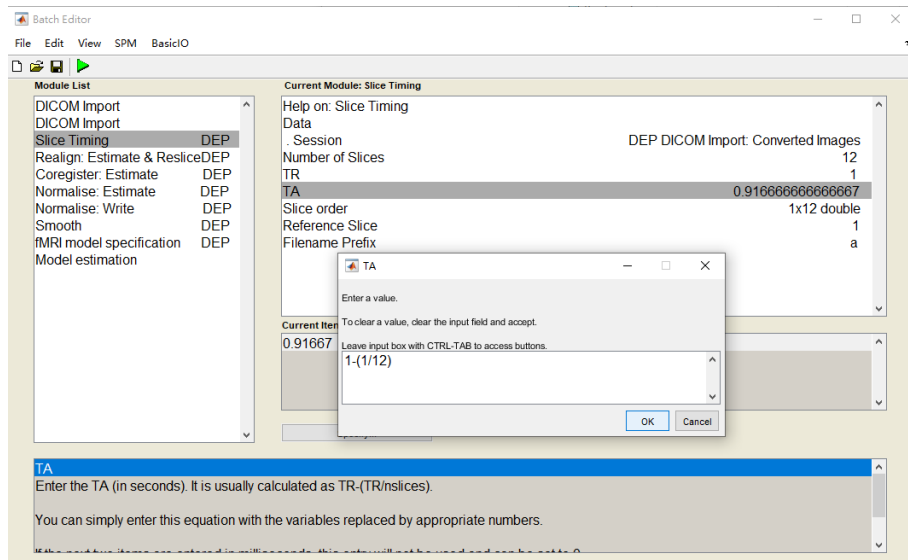
- Load files

DICOM → Nii



# Method

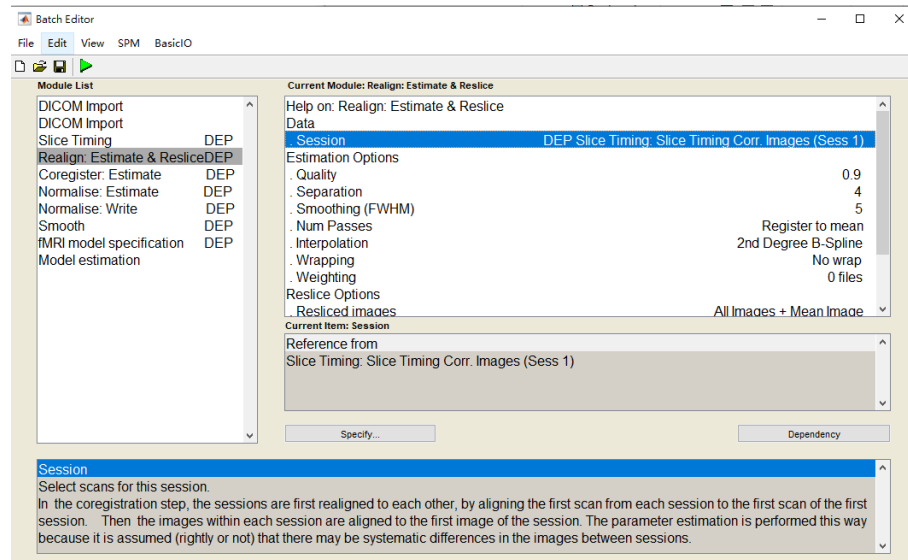
- Slice Timing





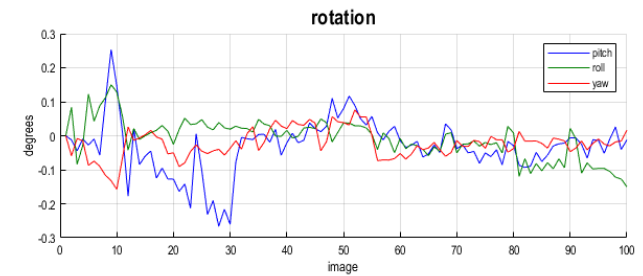
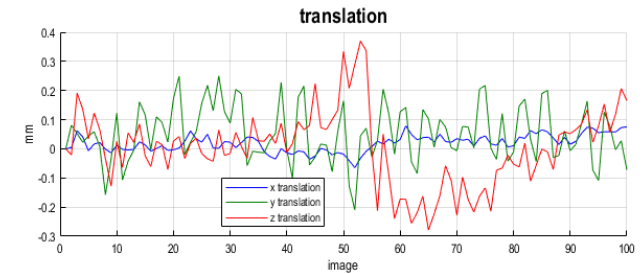
# Method

