Classify dementia from brain scans

DAS ETH Zürich – Deep Learning

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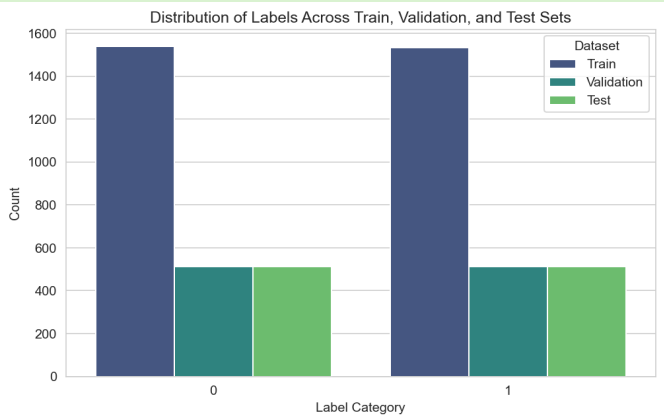
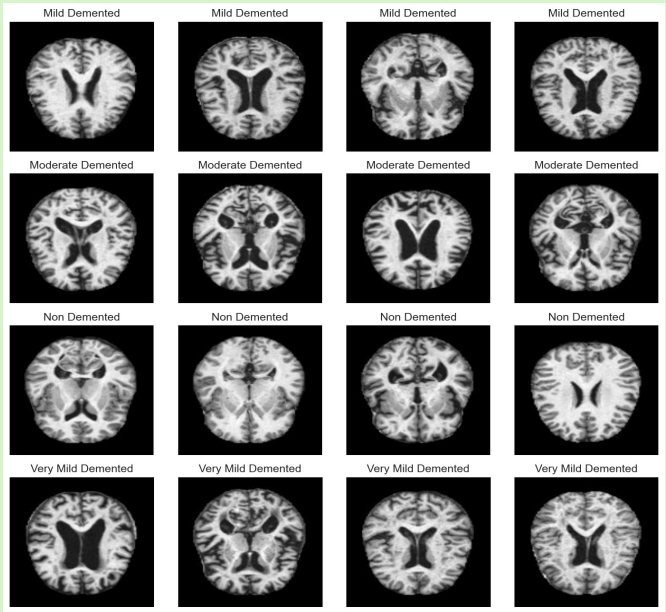
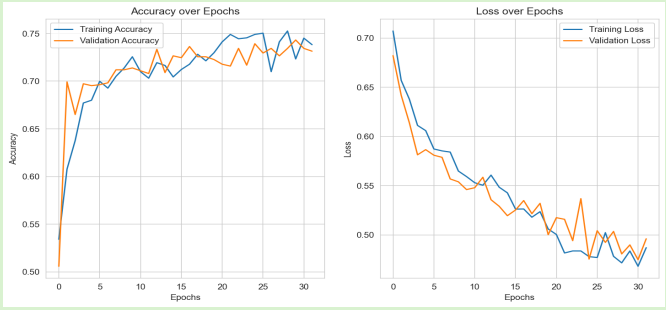
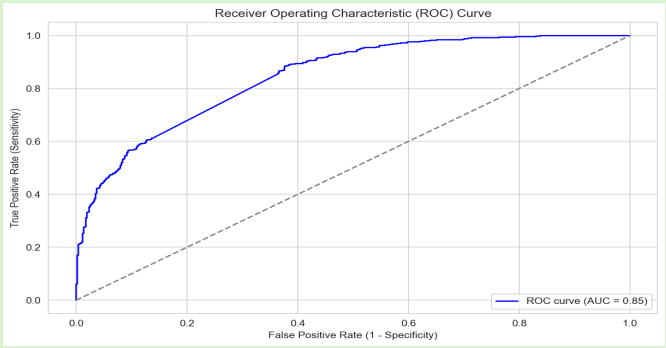
Data:
- Source: Kaggle
- 5'120 MRI images (brain scans, 128 x 128 pixels)
- Binary labels (1: demented, 0: non-demented)

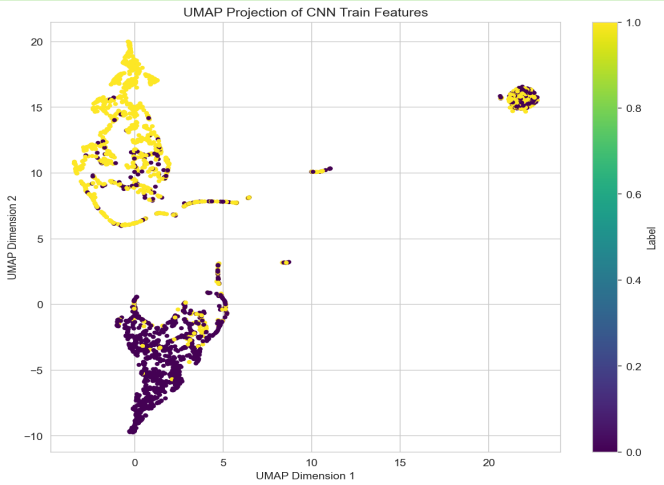




Model: CNN with the following layers:
- 32 filters of size (3,3)
- 2x2 max-pooling
- 64 filters of size (3x3) to the 32 feature maps from the previous layer
- 2x2 max-pooling
- 128 filters of size (3x3) to the 64 feature maps from the previous layer
- 2x2 max-pooling
- Flatten, converts the 14*14*128 feature map into a 1D vector
- Dense layer with 128 neurons
- Dropout layer with 50% dropout rate.
- Final Dense layer with 1 neuron (binary classification).
- 32 epochs
- Batch size: 32
- Optimizer: adam







Results:
- Sensitivity from CNN: 89.4%
- Specificity from CNN: 59.3%
- Accuracy with random forest on extracted features from CNN: 72%

Possible improvements (not tried yet):
- Transformations such as rotations, flips, and zooms.
- More layers or increase the number of filters
- Use a pre-trained model (e.g., VGG16, ResNet)
- Integrating tabular data such as patient characteristics