Containerizing Neural Network Apps for Medical Compute

Sprint 4

Mentors: Rudolph Pienaar, Sandip Samal

Group Members: Ken Krebs, Brian Mahabir, Tingyi Zhang,
Cagri Yoruk, Xiaoyu An

Total Project Deliverables: Where we are

- 2 working pipelines for two different types of classifiers.
- 2 phases of each pipeline
- Training :
  - Train models using two different types of classifiers (one classifier to identify multiple parts of the brain, the other to utilize multiple classifiers to identify specific parts of the brain)
- Infererence :
  - Use models to infer data about brain structure volume and output text report.

- Deployment of these pipelines on MOC *

Sprint 4 Accomplishments

- Begin training models for specific labels that pertain to a certain part of the brain and our results

- Modify existing plugins to facilitate training and correlate inputs and outputs in the workflow

- Develop additional plugins for interpreting results (pl-heatmap)

- Continue working on deploying to the MOC

Burn Down Chart

SPRINT 4 CONTAINERIZING NEURAL NETWO... 29 OCT 2020-12 NOV 2020
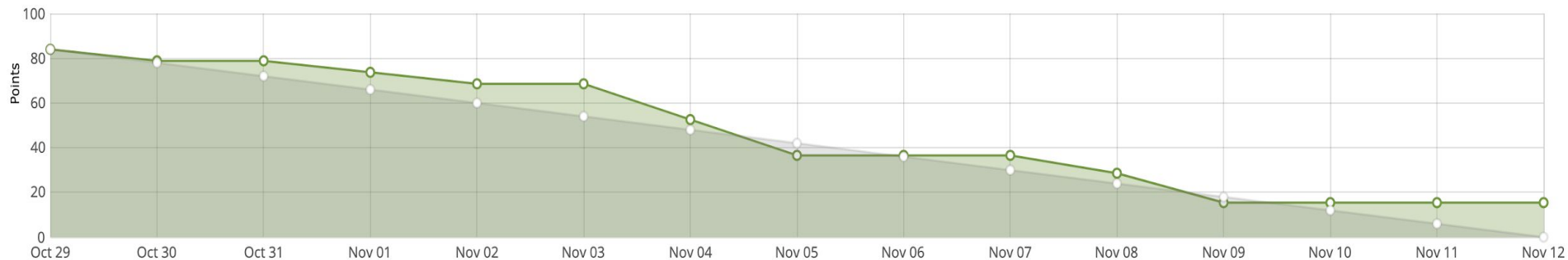
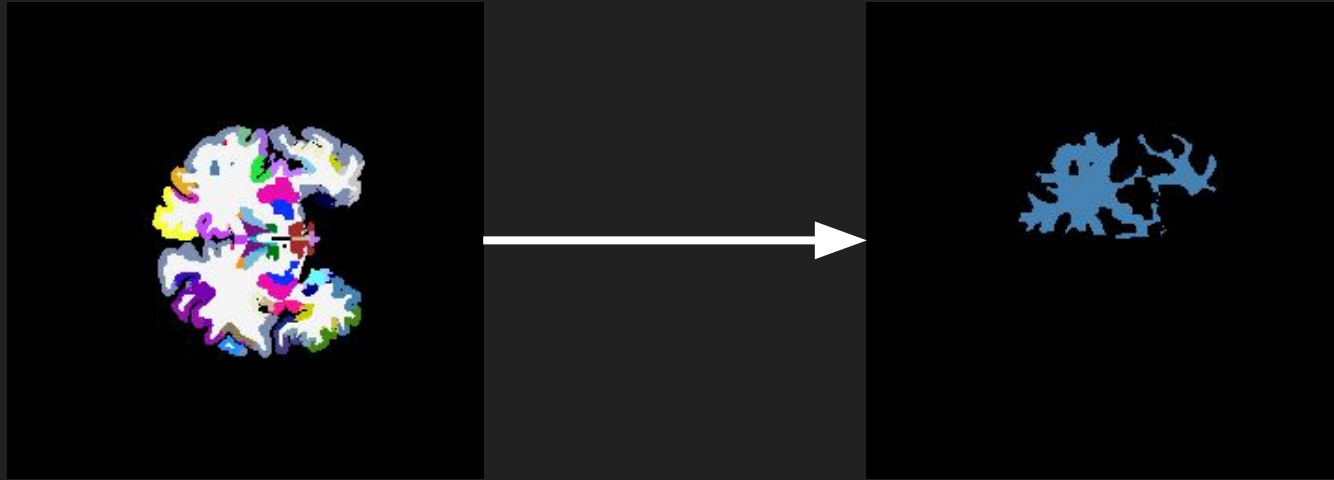57% ⌄ 84 total points · 48 completed points | 3 open tasks · 9 closed tasks ⇄ · 0 iocaine doses
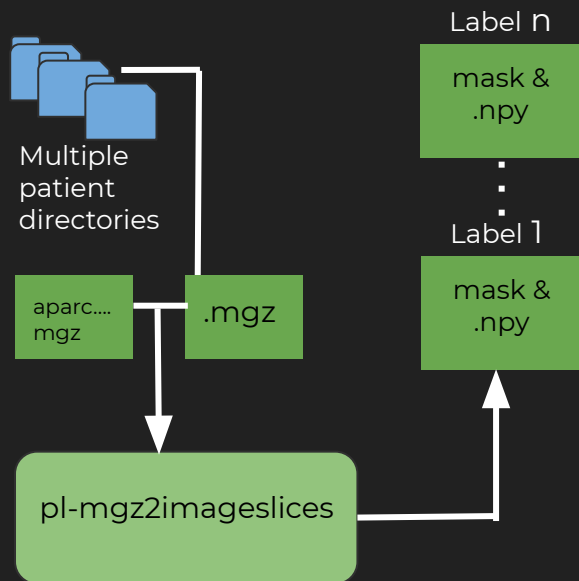
Sprint 4: Training Specific Classifiers