- Realign



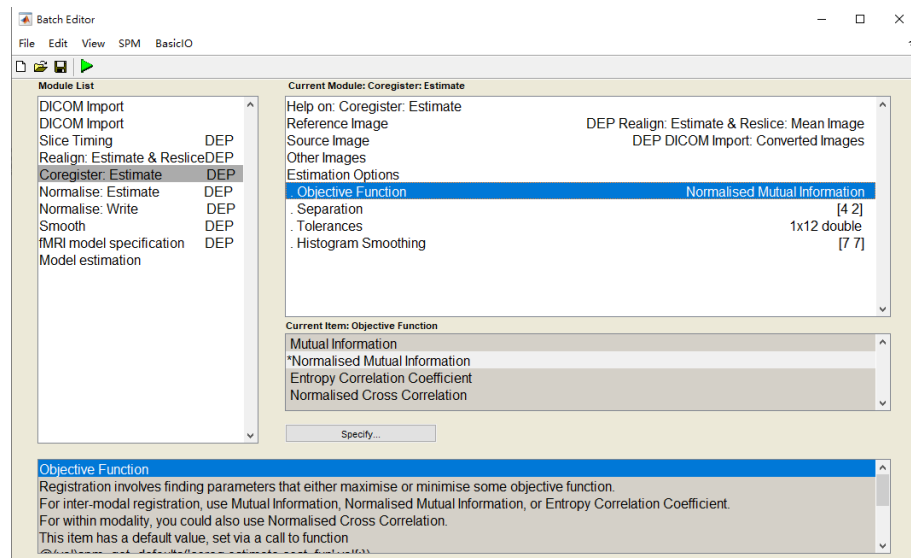
## Image realignment

```
1 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00001-000001-01.nii,1
2 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00010-000010-01.nii,1
3 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00100-000100-01.nii,1
4 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00011-000011-01.nii,1
5 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00012-000012-01.nii,1
6 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00013-000013-01.nii,1
7 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00014-000014-01.nii,1
8 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00015-000015-01.nii,1
9 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00016-000016-01.nii,1
10 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00017-000017-01.nii,1
11 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00018-000018-01.nii,1
12 D:\MRIMRI_HW3\resultaf110517204326STD131221107523235063-0003-00019-000019-01.nii,1
.....etc
```



# Method

- Coregister

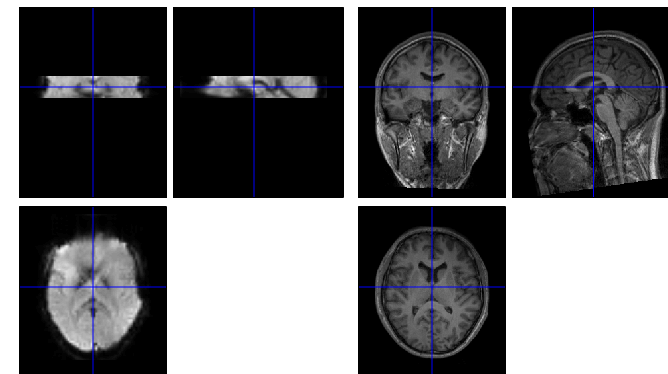
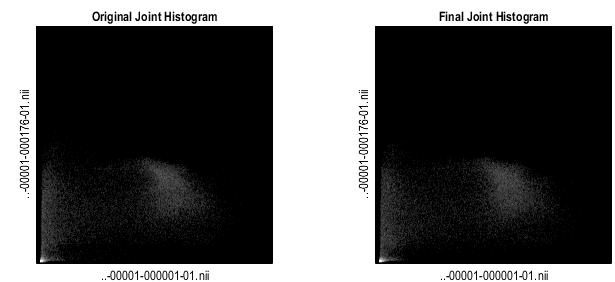


