

iVAC user's manual

Individual Voxel-based morphometry Adjusting Covariates (iVAC) is a toolbox for SPM which estimates the deviation of individual data from normative values while adjusting arbitrary covariates using the general linear model. One of the main features of this toolbox is that it can include covariates of no interest into the model. Using multiple regression model the toolbox estimates the distribution of control group adjusting for covariates of no interest in each voxel. Once you generate the reference database as parametric images from control subjects, you can calculate the z-score maps for individual adjusting for the covariates of no interest. Please note that reference images should be generated from sufficient numbers of subjects so that covariates have enough variations (e.g. a range of age).

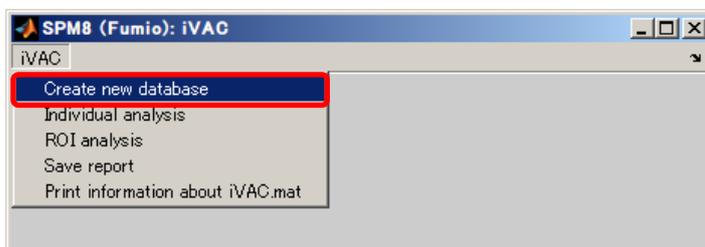
1. Download and Installation

Download the latest version of iVAC from Download section of the following link: http://amrc.iwate-med.ac.jp/modules/english_contents/

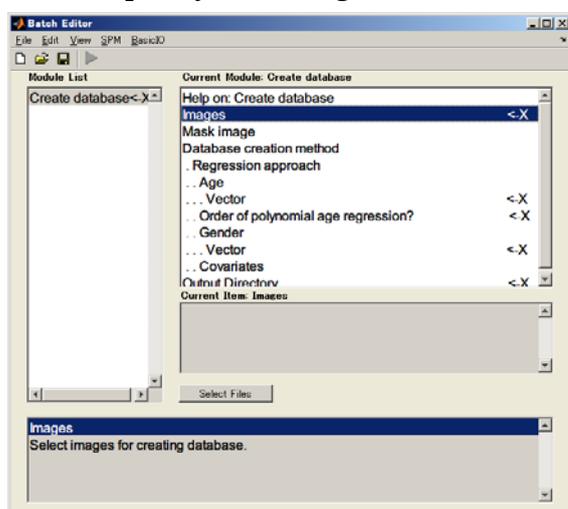
Unzip the iVAC.zip file and put the iVAC folder into the toolbox folder of SPM. If you want to use with SPM8, the path should be spm8/toolbox/iVAC.

2. Create a new database

In order to use iVAC, you need to generate a database from your control subjects. Start iVAC from the toolbox of SPM and select "Create new database" from the menu.



After selecting the menu, a new window (the Batch Editor) will open. Here you can specify the images and covariates to generate a database.



Images: Choose images. Pre-processed (i.e., segmented, normalized and smoothed) images are generally used.

Mask image (optional): Choose a mask image if you want to limit the regions for analysis.

Database creation method: Select "Regression approach" or "Mean and standard deviation approach". The default is "Regression approach". When you select this, you need to specify "Age" and "Gender".

. . Age: Enter ages into the "Vector" according to the order you selected images. You can enter decimal such as 50.5.

. . Order of polynomial age regression: You can add polynomial covariates of ages up to cubic. Select either "Linear", "Quadratic" or "Cubic" according to your model.

. . Gender: Enter 0 for female and 1 for male into the "Vector" according to the order you selected images.

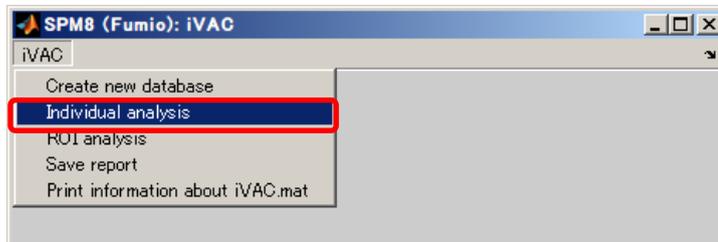
. . Covariates (optional): You can add any covariates other than age and gender. Select "New: Additional Covariate" as many times as you want to add and enter the value and name of the covariates.

Output Directory: Specify the directory you want to save the result of iVAC

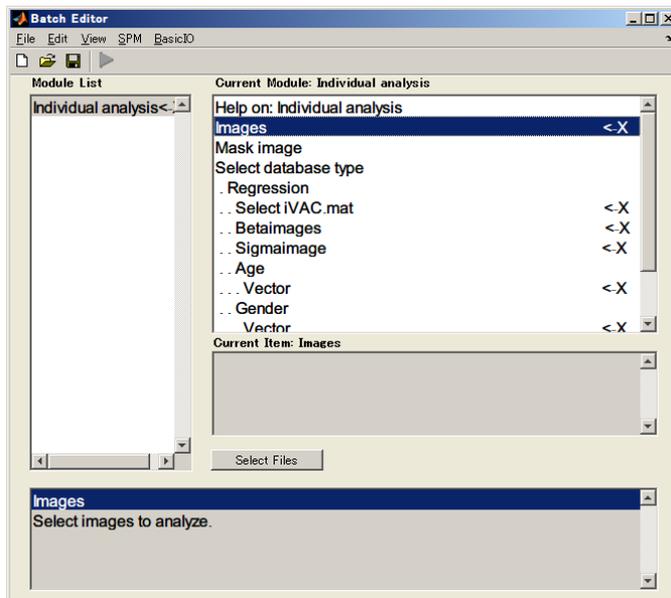
After setting up (and there are no "<->" symbols, which indicate that more information is needed), click the Run button (the green triangle) to generate the database.

