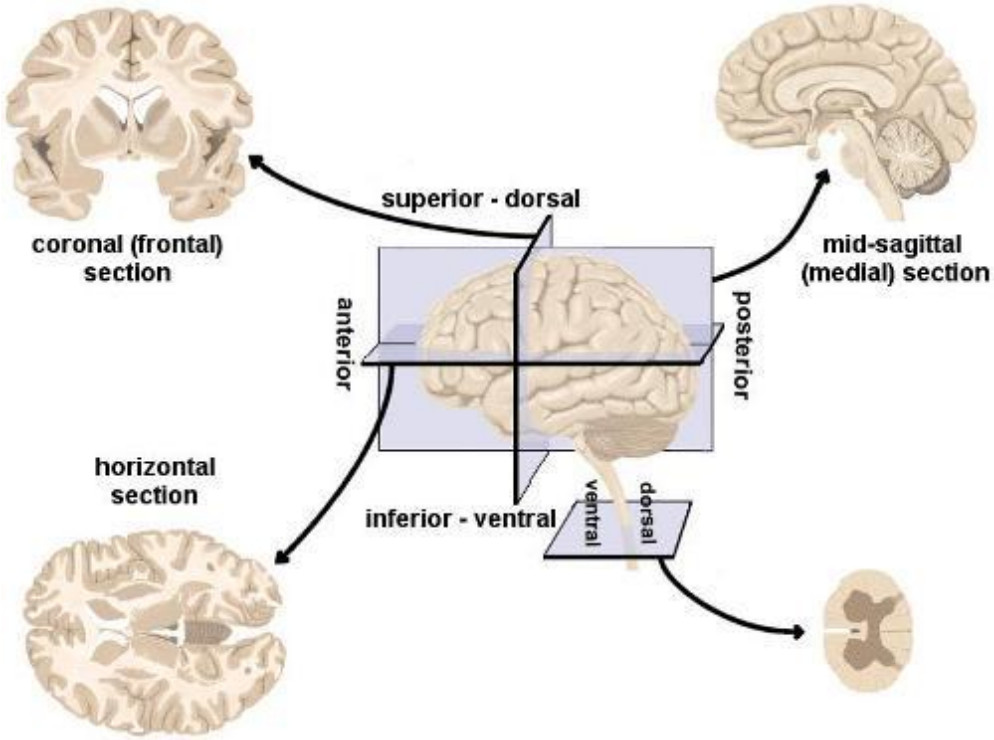
Detecting Brain Tumors With Machine Learning

Presentation by Sam Dedes

What is an MRI?

- Magnetic Resonance Imaging
- 2D Slice of the Brain
- Different Section Types

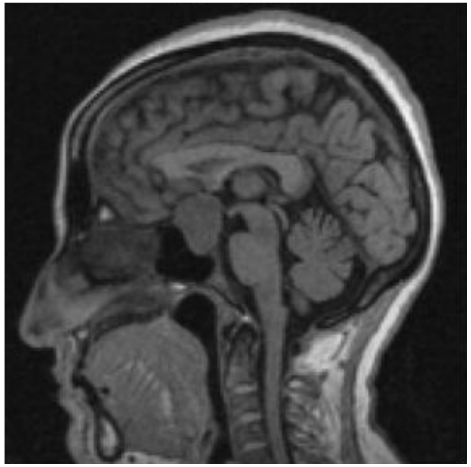


(Technische Universität München, n.d.)

