

<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 **17th of February 2016**, 11.59pm.

MR Image Preprocessing Framework

Design a preprocessing framework for *cleaning* MR images. The framework will include the following filters: **denoising, intensity standardization, 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 Proton Density (PD) Images [5 pts]

- Download *BrainWeb* images of PD data set (1mm, 0% of noise, and intensity uniformity of 0%) from http://brainweb.bic.mni.mcgill.ca/brainweb/selection_normal.html. Call them **clean** images.
- Download *BrainWeb* images of PD data set (1mm, 9% of noise, and intensity uniformity of 40%) from http://brainweb.bic.mni.mcgill.ca/brainweb/selection_normal.html. Call them **unclean** images.
- Process unclean images with denoising, intensity standardization, and inhomogeneity correction filters in correct consecutive order.
- Compare processed image with respect to the clean image by differing them, and reporting the mean and standard deviation of the differed image (see link below for an example code).
- Repeat the above steps for unclean data set where noise level is 5% and inhomogeneity level is 20%.

Preprocessing T2 Images [5 pts]

Repeat the above steps for T2 MR images instead of PD. All steps are the same except the imaging modality.

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>