Brain Tumor Classifier

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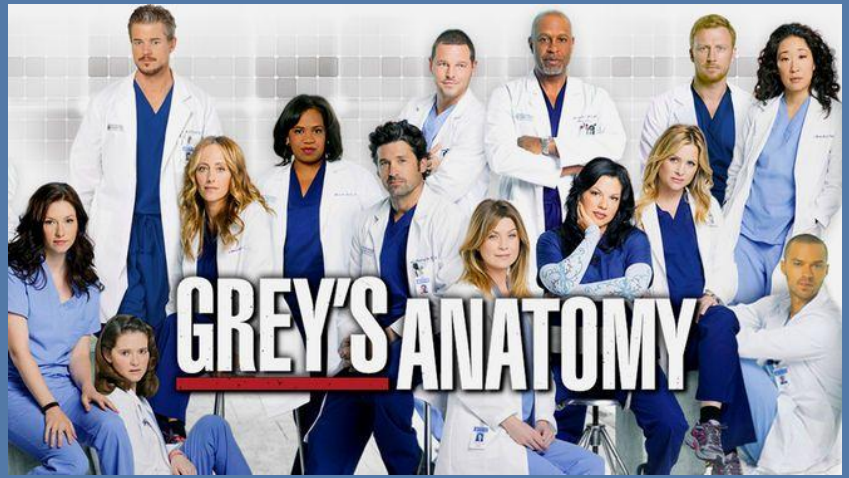
Data Scientists Urgently Needed!



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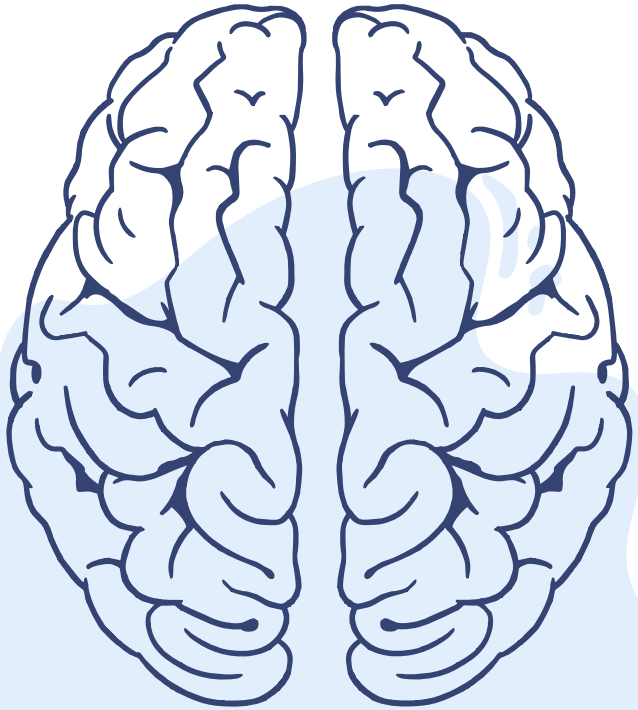
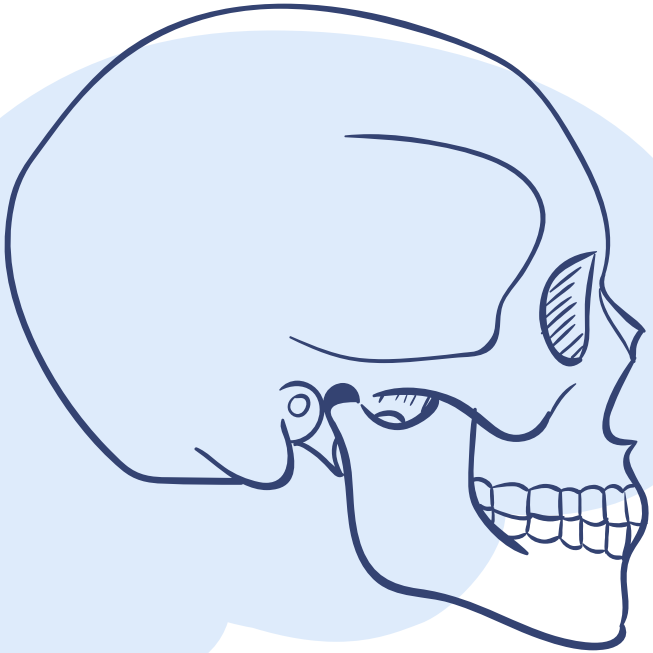
PROBLEM STATEMENT



Problem Statement

This project aims to develop a machine learning classification model to accurately distinguish between four types of brain tumors: gliomas, meningiomas, no tumors, and pituitary tumors.



