## Howard University Hospital Imaging Lab - Various Projects

**Billi Hall** 

### About the Internship & MRI

#### Howard Hospital

Imaging Lab - MRI (T1, T2, DTI, fMRI, CEST, etc.), NMR, optical fluorescent, bioluminescent, light scattering spectroscopy, histological microscopy

Various Projects completed - "Big Picture" work

- 7.4 and 9 Tesla magnets → Tesla is a unit of measuring the strength of the magnetic field
- MRI has many different sequences!





9.4 Tesla machine, including me adjusting the wobble so that the water peak of the signal is at 0

Proton spin  $\rightarrow$  resonance frequency  $\rightarrow$  x-y plane  $\rightarrow$  signal  $\rightarrow$  IMAGE!

# Piglet Brain Imaging Processing and Atlas Registration



• Purpose: Use various softwares to register pre-made piglet brain atlas onto a scanned piglet brain image.







#### **Engineering and 3-D Printing C and T-mounts**

0

- T-mount  $\rightarrow$  connects to microscope; M42x0.75
- C-mount  $\rightarrow$  connects to camera; M25.5x0.75
- One side of the structure for each mount



#### Models & Issues

- Model One
  - could only change scale; jumping point for model made from scratch













- Missing threads in Autodesk Inventor
  - Editing Threads.xls
  - Messaging Autodesk
    Community
- Model Three & Four
  - Coils in lieu of threads
  - Decided to change supports

#### Steps (in-picture)



#### Outcome: trying to apply to T-mount side



#### **Ilastik - Machine Learning**

- Purpose: Editing the background of our microglial cell image so that cells come out clean cut, seperated, and visible.
- Ground Truth  $\rightarrow$  machine learning











#### 3D-Morph

Purpose: Outlining and selecting the microglia cells to create a legible 3D set from the 3D image.



## Chemical Exchange Saturation Transfer



- Presence of Hydrogen protons in other substances
- Exchange of non-water excited protons and water protons
- Magnetic saturation non-water substance
  → water
- ↓- water peak signal ↑- excited proton signal → signal expressed!
- Saturation band → figuring out what the saturation will be for magnetic field to be the strongest



Around 200 completed including both z-cest and WASSR CEST images

#### **Cell Segmentation**

Purpose: Assist "big picture" project of creating a database that better identifies and differentiates between types of brain cells and what those types look like both before and after trauma



#### **Shrimp Diffusion Image Scan**

- Diffusion Imaging
- Processed tensor image
  - $\circ \quad \text{TrackVis} \rightarrow \text{visualizes} \\ \text{fibers} \quad \$
- No visual fibers came from the image results



## **Personal Conclusions**

- Digital organization
- ALWAYS ask questions
- Be open to make mistakes
- Be present and take advantage of the opportunity

## **Thank You!**

to Dr. William Tu, Artur Agaronyan, Dr. Krug, and Ms. Davis!