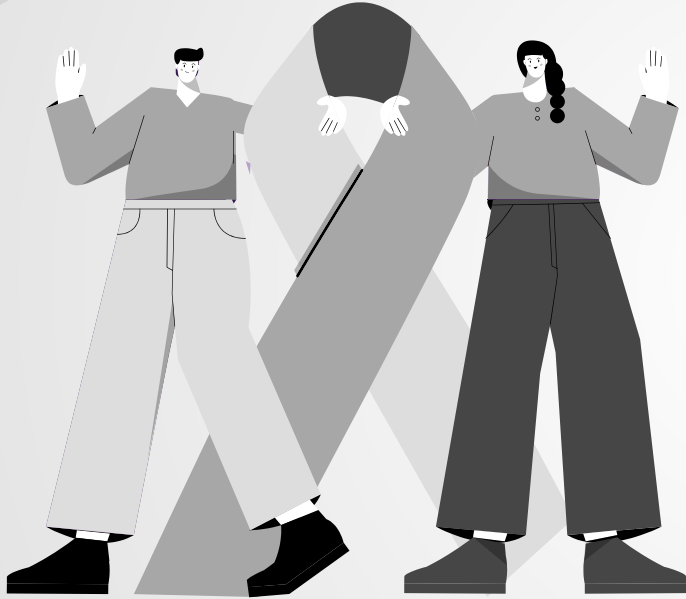# MRI Image Classification

Colby Tse | Data Scientist

The first step of many to come

Disclaimer: There are images of MRI brain scans in this presentation.

MRI?

- Magnetic Resonance Imaging
- Uses powerful magnetic fields, magnetic field gradients and radio waves