02
DATASET

Dataset

- Kaggle dataset was used
- Contained Training and Testing folders
- Included folders of images for the various types of tumors
  - Glioma
  - Meningioma
  - No tumor
  - Pituitary
- Overall, over 7,000 images used to train and test the model

Tumors

Glioma	Found in glial cells which support the brain and spinal cord
Meningioma	Develops in membranes around the brain and spinal cord
No tumor	A clean scan, no tumor indicated
Pituitary	Located in pituitary gland, close behind the nose

03

PREPROCESSING & MODELS

PREPROCESSING STEPS

STEP 1

Reading in data from Google Drive

STEP 2

Custom read_images function used

STEP 3

Data was shuffled and train test split performed

STEP 4

Shape of X train and y train were found and matched

MODELS

01

MODEL 1

Conv2D and Maxpooling2D layer

Accuracy: 95%

02

MODEL 2

Two Dense layers with Early Stop

Accuracy: 82%

03

MODEL 3

Two Dense layers with l2 regularizers

Accuracy: 66%

04

MODEL 4

Conv2D, Maxpooling2D layers, Dense layers, and a Dropout

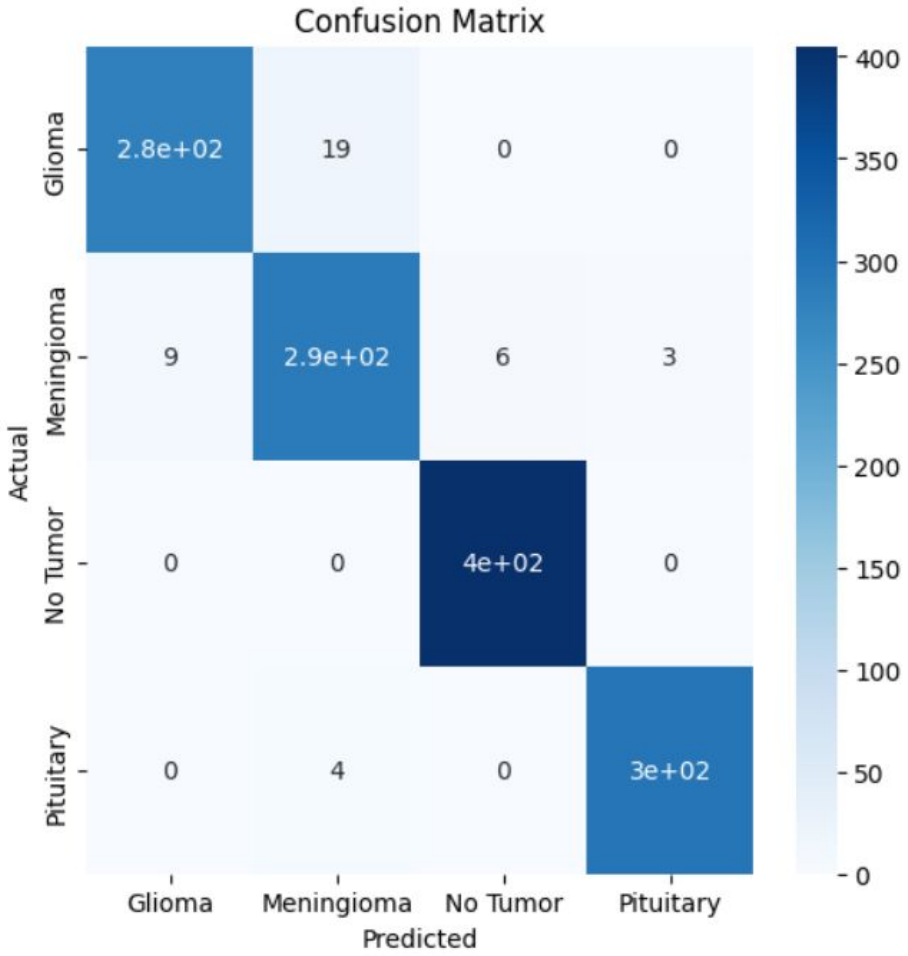
Accuracy: 97%

METRIC OF SUCCESS: f1 SCORE - WHAT IS IT & WHY?