3. Individual analysis

Individual analysis will be performed using the constructed database. Select “Individual analysis” from the iVAC menu.



A batch editor will open. Here you can specify the individual image and database.



Images: Specify the individual images. Select images processed in the same manner as those selected in the database construction process. Pre-processed (i.e., segmented, normalized and smoothed) images are generally used.

Mask image (optional): Choose a mask image if you want to limit the regions for analysis.

Database type: Select either “Regression” or “Mean and standard deviation.”

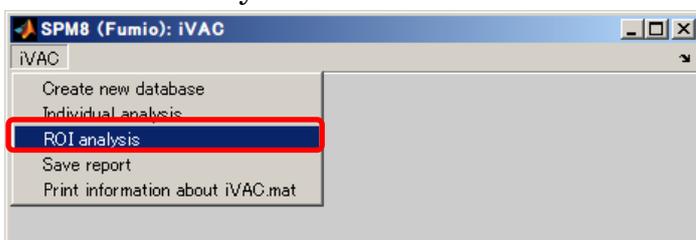
. Regression: When you select “Regression,” you further specify the followings;

- . . Select iVAC.mat: specify “iVAC.mat” in your database folder.
 - . . Betaimages: specify “beta.nii” in your database folder.
 - . . Sigmainimage: specify “sigma.nii” in your database folder.
 - . . Age: Enter the ages into “Vector” according to the order you specified the individual images. You can enter even the decimal such as 50.5. Polynomial covariates of age will be automatically generated if you add polynomial covariates when you create your database.
 - . . Gender: Enter 0 for female and 1 for male into “vector” according to the order you selected individual images.
 - . . Covariates (optional): If you add covariates other than age and gender when you create your database, add covariate with the same order and enter the value and name of the covariates.
 - . . Output images: You can get t-images or z-score images or both.
- . Mean and standard deviation: When you select “Mean and standard deviation,” you further specify the followings;
- . . Mean image: Select “mean.nii” in your database folder.
 - . . SD image: Select “mean.nii” in your database folder.
 - . . Output images: You can get t-images or z-score images or both.
- Output Directory: Specify the folder you want to save the results.

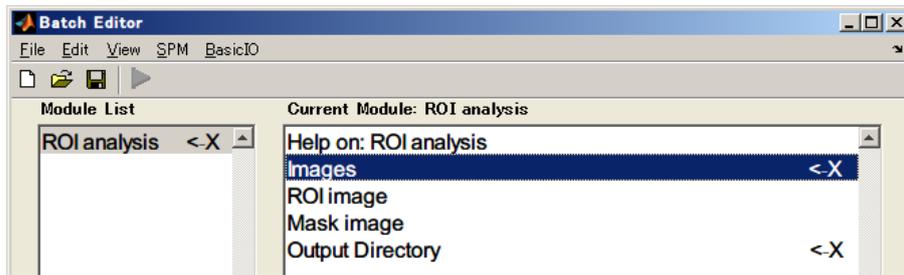
Once everything is set up, click the Run button and analysis begins.

4. ROI analysis

Select “ROI analysis” from the iVAC menu.



A batch editor will open. Here you will specify the ROI.



Images: Specify either z-score or t- images generated by individual analysis.

ROI image: Specify ROI images.

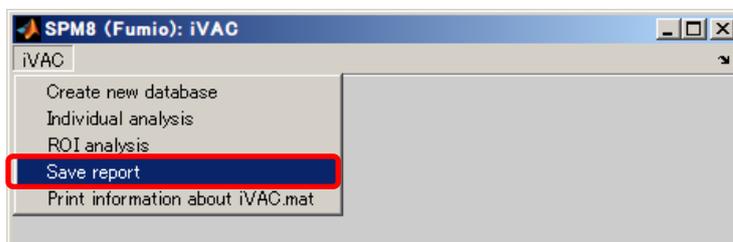
Mask image (optional): Choose a mask image if you want to limit the regions for analysis.

Output Directory: Specify the folder you want to save the result of ROI analysis. The results will be saved as tab separated text files.

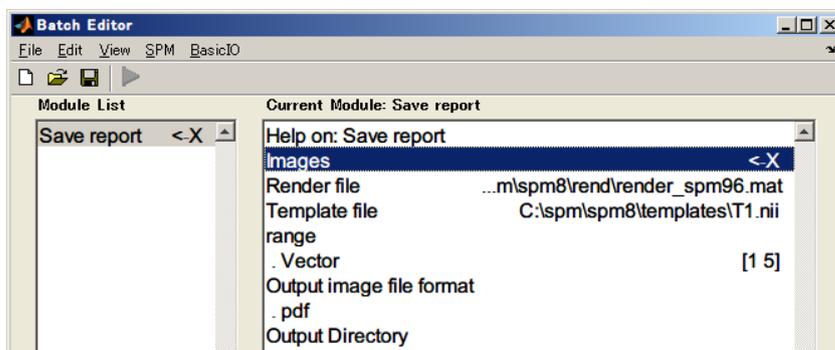
Once everything is set up, click the Run button to start the ROI analysis.

5. Save report

Select "Save report" from the iVAC menu.



A batch editor will open. Here you will specify how you save your results.



Images: Specify z-score or t- images generated in individual analysis

Render file: Specify .mat files for rendering.

Template file: Specify the template images where you want to overlay the results.

Range: Set the lower and upper threshold of the image. Enter a 1 by 2 matrix such as [1 5].

Output image file format: Select a file format of the output image from png, tiff, or pdf.

Output Directory: Specify the directory where you want to save your results.