TYPES OF BRAIN TUMORS

Glioma

Overgrowth of glial cells

Meningioma

Tumor on the membranes

Pituitary

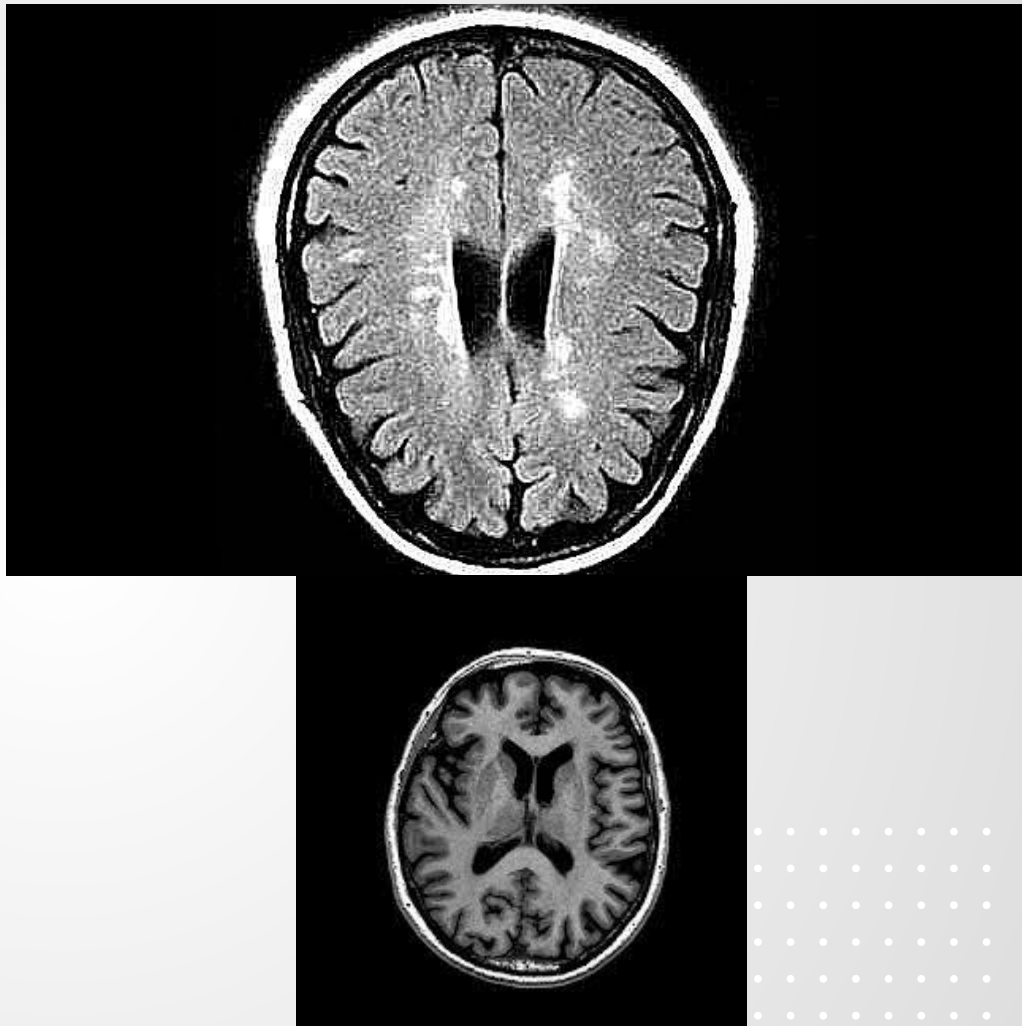Tumor on pituitary gland

No tumor

Nothing

Goals

There are a couple things I wished to accomplish:

- Create two robust models
  - Binary - Positive or Negative for tumors
  - Multiclass - what kind of tumor?
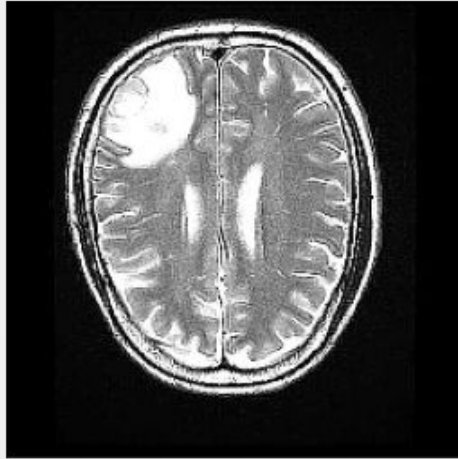- Create a deployable application

Different technician, different image

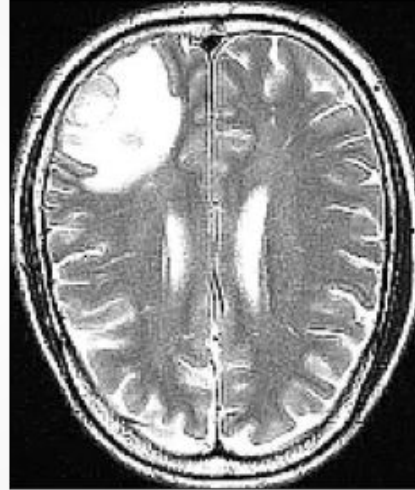# Created a function to crop the images

Original Image

Cropped Image

Modeling

| Parameter	Setting	Notes
Dropout	0.5, 0.3	0.5 binary model and 0.3 for multiclass model
Batch Size	8	Chosen to converge faster, generalize better, and prevent overfitting
Epochs	50	Never got close to 50, but set a hard upper limit to prevent unreasonable compiling time
Learning Rate	0.0001	more finite tuning for the weights
Optimizer	Adam	chosen for future model training. See notebook for details