● Current plugins exist to separate patient mgz files into separate labels for each part of the brain.
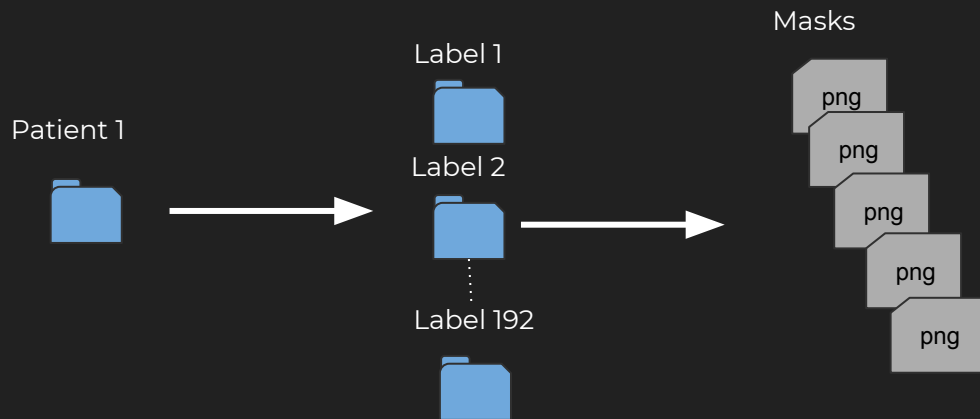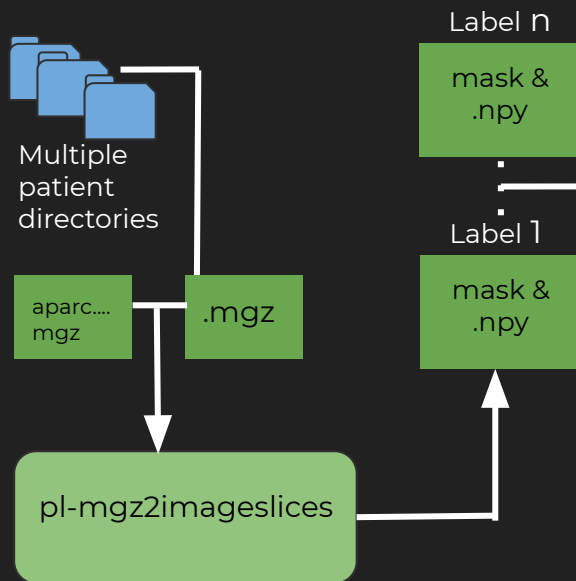
Plugin to separate labels