Diagnostic Process

- Neurological exam (No Risk)
- CT or MRI Scan (Minimal Risk)
- Biopsy (Highest Risk)

No Tumor

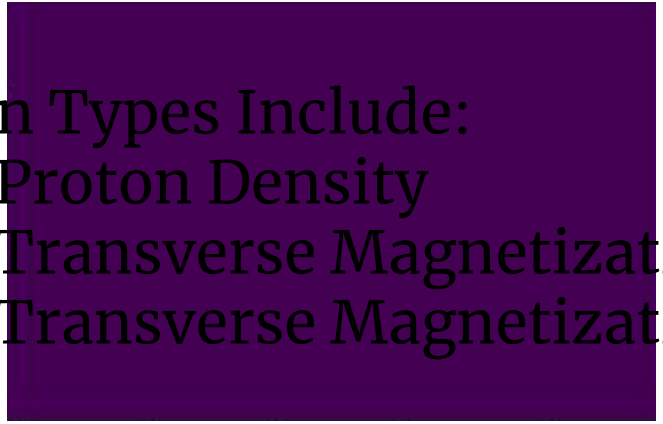


Tumor Present

Tumor Detection Model

- Section Agnostic
- Scan Agnostic

Proton Density



Scan Types Include:

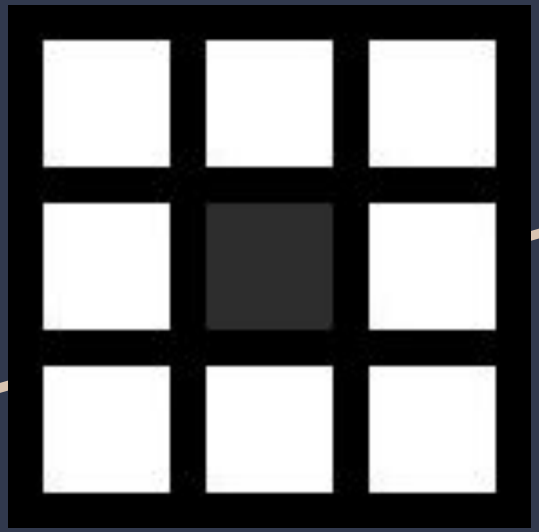
- Proton Density
- Transverse Magnetization (1)
- Transverse Magnetization (2)

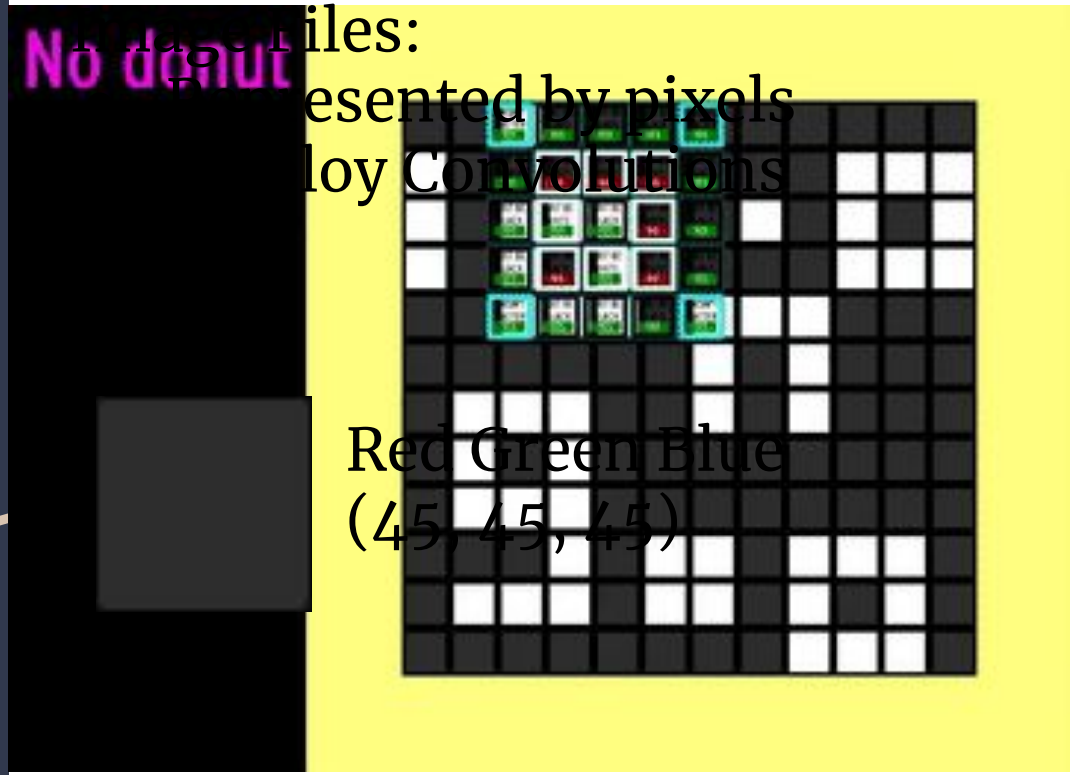
Transverse Magnetization (2)

