Computational Homework 4

4 MriCloud

4.1 Neuroimaging data

Each group will download 10 MPRAGE brain images from github. They are in the folder called `mriCloud/`. Each image contains a header file (`.hdr`) which contains information about how to orient the data spatially, and an image file (`.img`) which contains the values of the image at each voxel. Five images are of patients with Alzheimer's disease. They are named:

```
AD01.hdr AD01.img
AD02.hdr AD02.img
AD03.hdr AD03.img
AD04.hdr AD04.img
AD05.hdr AD05.img
```

And five images are of patients who are healthy. They are named

```
Normal01.hdr Normal01.img
Normal02.hdr Normal02.img
Normal03.hdr Normal03.img
Normal04.hdr Normal04.img
Normal05.hdr Normal05.img
```

5 Defining neuroanatomy with MriCloud

Each group should sign in to MriCloud and parcellate their brain images as explained in the document `mriCloud/Mri_Cloud_computational_medicine_introduction_4.pptx` on github.

6 Volumetric analysis

Each group will perform a volumetric analysis of a group of structures that are related functionally as described in Table 1. The hierarchical organization of each structure is described in the document `mriCloud/multilevel_lookup_table.txt`.

The volume of each structure should be looked up from the MriCloud output. For each structure:

- Plot a histogram of volumes for the AD subjects, and a histogram of volumes for the Normal subjects.
- Report the mean and standard deviation of volumes for each group.
- Report the signal difference to noise ratio (difference in means, divided by square root of average variance) between groups.
- Perform a t test to see if differences between groups are more than what would be expected by chance

Table 1: Structures for each group to analyze

Group	Structures
Boss Alpacas	**left** cluster 1: PrCu: Pre-cuneus; SFG: superior frontal gyrus; Cing: cingulum
Hodgkin Podge	**left** cluster 2: MTG, and ITG: middle and inferior temporal gyri; ; AG: angular gyrus; MFG and IFG: middle and inferior frontal gyri; MFOG, LFOG: middle and lateral fronto-orbital gyri; RG: retus gyrus
Jozzle My Jimmies	**left** cluster 3: SPG: superior parietal gyrus; PoCG, PrCG: post and pre central gyri; SMG: supra marginal gyrus; Ins: Insula; STG: superior gyrus
Team Uzbekistan	**left** cluster 4: SOG, MOG, and IOG: superior, middle and inferior occipital gyri; Fu: fusiform gyrus; Cu: cuneus; LG: lingual gyrus.
Team HAY	**right** cluster 1: PrCu: Pre-cuneus; SFG: superior frontal gyrus; Cing: cingulum
Team 1,2.0	**right** cluster 2: MTG, and ITG: middle and inferior temporal gyri; ; AG: angular gyrus; MFG and IFG: middle and inferior frontal gyri; MFOG, LFOG: middle and lateral fronto-orbital gyri; RG: retus gyrus
Standard Deviants	**right** cluster 3: SPG: superior parietal gyrus; PoCG, PrCG: post and pre central gyri; SMG: supra marginal gyrus; Ins: Insula; STG: superior gyrus
Instructors	**right** cluster 4: SOG, MOG, and IOG: superior, middle and inferior occipital gyri; Fu: fusiform gyrus; Cu: cuneus; LG: lingual gyrus.