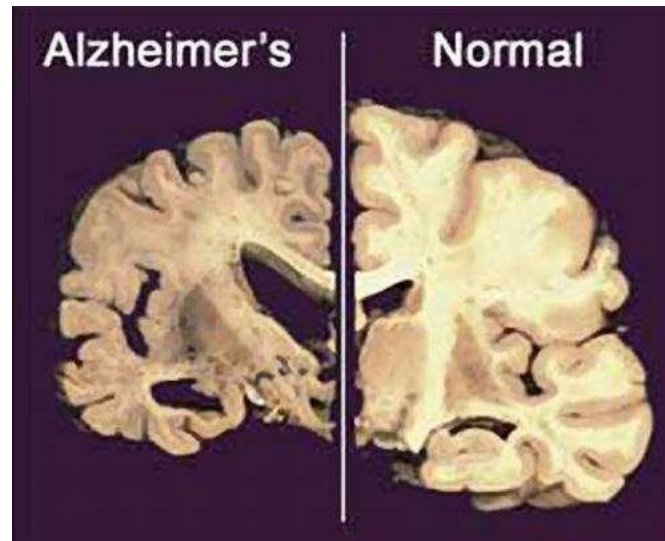


Dementia Detection



Overview

Dementia is a syndrome in which there is deterioration in cognitive function beyond what might be expected from the usual consequences of biological aging.

- Currently more than 55 million people live with dementia worldwide, and there are nearly 10 million new cases every year.
- Dementia results from a variety of diseases and injuries that primarily or secondarily affect the brain. Alzheimer's disease is the most common form of dementia and may contribute to 60-70% of cases.
- Dementia is currently the seventh leading cause of death among all diseases and one of the major causes of disability and dependency among older people globally.
- Dementia has physical, psychological, social and economic impacts, not only for people living with dementia, but also for their carers, families and society at large.

Problem

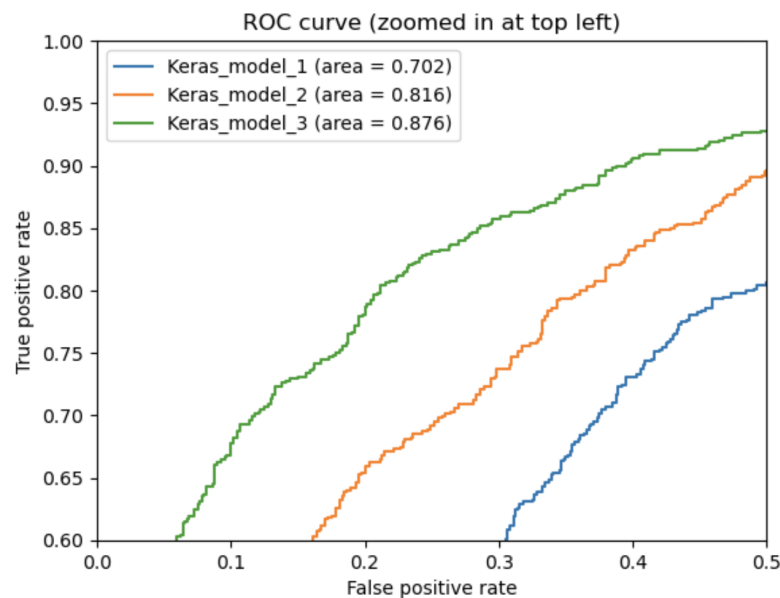
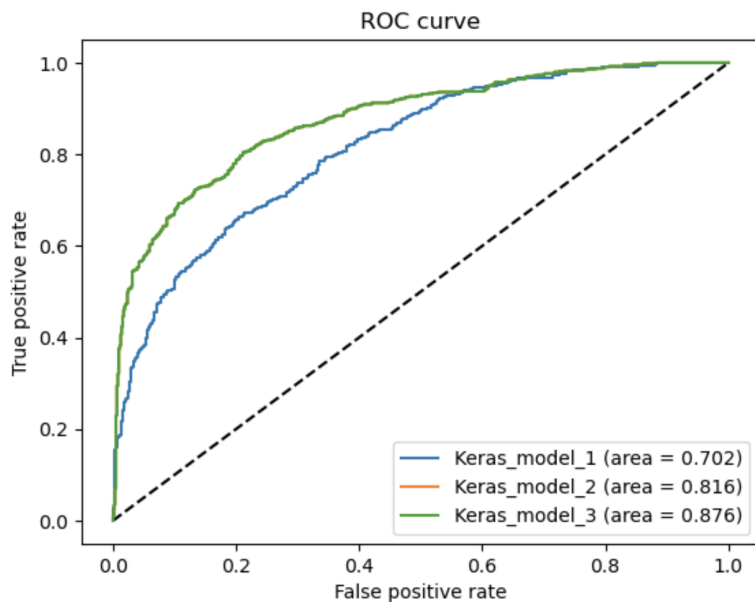
Since there is no known cure for dementia, early detection can underscore the need for preventative measures.