pl-mgz2imageslices

Multiple patient directories

Label n
mask & .npy

Label 1
mask & .npy

aparc.... mgz

.mgz

pl-mgz2imageslices

- Input consists of multiple patient directories of mgz files

- Output of mgz2imageslices consists of a directory for each patient, consisting of directories for each label, consisting of mask images for the label
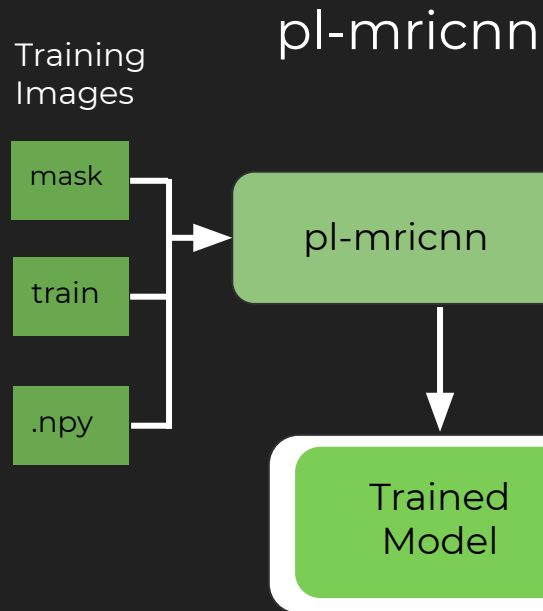
Patient 1

Label 1

Label 2

Label 192

Masks

png
png
png
png
png

Problems Connecting Outputs and Inputs

pl-mgz2imageslices

Training Plugin

pl-mricnn

Multiple patient directories

aparc.... mgz

.mgz

pl-mgz2imageslices

Label n

mask & .npy

Label 1

mask & .npy

Training Images

mask

train

.npy

pl-mricnn

Trained Model

- Training model requires single .npy file for **all** masks and single .npy file for **all** training images

- Output of mgz2image slices separates each patients labels with their own .npy file resulting in n .npy files
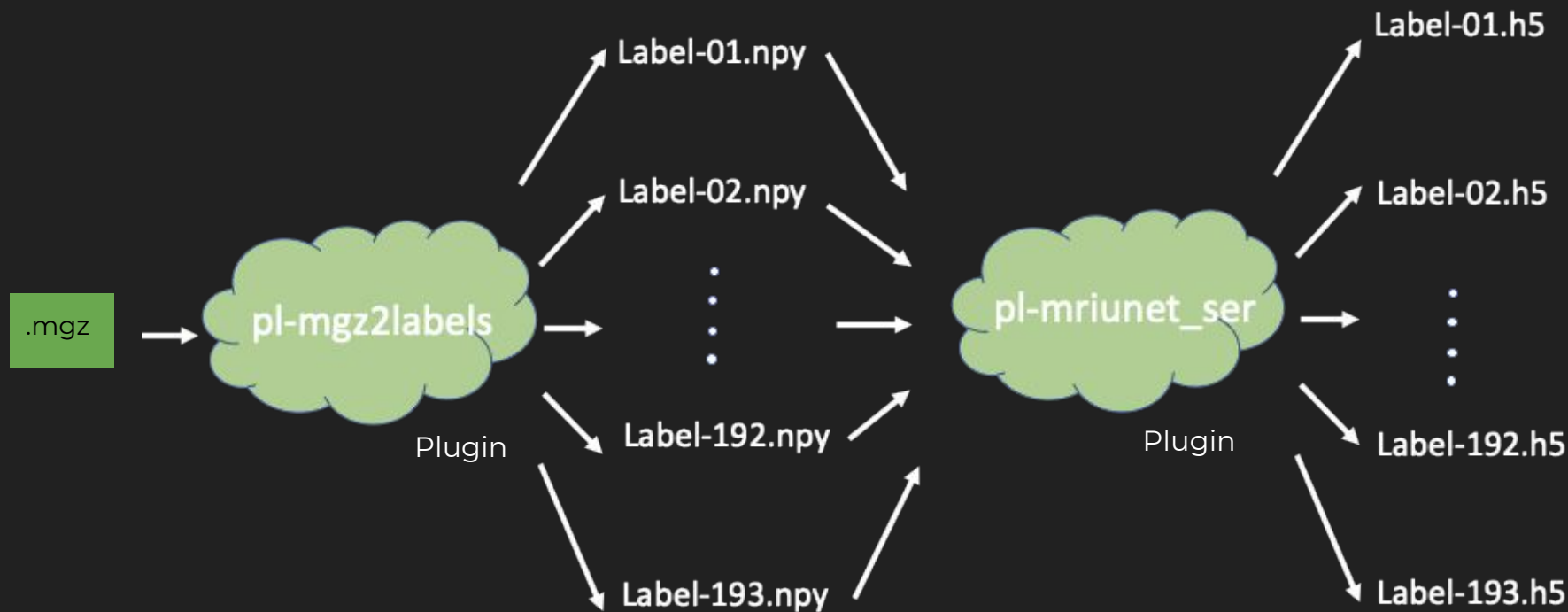
Problem

