FreeSurfer Summer Workshop Schedule

Hosted by CFMI @ Georgetown University

June 26 - 30, 2017

The FreeSurfer Summer Workshop was made possible by funds from the Center for Functional & Molecular Imaging (CFMI) for the purpose of fostering youth interest in the neurosciences and for the overall benefit of the Georgetown Academic community. This tutorial is intended for individuals with little to no experience in neuroscience, computer science or neuroimaging.

Goals

- Learn basic brain anatomy. Identification of different lobes, major landmarks and anatomical structures in MR images.
- Become familiarized with nuclear magnetic resonance imaging and how it is used for biomedical imaging.
- Develop proficiency with assessing MR image quality through visual inspection.
- Become familiarized with computational tools (i.e. FreeSurfer) for analyzing brain morphometry.
- Perform QC and editing of ADS structural MRI dataset.
- Create a *real* pull request using github ;)

Enrichment Opportunities

Psychology Department Career Panel
12:00 - 14:00 - Wednesday, June 28

Physics Colloquium: Engineering and Imaging Excitons for Brain Imaging of Modulatory Neurotransmitters
12:30 - 14:00 - Thursday, June 29

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GUMC Career Symposium

12:00 - 13:00 Tuesday, August 8th

NRB Auditorium

MRI Summer Course Schedule

Dr. John VanMeter will offer bi-weekly courses/workshops on functional magnetic resonance imaging. This will allow students an opportunity to gain exposure to other forms of data acquisition using MRI, not just the structurals. Dates tentative and TBD.

July 17 - 20	Basic MR - Tissue Contrasts
August 1 - 4	Functional MR (T2*)
August 13 - 18	MR Spectroscopy
August 27 - 30	Diffusion

Resources & Links

- CFMI Slack Team
- Summer Workshop Github Repository
- Surfer-Gems Github Repository
- Software Installation Guide

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Monday, June 26th

10:30 - 11:30	**Welcome Orientation & CFMI Tour** **Presentation|01**	John provides introduction and welcome, maps of georgetown and presentation on important safety issues *Breakfast provided*
11:30 - 12:30	**Introduction to the Brain** **Presentation|02** **Magnetic Resonance Imaging** **Presentation|03**	John gives overview of goals for the Summer Camp & ADS project. John also provides a primer on the anatomy of the central nervous system and how MRI is used to take pictures of the brain
12:30 - 13:30	**MRI Lab 1**	Perform extra-hydration experiment in the MRI scanner (part I)
13:30 - 14:30	**Lunch Break**	*Lunch is provided @ Epicurean*
14:30 - 16:00	**The Computer as a Laboratory for Science** **Presentation|04** **~** **Notebook|01**	Shady provides introduction & familiarization with the computational environment, software and terminal Opening & viewing a subject in freeview

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Tuesday, June 27th

10:00 - 10:15	**Review: Anatomy**	Guess the brain structure! Anatomy Quiz
10:15 - 11:30	**Assessing MR Images for Quality** **Presentation|Harvard MRI QC**	John trains everyone on assessing MR image quality. How to rate an image.
11:30 - 12:30	**MRI Lab 2**	Perform overnight dehydration experiment in the MR scanner (part II)
12:30 - 13:30	**MR Image Quality Lab**	Students perform QA on MR dataset using the mindcontrol software
13:30 - 14:30	**Lunch Break: Tour of the Medical Center Campus & Locations for Food + Go Cards**	John leads tour through campus, terminates at the GoCard office *Lunch on your Own*
14:30 - 16:00	**MR Image Quality** *Post Lab* ~ **Notebook|02**	Explore: 1. inter-rater-reliability from MR Image Quality Lab data, 2. the relationship between reliability and QA metrics and finally 3. general Q&A

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Wednesday, June 28th

10:00 - 10:30	**Anatomy Review**	Anatomy Quiz
10:30 - 11:30	**Introduction to FreeSurfer: Hands On Image Viewing** **Presentation|05** ~ **Notebook|03**	Shady introduces FreeSurfer. Viewing of surfaces reconstructed from data acquired during MRI Lab Parts I & II. **Thought question**: *How does motion affect the reconstruction?*
11:30 - 13:00	**FreeSurfer Pipeline Overview** **Presentation|06**	Detailed exposition of individual recon steps and what may go wrong at each of the steps. Command line tips & tricks. How to run a subject. **Though question:** *Can we identify specific steps where motion affects the reconstruction?*
13:00 - 14:00	**Lunch Break** *Psychology Career Panel* *(free pizza)*	*Lunch on your own*
14:00 - 16:00	**FreeSurfer Pipeline Walkthrough Part I** ~ **Notebook|04**	Part I : Recon-all steps 1-5 Intensity normalization, skull stripping, subcortical labeling Visualizing intermediate results, inspecting the output, identifying and fixing errors in the brain mask

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Thursday, June 29th

10:00 - 10:30	**Anatomy Review**	Anatomy Quiz
10:30 - 12:00	**FreeSurfer Pipeline Walkthrough : Part II** ~ **Notebook|05**	Part II: Recon-all steps 6-23 Registration, Intensity normalization, Non-Linear registration, Neck Removal, Subcortical Labeling Visualizing intermediate results, inspecting the output, identifying and fixing errors in the white matter mask and surfaces.
12:00 - 13:30	**Georgetown University Medical Center Welcome Luncheon**	
13:30 - 15:30	**FreeSurfer Pipeline Walkthrough Part III** ~ **Notebook|06**	Part III : Recon-all steps 24-31 Spherical mapping & registration, map average curvature to subject, cortical parcellation Visualizing intermediate results, inspecting the final product
15:30 - 16:00	**Review: FreeSurfer Pipeline Overview**	Doesn't seem so complicated anymore does it?

Friday, June 30th

10:00 - 10:30	**Anatomy Review**	Anatomy Quiz
10:30 - 11:30	**Longitudinal Analysis of Structural Changes** ~ **Notebook|07**	
11:30 - 12:30	**Documenting FreeSurfer Edits**	
12:30 - 13:30	**Lunch**	*Lunch on your own*
13:00 - 16:00	**FreeHandsOn!**	Hands on editing: begin editing training data set of 10 subjects

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From This Point Forward

Monday, July 3rd - Tuesday July 4th - HOLIDAY

Wednesday, July 5th

09:00 - 13:00 MRI Safety Training

Rest of the week (through to July 8th)

FreeHandsOn!
Continue working on training data set of 10 subjects.
Keep your own schedule between 10:00am and 4:00pm

Monday, July 10th thru 12th

Assess inter-editor-reliability. Just how different are all of your edits, how different do the final brain products look? What are the reasons for these differences? Q&A; 1-on-1 guidance.