Modeling
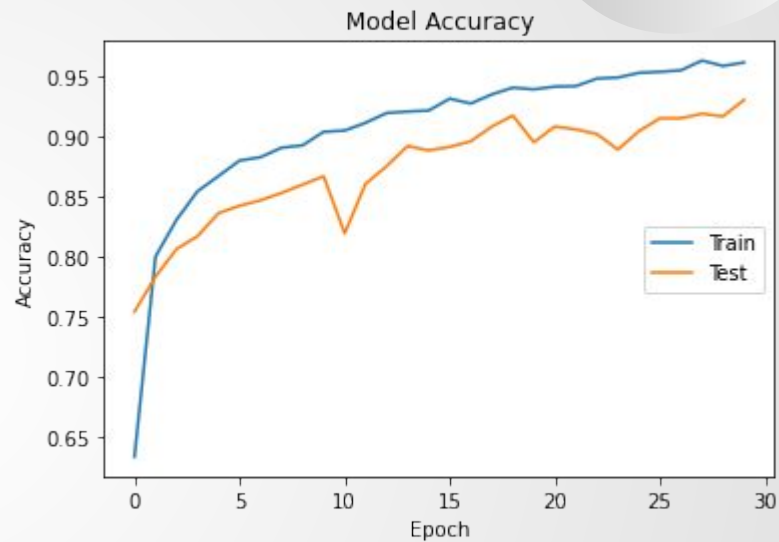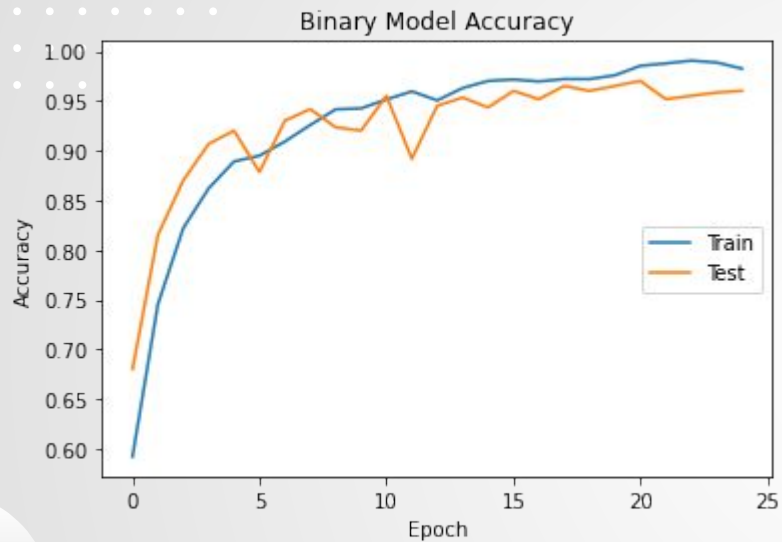
Model	Test Accuracy
Binary	97.8%
Multiclass	91.4%

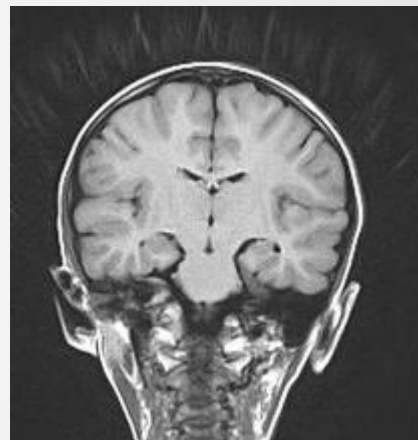# Real world image quality

Patient kept moving...
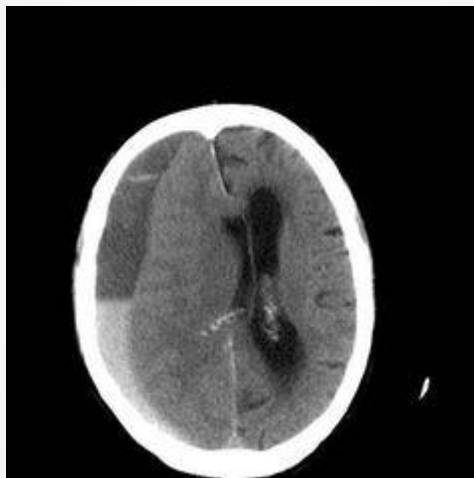
Patient kept moving!

Great

Real World data

Model	Test Accuracy	Val. Accuracy
Binary	97.8%	**95.7%**
Multiclass	91.4%	**68.5%**

Next Steps

Task	Details	Anticipated Effect
Gather more data	get more data	model should improve
Vertical & horizontal axis flip	flip the images along the axis down the center of the cropped image	# images x 3
Rotation	rotate the images +/- 20 degrees in both directions in 5 degree increments	# images x 8
Gamma values	adjust gamma (brightness) for each of the images +/- 20% gamma in 10 % increments	# images x 4
Increase patience	allow the model to train more epochs by increasing the patience of the Early Stopping from 5 to 10	training time increase, *maybe* accuracy increases
Increase max epoch cutoff	inline with increasing patience, will also need to increase epoch maxima	training time increase, *maybe* accuracy increases