## Normalised Mutual Information Coregistration

$$X1 = -0.001 \cdot X - 0.006 \cdot Y - 0.291 \cdot Z + 58.449$$

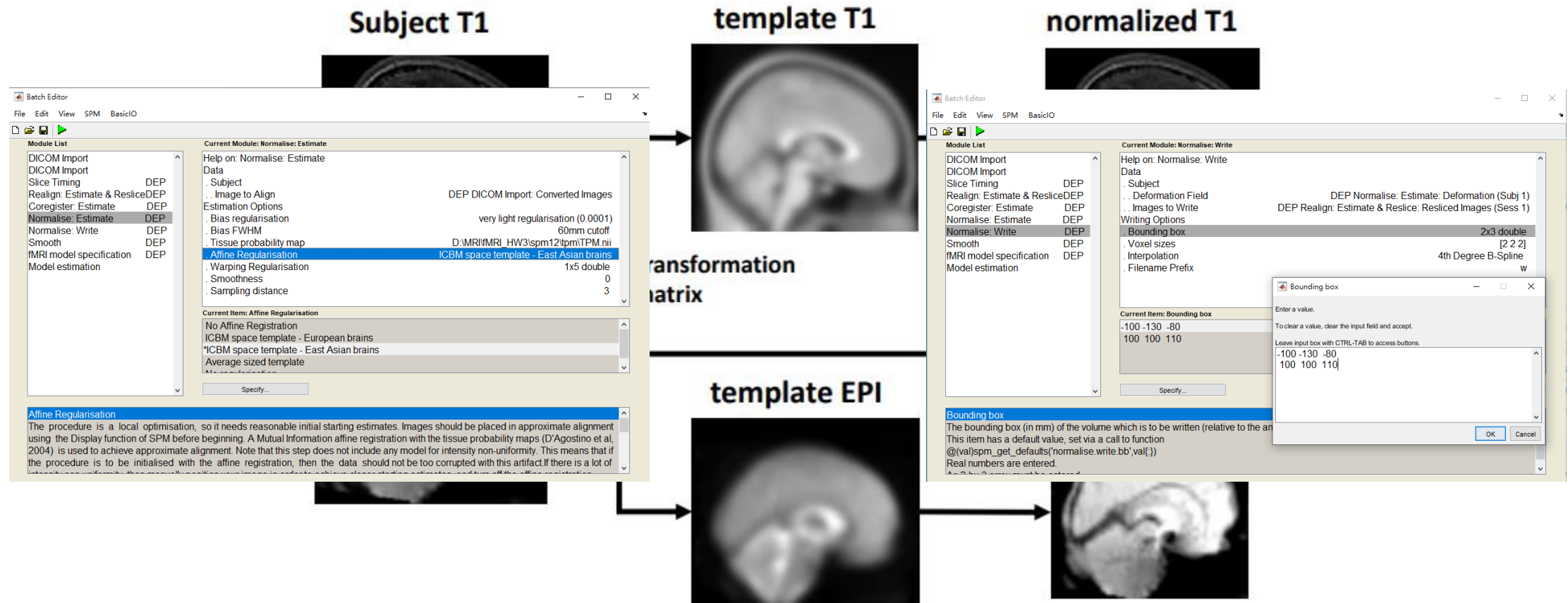
$$Y1 = -0.281 \cdot X + 0.041 \cdot Y + 0.000 \cdot Z + 56.929$$