- What is an f1 Score?
  - Balance between precision and recall
- Why was it chosen?
  - Imbalanced classes in data
  - Need a balance between Type I errors (false positives) and Type II errors (false negatives)
- False positives: the model predicts that there is a tumor when there actually is not
- False negatives: the model predicts that there is no tumor when there actually is

f1 SCORES

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
GLIOMA	0.92	0.76	0.70	0.95
MENINGIOMA	0.90	0.54	0.28	0.93
NO TUMOR	0.99	0.95	0.81	0.99
PITUITARY	0.99	0.93	0.72	0.99

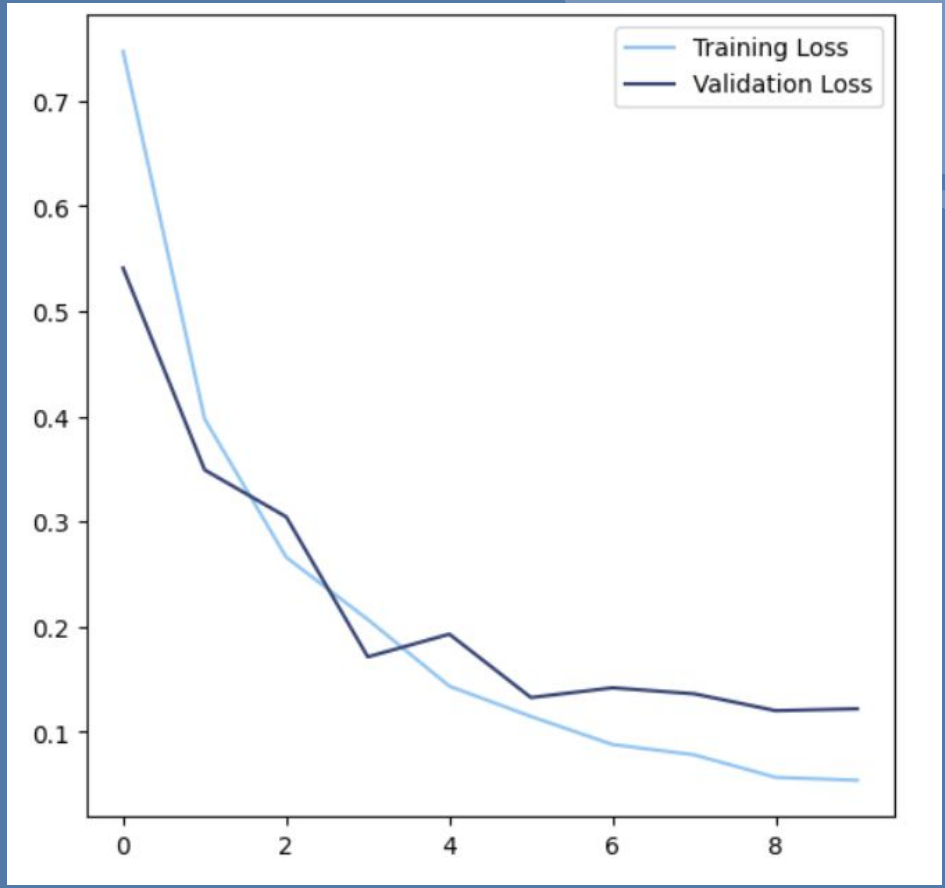


Confusion Matrix

- Shows the number of cases where what the model predicted vs the actual are different
- 6 cases where there was a tumor but the model predicted no tumor (FN)
- 0 cases where there was no tumor but the model predicted a tumor (FP)

