AFNI Jazzercise

Please read the following questions and use your AFNI know-how to answer them. Hints to answering these questions are available in the "Hints" handout. The answers to these questions can be found in the "Answers" handout.

1. The dataset **AFNI_data1/afni/`func_ht2+orig`** contains 38 sub-bricks of statistical data. Use **`3dbucket`** to create a new "slimmed down" version of this dataset that contains only the following sub-bricks: #0, 17, 19, 20, 22, 35-37. Name this new slimmed dataset **ht2_slim**.

2. In directory **AFNI_data1/afni** you will find three anatomical datasets: **`anat+orig`**, **`anat2+orig`**, **`anat3+orig`**. These datasets are 3 separate anatomical scans of a single subject. They have already been motion corrected for you. Now take them and average them together into a single, averaged dataset called **anat_mean+orig**.

3. Use AFNI's two skull-stripping programs, **`3dIntracranial`** and **`3dSkullStrip`**, to remove the skull from dataset **AFNI_data1/afni/`anat+orig`**. Name the output file from 3dIntracranial **anat_3dIntra+orig** and the output file from 3dSkullStrip **anat_3dSkull+orig**. Compare the two output datasets. Did one program do a better job at skull stripping or are the results similar? (Note: 3dSkullStrip may take a few minutes to run so be patient).

4. Use AFNI's Winsorizing program to apply a 3D Winsorizing filter to dataset **AFNI_data1/afni/`anat+orig`**. This filter is used to improve the gray-white matter contrast in an anat volume. Add an option on the command line to repeat the filter 5 times (the default runs the filter only once). Give the output file the prefix name **anat_winsor**. Compare the original and the Winsorized datasets to see if there is any difference in the gray-white matter contrast.

5. Dataset **AFNI_data1/afni/`anat+orig`** was acquired sagittally and contains 124 slices. Create a new dataset that contains only slices 40-90 of anat+orig. Provide the new dataset with the prefix name **anat_40_90**.

6. Creating and Playing with ROI Masks:
    a. The dataset **AFNI_data1/afni/`func_slim+orig`** has beta values and F-stats for 2 stimulus classes, <u>Actions</u> and <u>Tools</u>. Use **`3dcalc`** to create a mask called **ex_AT_mask** that is **1** everywhere that both the Actions F-stat and the Tools F-stat values are greater than 50, and **0** everywhere else.

    b. Similar to part a, create a conjunction mask that is **1** wherever a>50 (from Actions F-stat sub-brick), **2** wherever b>50 (from Tools F-stat sub-brick), **3** wherever both are true, and **0** otherwise. Name this dataset **ex_AT_mask_4+orig** (since it contains 4 values).

    c. Use the afni GUI to display this mask, **`ex_AT_mask_4+orig`**, so that each mask value gets its own color. What does each color mean?

d. Use **`3dROIstats`** to store the average time series from **`epi_r1+orig`** into the text file **ex_AT_mean.1D**, where the mean is over the voxels in the mask (from part a), **`ex_AT_mask+orig`**.

7. Fun with 1D files:
   a. Create a 3-column file with the numbers 1-10 in column one, 11-20 in column two, and 21-30 in column three. Call this 1D file **3_cols.1D** (note: you need to run 3 separate AFNI programs to do this task).

   b. Create a new file that contains columns 1, 2, 3, 3, 2,1, from question 8a (i.e., there will be a total of 6 columns in this new 1D file). Call this new 1D file **6_cols.1D**.

   c. Now take the 6 columns from question 7b and average them together to create a new file with a single column. Call that new file **ex_mean.1D**.

8. Fun with the AFNI GUI:
   a. Open **AFNI_data1/afni/`anat+orig`** and in any one of the views (sagittal, axial, or coronal), change the gray-scale intensity range to be 50 minimum and 150 maximum.

   b. Open **AFNI_data1/afni/`func_slim+orig`** and set the Full-F as the OLay and Threshold. Set the Threshold to F=8.0. Show only Positive values and set the color scale to show only 4 colors. Edit the color scale so that F-values between 226.22-339.32 are shown in lime green.

   c. View the above settings you created from question 9b in a sagittal slice. Make a jpeg file from sagittal slice #86 and name it **cool_slide**.

   d. Switch to <u>Talairach</u> view and Talairach to the **right uncus**.

   e. Change the display to show 5 sagittal slices all at once.

   f. Can you find the AFNI Mission statement hidden in the AFNI GUI?

9. Doing Calculations in AFNI:
   a. Determine what type of data (short, float, etc) makes up dataset **AFNI_data1/afni/`func_slim+orig`**.

   b. Calculate 22.3 * 44.5 using the simple calculating program in AFNI.

10. Image Filtering:
    a. Smooth **AFNI_data1/afni/`epi_r1+orig`** with a 8mm FWHM filter. Name the output file **ex_blur8**.

    b. Enhance **AFNI_data1/afni/`anat+orig`** by emphasizing the minimum-valued voxels across +/-3 voxels in the sagittal (z) direction. Name the output dataset **ex_minz3**.

c. Enhance dataset **`ex_minz3+orig`** from question 10b by removing the noise with program **`3danisosmooth`**. Name the output dataset **ex_aniso**. Use the **-viewer** option in this program to select the number of noise-removing iterations.

11. Random Exercises with AFNI Datasets:

a. Open dataset **AFNI_data1/afni/`anat+orig`** dataset and find the storage order (i.e., xyz-orientation). Re-orient it to RAI orientation and name the new output dataset **exRAI**.

b. Open dataset **AFNI_data1/afni/`func_slim+orig`** and create 2 separate datasets: one with the 4^{th} sub-brick only and one with the 5^{th} sub-brick only. Call the former dataset **ex_toolcoeff** and the latter **ex_toolfstat**.

c. Combine **`ex_toolcoeff+orig`** and **`ex_toolfstat+orig`** from question 12b to create a new dataset called **ex_tool**.

d. Convert dataset **AFNI_data1/afni/`func_slim+orig`** to Talairach coordinates with a $4mm^3$ resolution. Use dataset **anat+tlrc** in the same directory as the data parent to perform the transformation on **`func_slim+orig`**. Name the output file **func_slim4mm**.

e. Locate the maximum "Full-F" stat voxel value in dataset **`func_slim4mm+tlrc`** and find the name of the Talairach atlas region that corresponds to that voxel's position.