$$Z1 = 0.047 \cdot X + 0.322 \cdot Y - 0.007 \cdot Z - 47.162$$



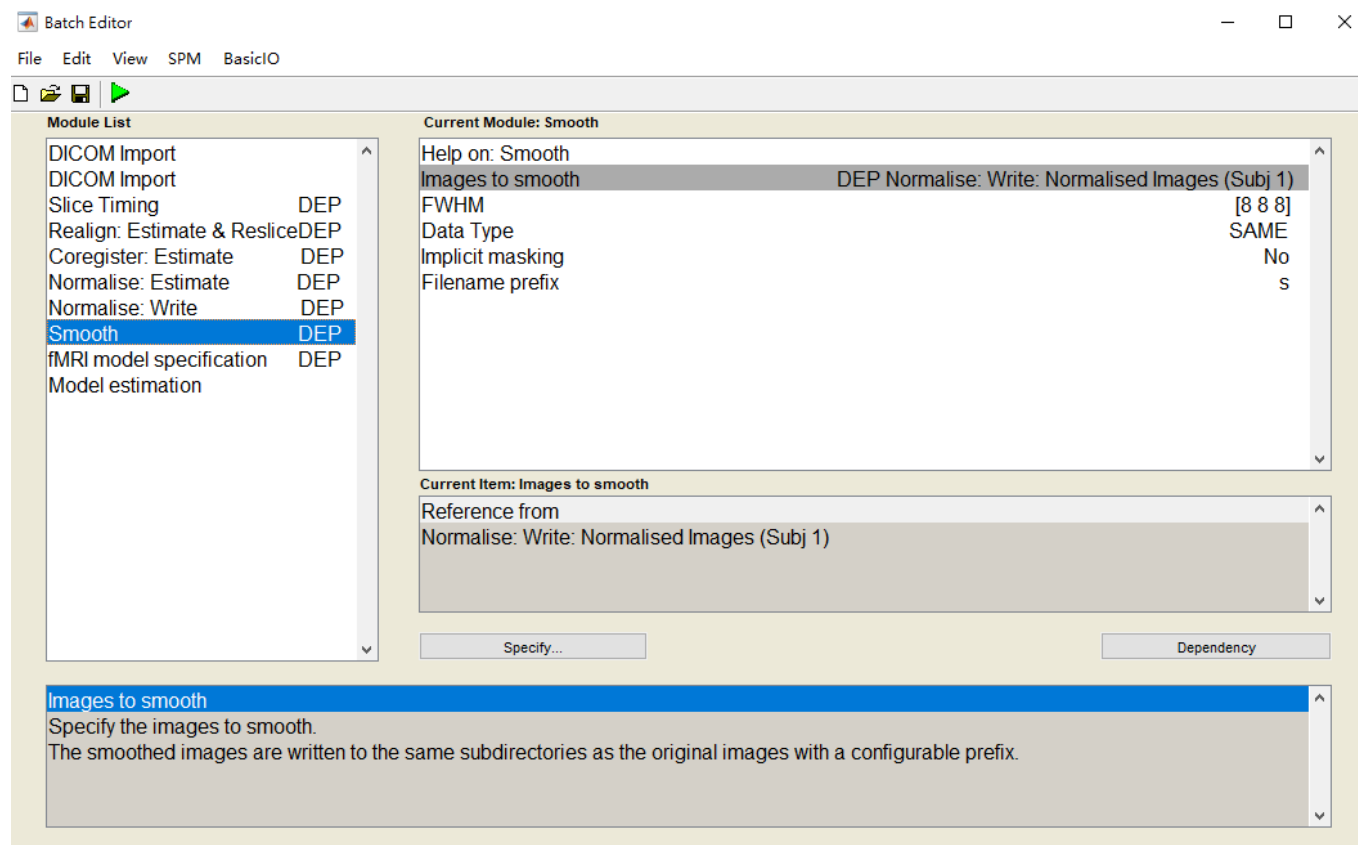
