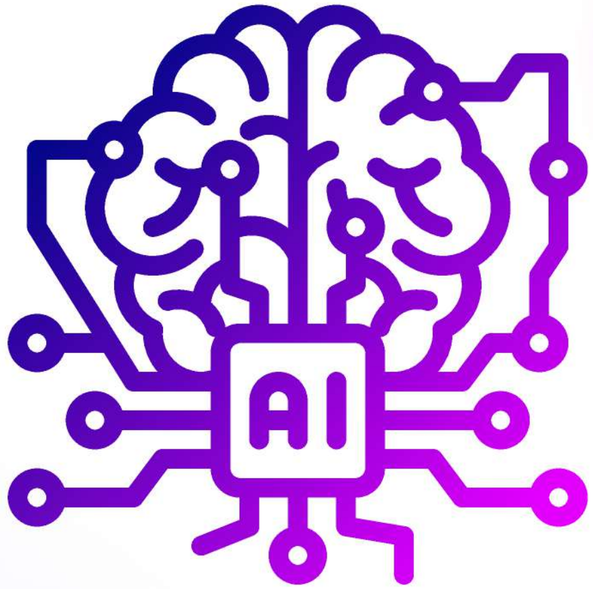

BRAIN TUMOUR CLASSIFICATION USING DEEP LEARNING

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Problem Statement

- Early and accurate brain tumour classification is critical in clinical diagnosis.
- Manual MRI interpretation is time-consuming and subjective.
- Aim: Build a deep learning model to automate classification of brain MRI images into 4 categories.