- The output of our plugin to separate mgz file into specific labels is not easily compatible with inputs for the training model plugin.
- Requires separating each patient's labels into their own directories.
- .npy files are not suitable and need to be modified.
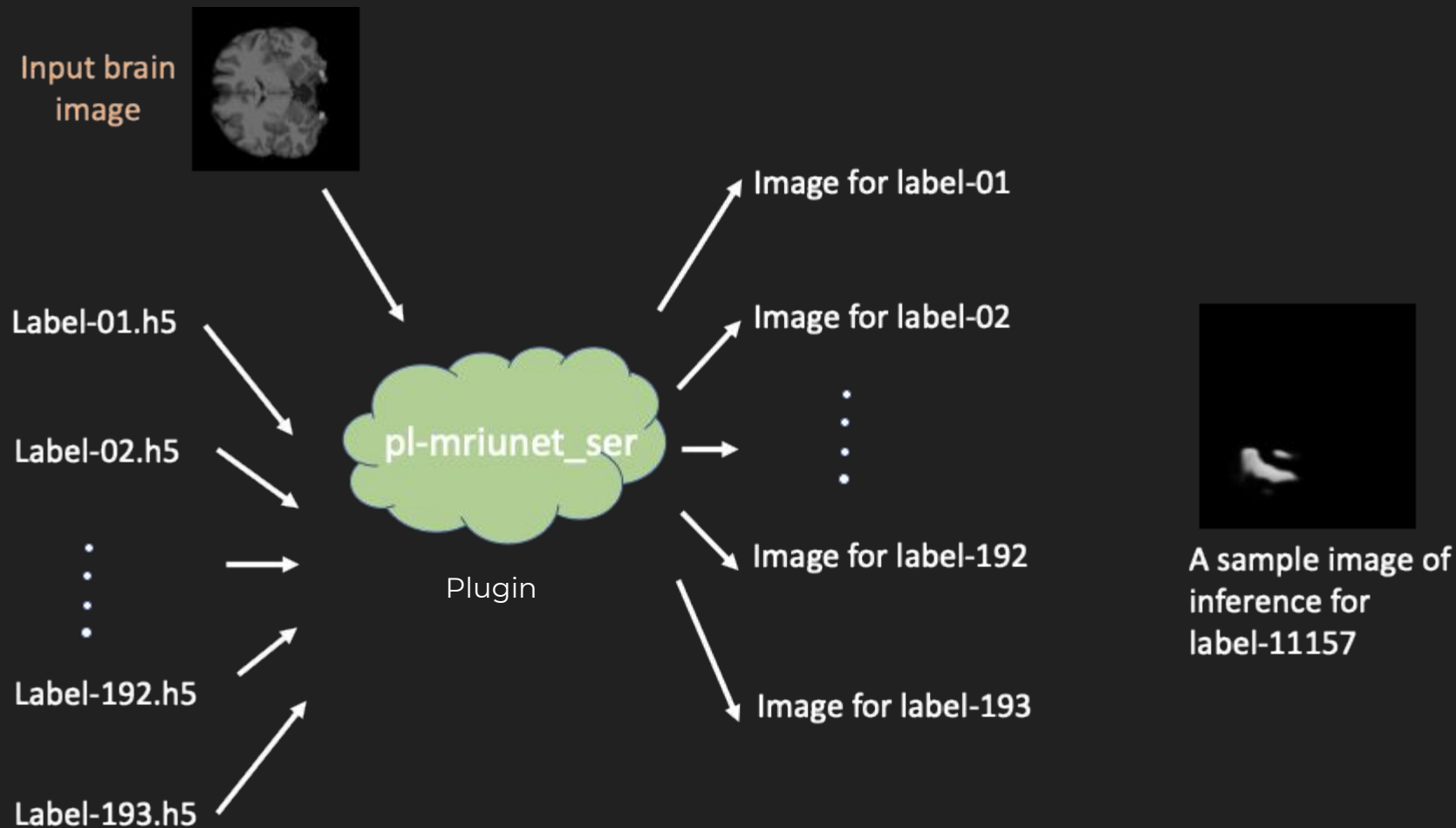
Our solutions