Model Type

- Convolutional Neural Network (CNN)

Donut

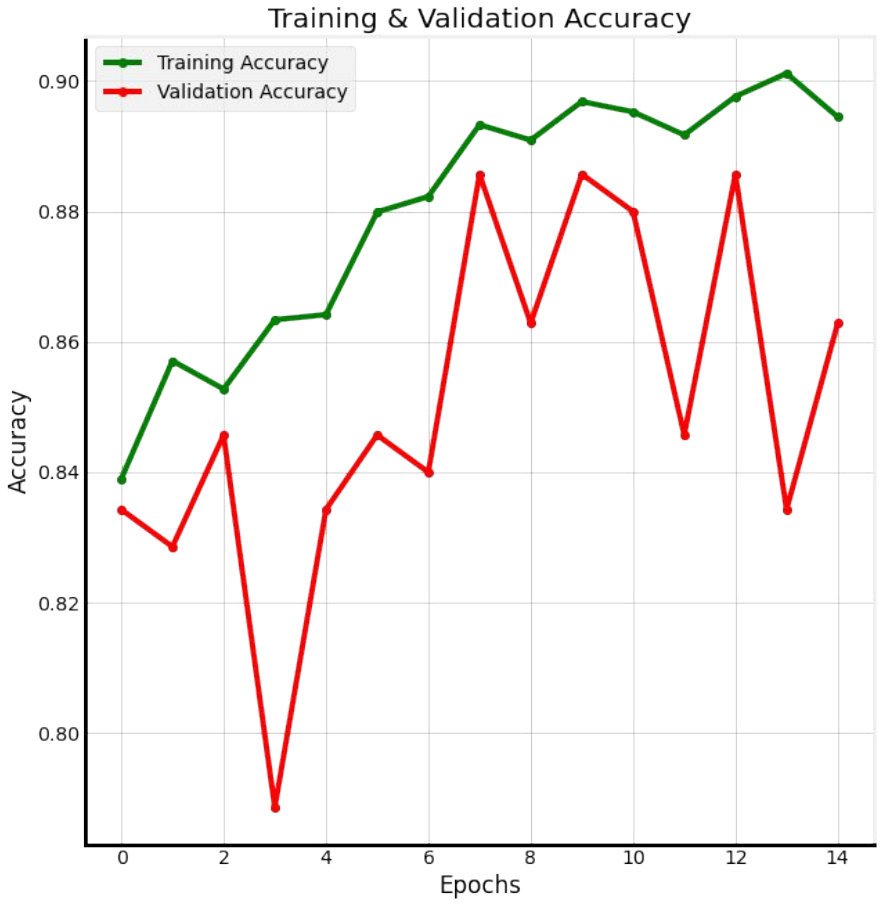




([[Convolutional Neural Network Visualization]], n.d.)

