

<http://www.cs.ucf.edu/~bagci>

# [PROGRAMMING ASSIGNMENT] (1)

MEDICAL IMAGE COMPUTING

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## Coding Standard and General Requirements

Code for all programming assignments should be **well documented**. A working program with no comments will receive **only partial credit**. Documentation entails writing a description of each function/method, class/structure, as well as comments throughout the code to explain the program flow. Both main code and necessary *cmake* files need to be submitted.

Submit by **13th of February 2017**, 11.59pm.

## MR Image Preprocessing Framework

Design a preprocessing framework for *cleaning* MR images. The framework will include the following filters: **denoising and inhomogeneity (bias) correction**. You will decide the correct order of preprocessing filters as well as their types. You are free to use available ITK filters for this purpose. Make sure that your denoising filter will preserve edges while removing noise.

### Preprocessing T1, PD, and T2 Images [10 pts]

- Download *BrainWeb* images of T1, PD, and T2 image data set (1mm, 0% of noise, and intensity uniformity of 0%) from [http://brainweb.bic.mni.mcgill.ca/brainweb/selection\\_normal.html](http://brainweb.bic.mni.mcgill.ca/brainweb/selection_normal.html). Call them **CLEAN** images.
- Download *BrainWeb* images of T1, PD, and T2 data set (1mm, 9% of noise, and intensity uniformity of 40%) from [http://brainweb.bic.mni.mcgill.ca/brainweb/selection\\_normal.html](http://brainweb.bic.mni.mcgill.ca/brainweb/selection_normal.html). Call them **unclean** images.
- Process unclean images with denoising and inhomogeneity correction filters in correct consecutive order.
- Compare processed image with respect to the clean image by the coefficient of variation (CoV) method. You can present the results based on the following tissues as well: CoVs in white matter and gray matter. Note that binary segmentations for those tissues are also available for clean images.
- Repeat the above steps for unclean data set where noise level is 5% and inhomogeneity level is 20%.
- Present your results in a neat-table.
- Make sure that your report is short, and descriptive. No format requirement. Submit also your code.

Some example ITK codes can be found in the following:

<http://www.itk.org/ItkSoftwareGuide>

<http://itk.org/Wiki/ITK/Examples>

Example code for **difference operation on two images**:

<http://itk.org/Wiki/ITK/Examples/ImageProcessing/SquaredDifferenceImageFilter>