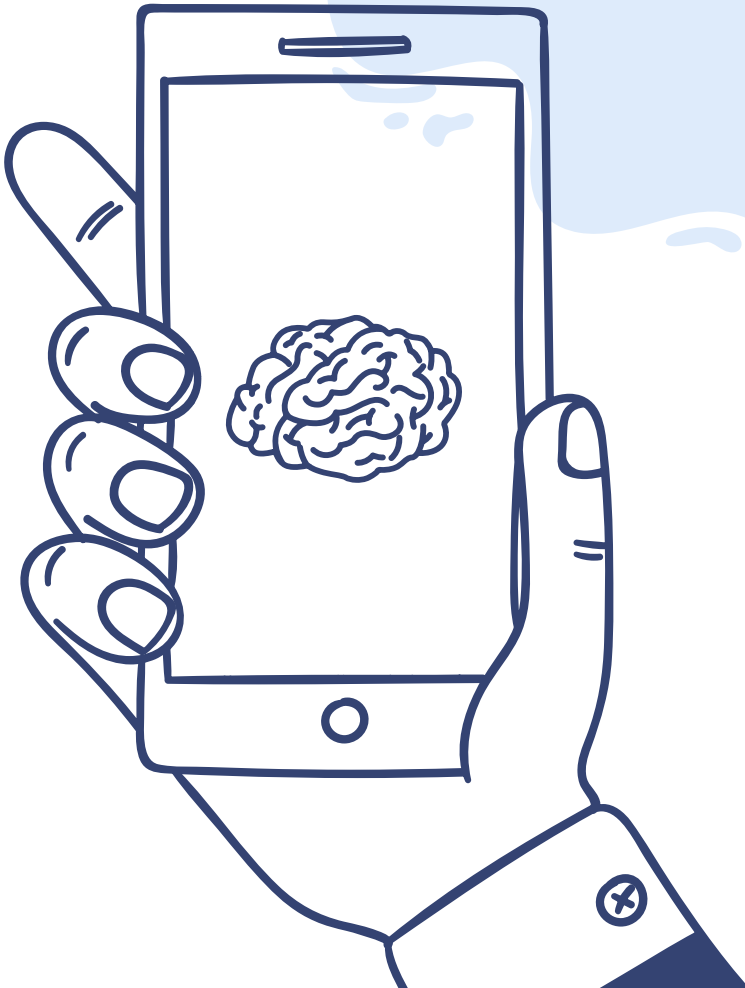
MODEL 4

- Graph shows the training loss vs the validation loss of model 4
- Both the training and validation are decreasing
    - Model is learning from training data and performing well with new data

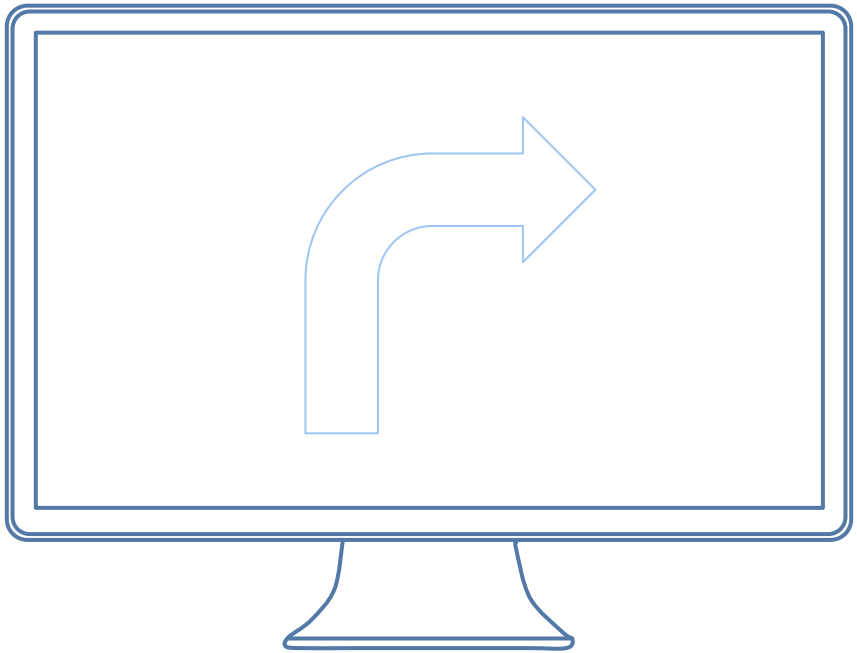


04

STREAMLIT APP



Time to demo our app!



05
CONCLUSION

CONCLUSION

01

All models performed decently well on distinguishing between the various types of brain tumors

02

Model 4 performed the best based on a variety of factors (f1 score, accuracy, loss graph, confusion matrix)

03

Model 4 performed well on both the training and testing data

RECOMMENDATIONS & NEXT STEPS

- Add more tumors and their scans can be added to the dataset
- We can dive into exactly which images the model predicted incorrectly
- More models can be created

RESOURCES

Information on tumors:

- https://www.cancerresearchuk.org/about-cancer/brain-tumours/types/glioma-adults#:~:text=Gliomas%20are%20cancerous%20brain%20tumours,gliomas%20grow%20faster%20than%20others.
- https://www.brighamandwomens.org/neurosurgery/meningioma#:~:text=Meningiomas%20are%20tumors%20that%20develop,or%20malignant%20meningioma%20(cancerous).
- https://www.hopkinsmedicine.org/health/conditions-and-diseases/pituitary-tumors#:~:text=A%20pituitary%20tumor%20is%20an,are%20not%20cancerous%20(benign).

RESOURCES

Images:

- https://shaleroracle.com/1295/arts-entertainment/someone-needs-to-put-greys-anatomy-and-its-fans-out-of-their-misery/

THANKS!

Do you have any questions?