# Method

- Normalise



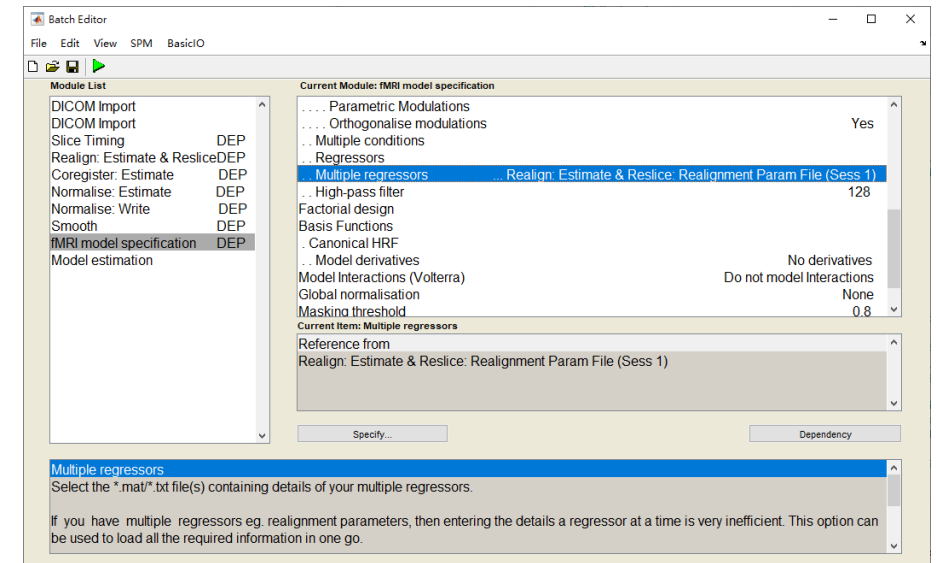
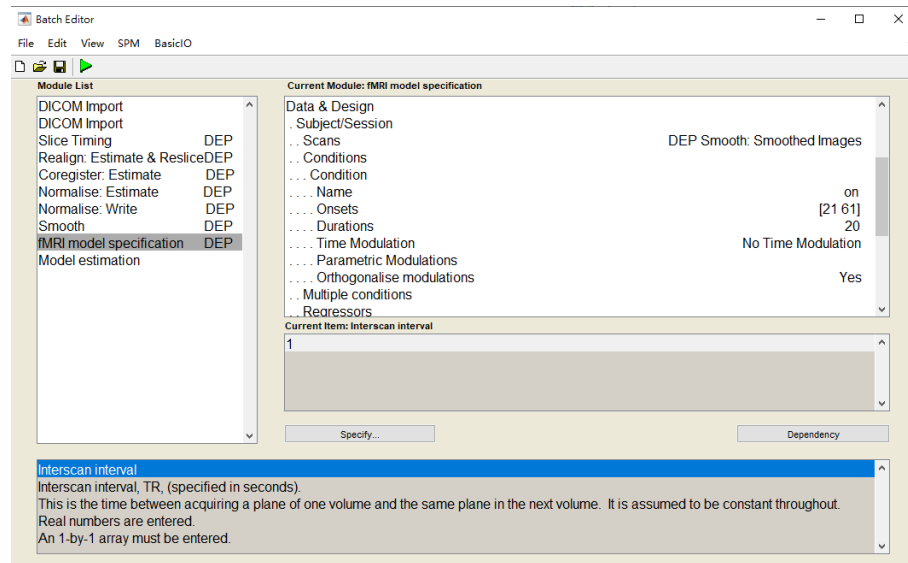
# Method