Summary of Findings

Each model became progressively better with each adjustment. Ultimately, a custom trained model performed better overall than transfer classification models such as VGG19 and Resnet50.

| Model | Accuracy | Selected |
|-----------|----------|----------|
| VGG19 | .72 | no |
| Resnet50 | .74 | no |
| CustomCNN | .78 | yes |

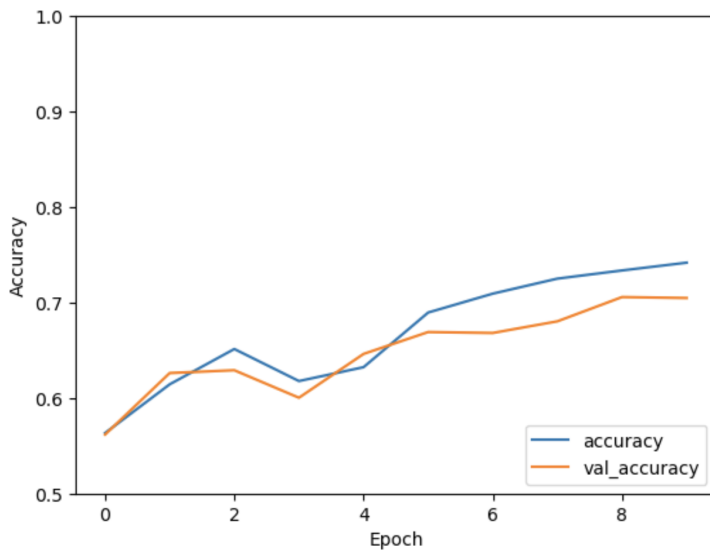
CNN Method



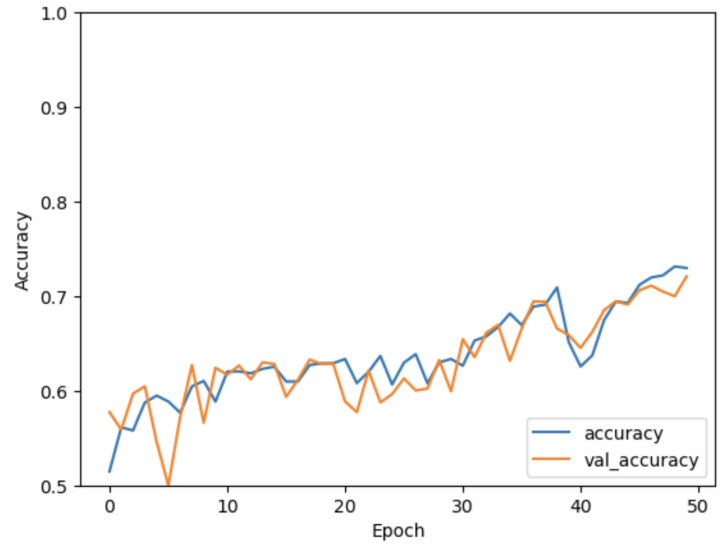
The following adjustments were made between models 1 and 2:

- Layers from (32, 64, 63) to (32, 64, 128, 128)
- Dropout of 0.5 after the final convolutional layer
- Created a batch size of 256
- Learning rate from .001 (standard) to .0003
- Epochs from 10 to 50

model1 accuracy & val_accuracy



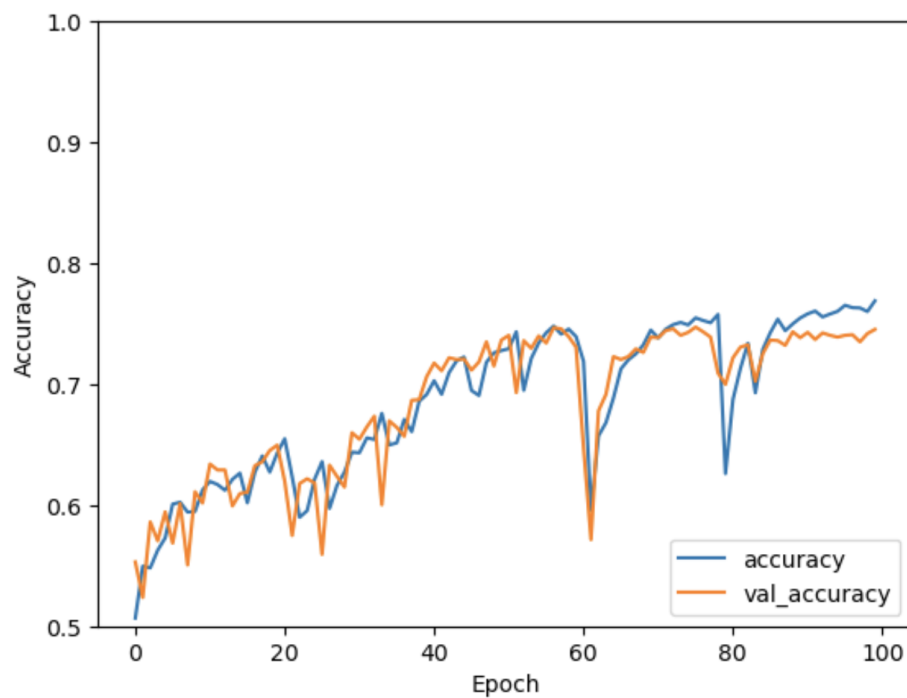
model2 accuracy & val_accuracy



The following adjustments were made between models 2 and 3:

- Epochs from 50 to 100

The reasons only Epochs were adjusted is that the model seemed to be performing considerably better and didn't overfit. Interestingly, the model performed better on the test set than on the training and validation sets. Perhaps this is the result of image augmentation.



Conclusion:

After the final adjustments, accuracy went from 60, to 73, to 78 and AUC went from 70, to 81.6, to 87.6 between the three models. Conceivably, based on the increase in performance and the apparent lack of overfitting, further Epochs could be introduced. However, the additional 50 epochs only introduced 5 points in both accuracy and AUC. And, while further tests would be required, overfitting might be indicated around Epoch 90 for the third model as validation loss seems to begin separating from and exceeding training loss and validation accuracy seems to separate and subceeds training accuracy.

Further Research:

For further tests, I would retrain the model, but use early stopping to detect overfitting to ensure that the model was given ample training time. I would implement Keras Tuner to discern the optimal architecture for each layer. Additionally, I would investigate why a pretrained model failed to deliver better results than the custom CNN.