- Modify other existing plugins to make outputs compatible.
- Modify training plugin to train multiple labels at once.

# Label-wise classifier training pipeline

# Label-wise classifier inference pipeline

Input brain image

Label-01.h5

Label-02.h5

Label-192.h5

Label-193.h5

pl-mriunet_ser

Plugin

Image for label-01

Image for label-02

Image for label-192

Image for label-193

A sample image of inference for label-11157

pl-heatmap

- Plugin developed to inspect differences between inferred images and ground truth training masks.
- Low contrast grayscale images are difficult to differentiate between labels

Inferred Labels

Ground Truth Mask
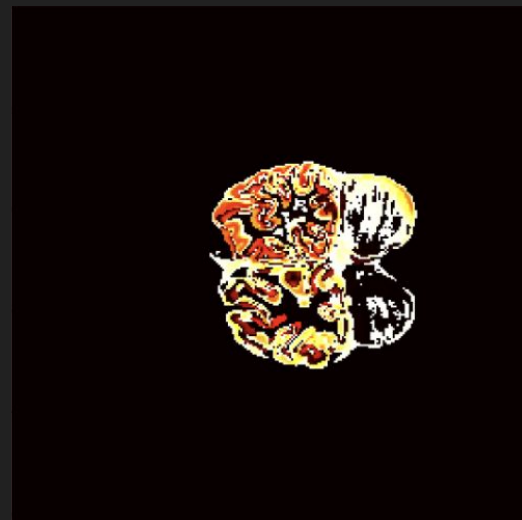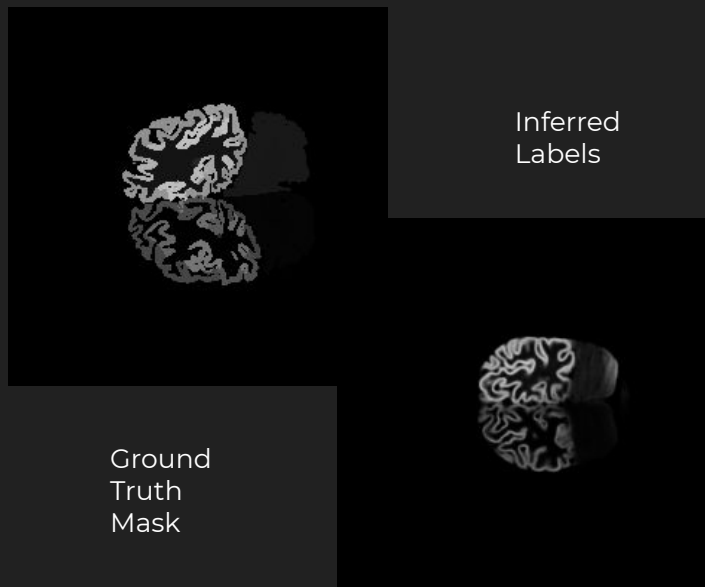
Demo

MOC deployment

As we talked about in our last demo we were getting HTTP related issues while running scripts on pfioh (I/O Handler). Upon further inspection and discussion with our mentors and developers of the ChRIS, we found out about malformed HTTP headers and bodies in pfioh. The process:

Missing Header → Minor Bug Fixes → Swift Keystone Auth?

400 Bad Request → 502 Bad Response → 401 Authentication Error

Next

1. Training models (more time and more data)
2. Generate text report from images (the last part of the whole pipeline)
3. MOC deployment

Thanks