- Smooth



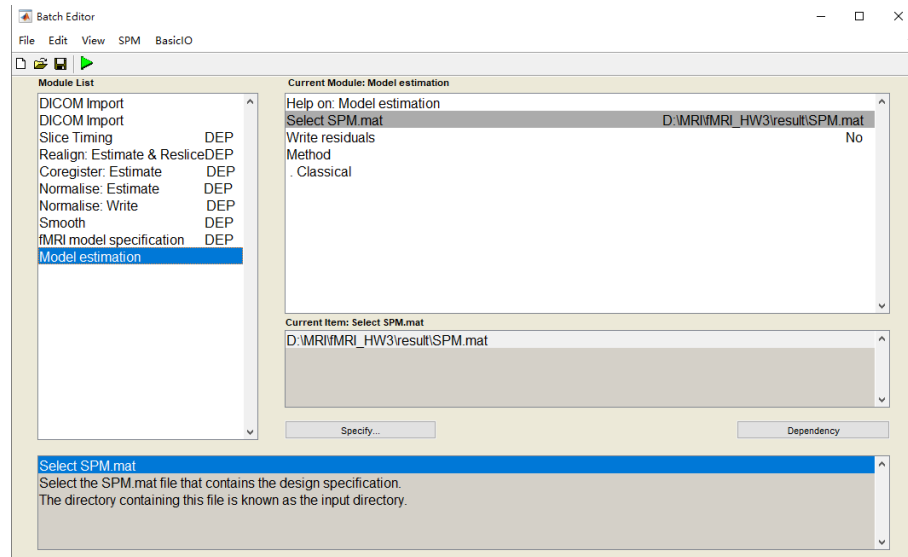
# Method

- fMRI Model Specification

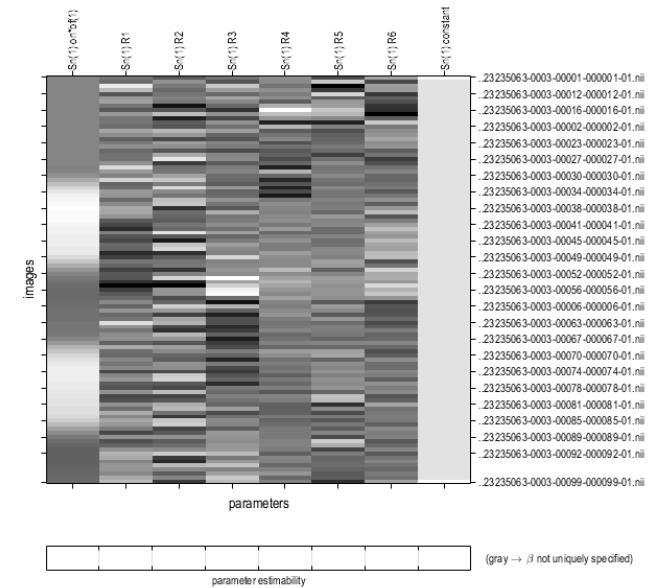


# Method

- Model Estimation



## Statistical analysis: Design

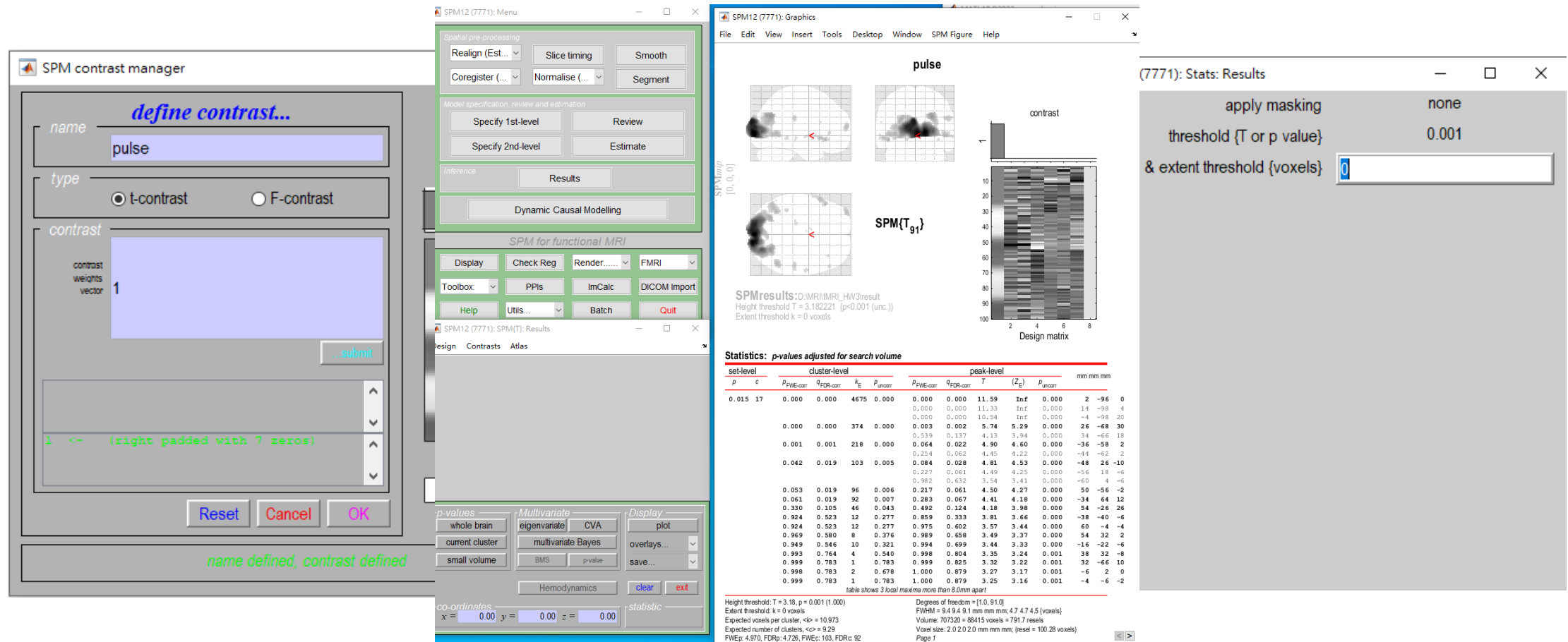


## Design description...

Basis functions : hrf  
Number of sessions : 1  
Trials per session : 1  
Interscan interval : 1.00 (s)  
High pass Filter : [min] Cutoff: 128 (s)  
Global calculation : mean voxel value  
Grand mean scaling : session specific  
Global normalisation : None

# Method

- Result Review



# Experimental Results

- xjview

