Medical Image Segmentation and applications

SPM: a neuroimaging tool

Introduction

The aim of this first lab is to download, install and test a well-known neuroimaging framework: **SPM**. We will play with the software to understand the effects of the pre-processing steps seen during the lectures, to move in subsequent labs to high level processes such as brain tissue segmentation.

With the provided set of brain MRI images (in Moodle), we ask you to apply the two most common brain pre-processing steps used to perform tissue segmentation:

1) Skull striping process
2) Bias field correction

Look for the corresponding tools in the framework, **SPM (Matlab software)** and test the different parameters. To install the framework, download the tool from moodle and add the folder into the Matlab path.

We recommend to use **ITK-SNAP** software to visualise all the images and results generated.

Objectives

A) Install, understand, and use SPM for brain tissue segmentation.
B) Apply and analyse the skull stripping and bias field correction pre-processing steps.
C) Provide the segmented the brain tissue classes into a single image (.nii file). Evaluate the results with the provided ground-truth of the WM, GM and CSF using Dice.

- Look for the information.
- Understand the basics of the algorithms.
- Investigate the parameters and how to run it with the provided brain images.
- Run the tools for all the data provided and generate the bias-free images and the skull stripped images.
- Obtain the brain tissue segmentation (WM, GM, CSF). The ground-truth is provided so you can tune the above parameters to obtain the best segmentation.

Coursework Submission:

Report with explanations and results (images from all the cases) obtained with the different objectives:

a. Brief explanation of the process.
b. How did you run the algorithms? Show the code/parameters used.
c. Qualitative image results before and after each pre-processing step. Show also the masks of the skull and the bias field corrected (SPM returns them).
d. Provide visual examples of brain tissue segmentation. Table with the evaluation of the mean and standard deviation of each brain tissue should be included.

DEADLINE**:** It will be indicated in the Moodle submission link. Late submission will be penalised.