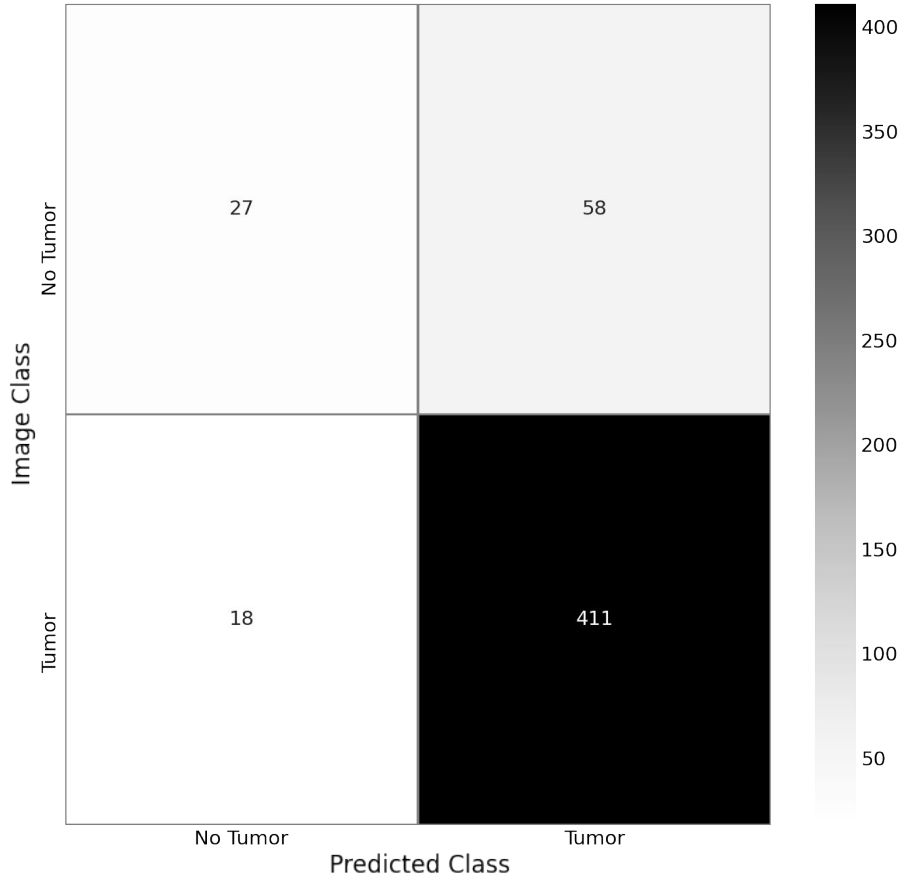
Training the Model

- Iterate model over *epochs*
- Accuracy increases



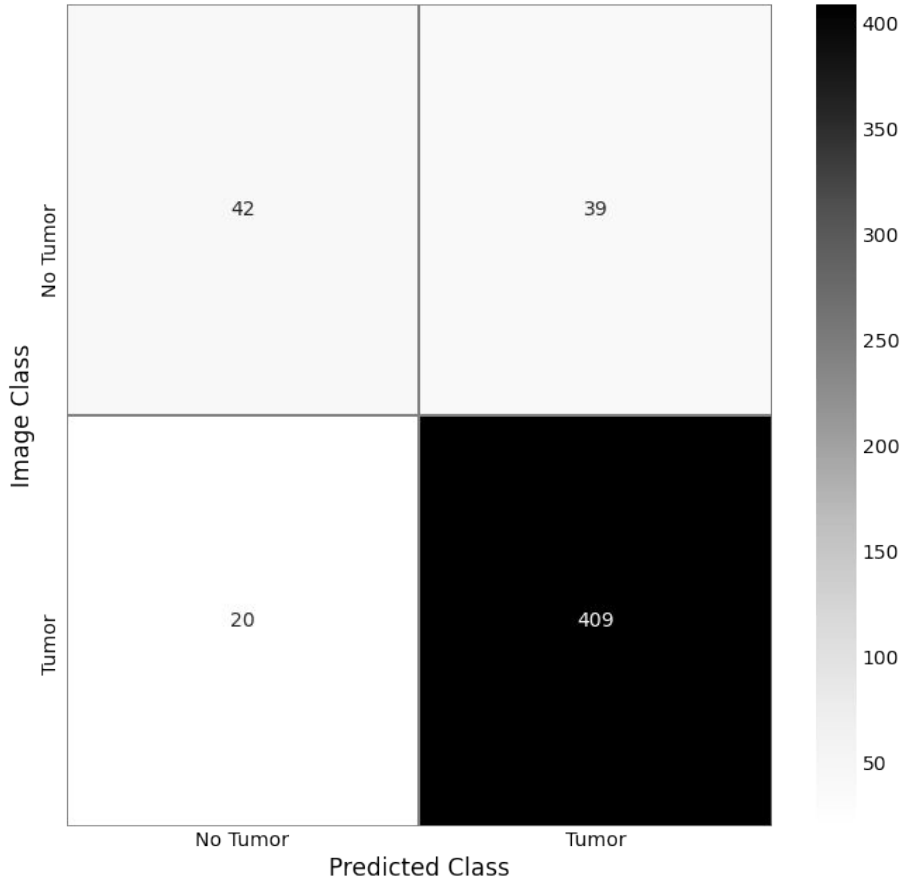
Initial Performance

- 85% Accuracy
- 96% Recall

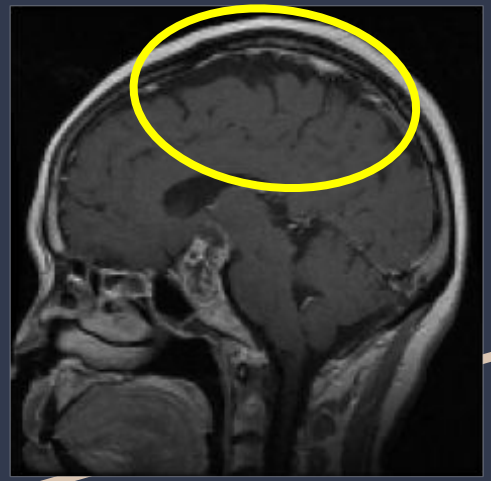


Current Performance

- 88% Accuracy
- 95% Recall



Understanding the Model with LIME



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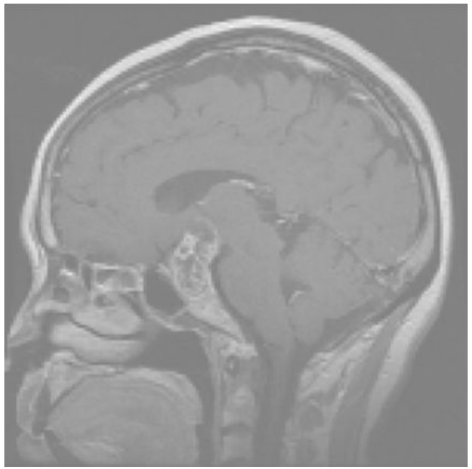

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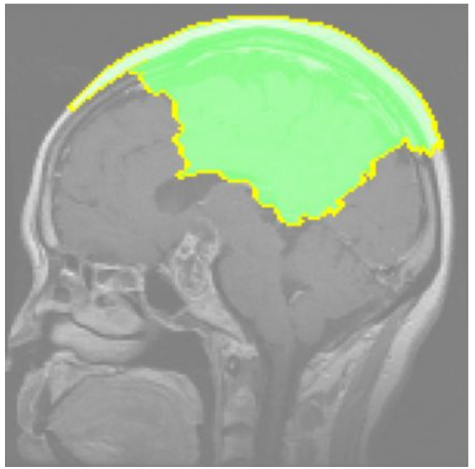

Next Steps

- Source more data and tune model to improve accuracy
- Multiclass problem to enable more descriptive diagnosis

Tumor Types

- Malignant
- Benign

Tumor Locations

- Frontal
- Parietal
- Temporal
- Occipital
- Cerebellum

Contact

- Ideas?
- Suggestions?
- Questions?

github.com/samjdedes/MRI_brain_scan_tumor_detection

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References

Technische Universität München. (n.d.). *Planes of the Brain* [Illustration]. Https://Wiki.Tum.De/. https://wiki.tum.de/download/attachments/29600620/Brain_directions_planes__sections_1_small.gif?version=1&modificationDate=1494257234627&api=v2

[Convolutional Neural Network Visualization]. (n.d.). Gfycat. https://thumbs.gfycat.com/CompleteOffbeatGosling-max-1mb.gif