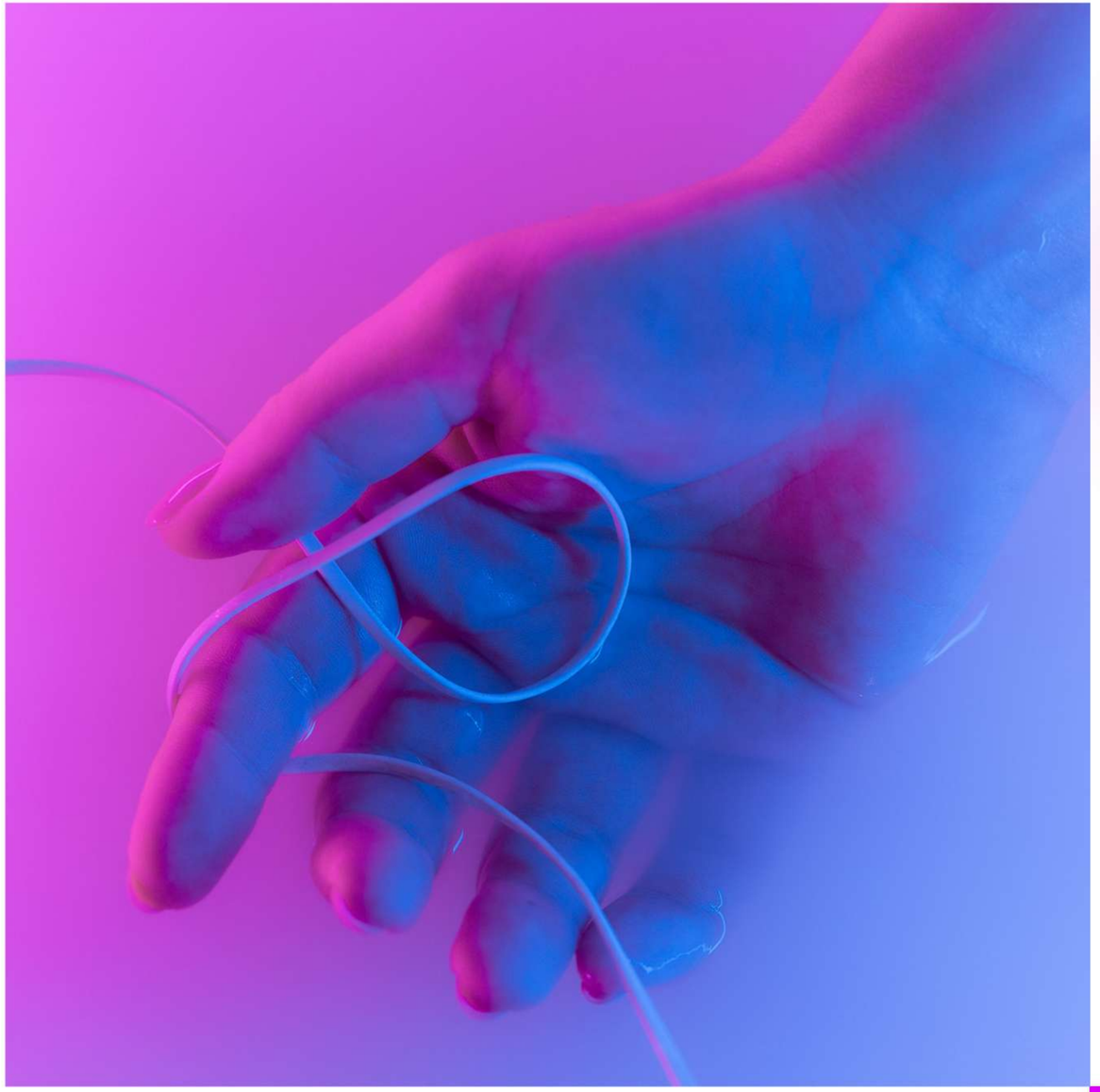
Dataset Overview

https://www.kaggle.com/datasets/masoudnickparvar/brain-tumor-mri-dataset

- 4 classes: Glioma, Meningioma, Pituitary, No Tumour
- Separate Training and Testing folders
- Images resized to 224x224 and converted to RGB
- Data augmentation applied (rotation, zoom, horizontal flip)

Model Architectures

- Custom CNN: 3 Conv2D + BatchNorm + MaxPooling blocks, followed by dense layers
- VGG19: Frozen base, custom classifier on top (Flatten Dense Dropout Softmax)
- InceptionV3: Pretrained from TF Hub, custom head similar to VGG
- Ensemble: Averaged outputs + new classifier head



