

Alzheimer's Disease Detection ML Project



THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

Problem Statement : The aim of this project is to automatically classify brain MRI scans to detect Alzheimer's disease using deep learning models.

Exact Type of Problem : Classification (Multi-class classification)

Classes used

- Non-Demented
- Very Mild Demented
- Mild Demented
- Moderate Demented

Dataset : <https://www.kaggle.com/datasets/uraninjo/augmented-alzheimer-mri-dataset/data/discussion>

Division : Cross-Validation

Example Split:

- Train: 70%
- Validation: 15%
- Test: 15%

TABLE :

MODEL	ACCURACY
Custom CNN	93.75%
CNN	86.48%
DenseNet121	88.36%
InceptionV3	76.80%
ResNet50	78.20%
VGG16	79.45%
MobileNetV2	74.47%
EfficientNetB1	28.41%
EfficientNetB0	28.25%
NASNetMobile	58.53%
TinyCNN	56.81%
MobileNetV3Small	35.61%

Your Novel / Semi-Novel / Ensemble Approach

In addition to basic CNN models, several deep learning architectures were implemented to improve Alzheimer's stage classification:

- Custom CNN

Pretrained Models (Transfer Learning):

- DenseNet121
- InceptionV3
- ResNet50
- VGG16 (Visual Geometry Group)

Design Approach (Algo)

- Preprocessing: image resizing (e.g., 176×176), normalization
- Data augmentation (rotation, zoom, flip)
- Feature extraction using convolution layers
- Fully connected layers for classification
- Softmax activation for 4-class output
- Transfer Learning used to leverage pretrained ImageNet features

CONCLUSION

- In this project, multiple deep learning architectures were evaluated for Alzheimer's Disease classification using MRI images.
- Among all models, the Custom CNN achieved the highest accuracy of 93.75%, outperforming standard architectures like DenseNet121, VGG16, ResNet50, and InceptionV3.
- Classical CNN also performed well (86.48%), while lightweight models such as MobileNetV3Small and EfficientNet variants showed lower accuracies on this dataset.
- Deep learning, especially a custom-tailored CNN, is highly effective for detecting Alzheimer's stages.
- Models like DenseNet121 and VGG16 gave competitive performance but were still outperformed by the optimized custom architecture.

THANK YOU