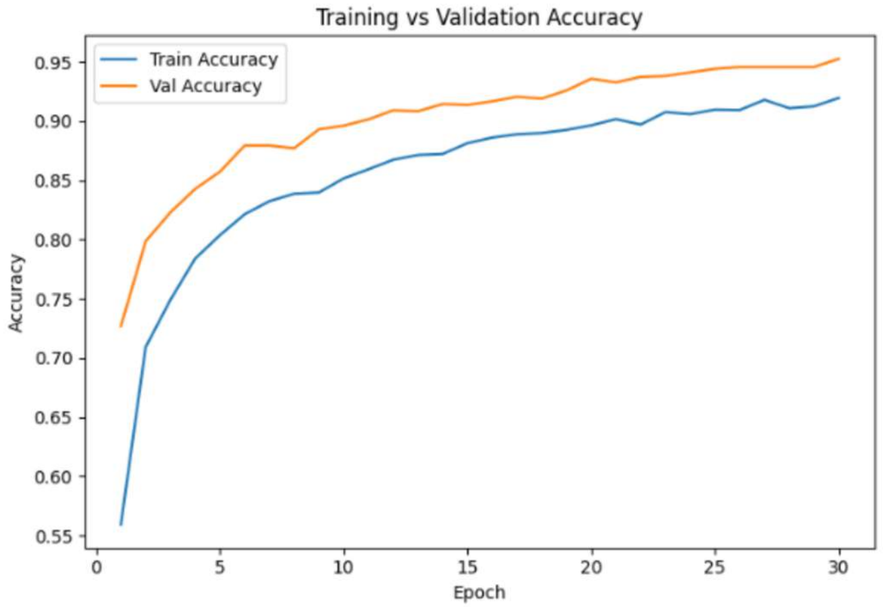
Training Details

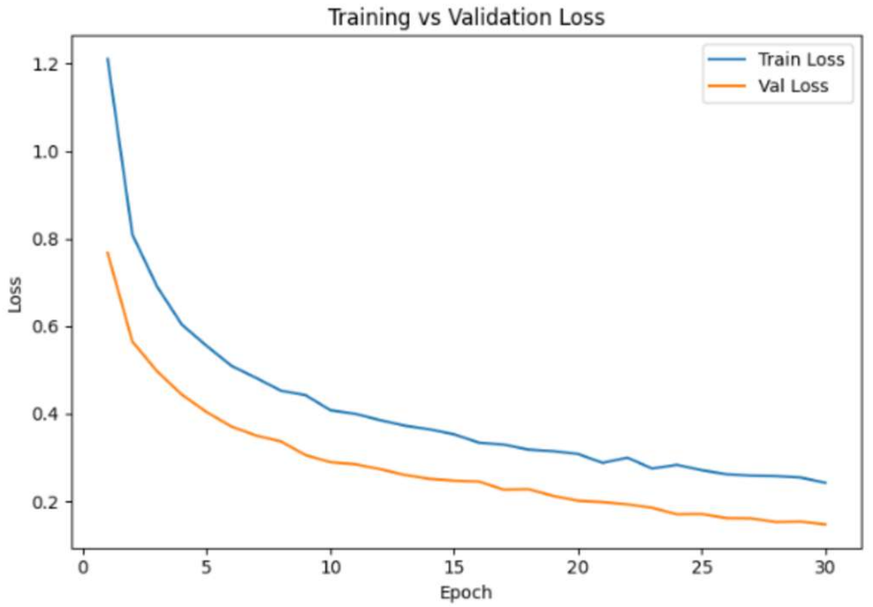
01

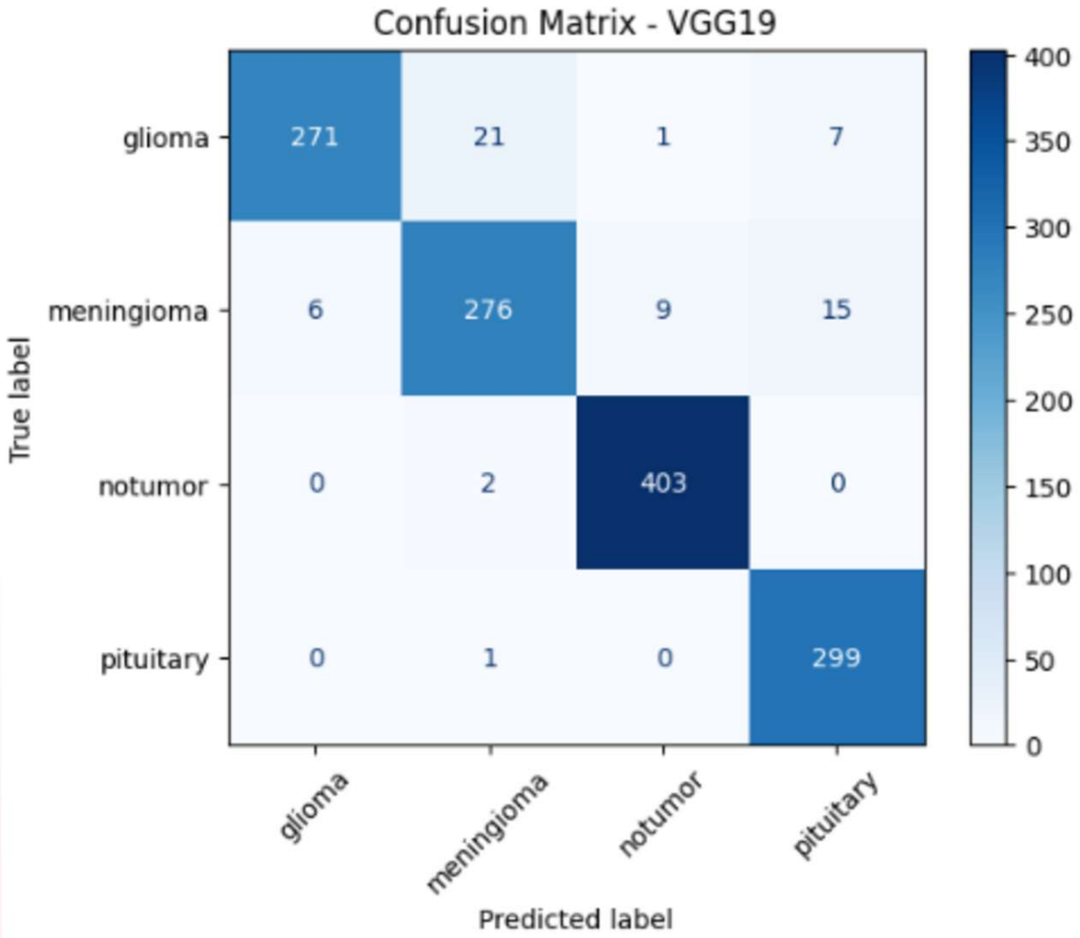
- Loss: Categorical Crossentropy
- Optimiser: Adam (1e-5 learning rate)
- Callbacks: EarlyStopping (loss & val_loss), ModelCheckpoint

02

- Batch size: 16, Epochs: 30 (stopped early)
- Separate training for each model





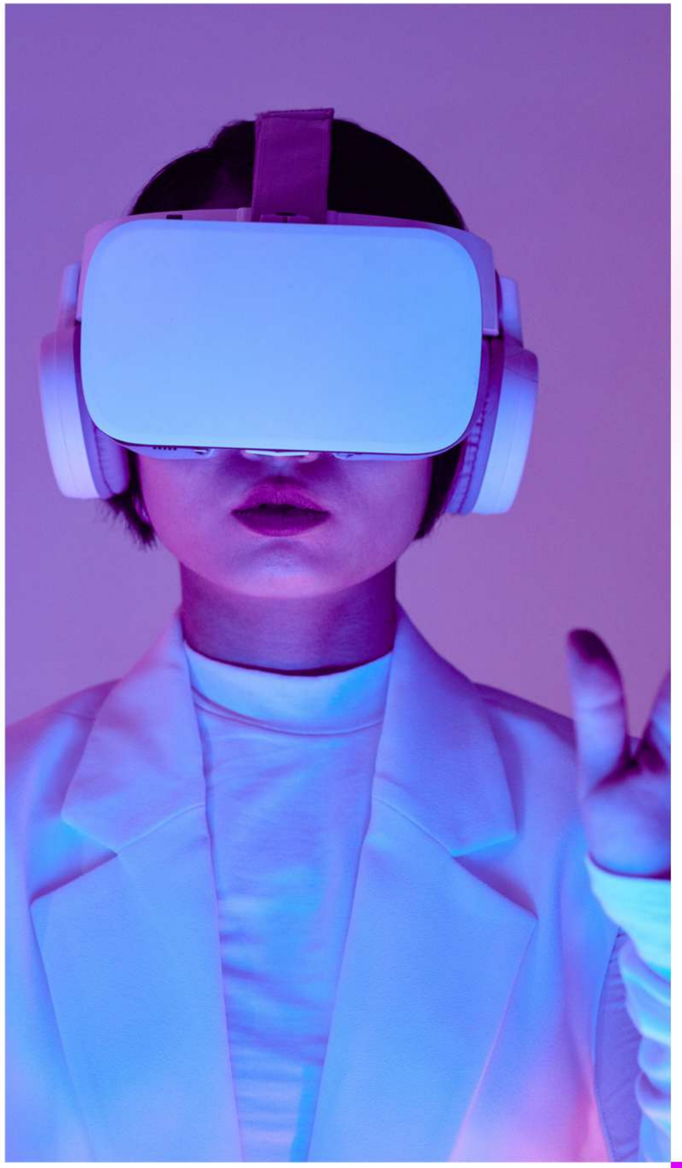


Evaluation Metrics

- Metrics: Accuracy, Precision, Recall, F1-Score
- VGG19 Test Accuracy: ~91%
- Custom CNN: ~86%, InceptionV3: ~89%
- Ensemble: ~93% (Best performing)

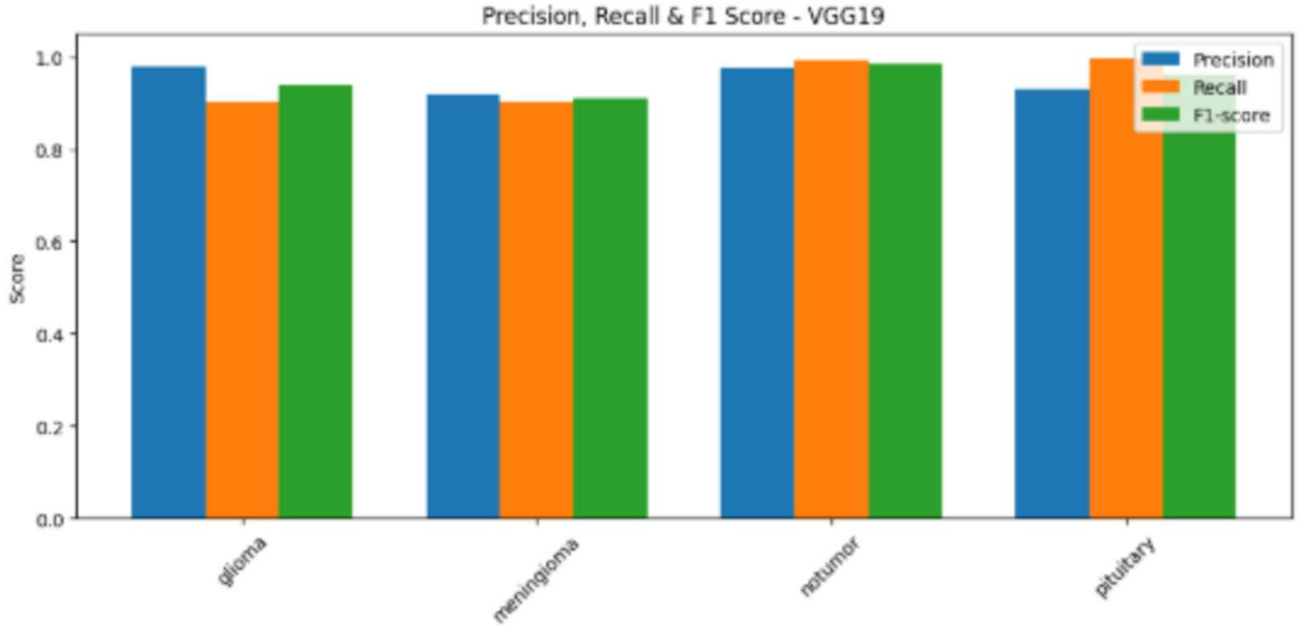
Observations and Insights

- VGG19 generalised well, stable training with minimal overfitting
- InceptionV3 required careful wrapping as KerasLayer
- Ensemble model outperformed individual models



Conclusion

- Deep learning models (especially VGG19 and ensemble) achieved high accuracy
- Ensemble boosted performance via model diversity
- Demonstrated the feasibility of automated MRI-based tumour classification



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About Me

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