

ALZHEIMER'S DISEASE CLASSIFICATION USING MULTIMODEL

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INTRODUCTION



- Alzheimer's Disease is a progressive brain disorder where early diagnosis is challenging.
- Single-modal approaches like MRI or cognitive tests may miss key patterns.
- This project uses Multimodal Deep Learning
- combining MRI images and MMSE data using CNN and MLP
- to improve classification and support early intervention.

PROBLEM STATEMENT



Problem statement

- Early diagnosis of Alzheimer's Disease is challenging, as single-modality data like MRI or cognitive scores may miss important patterns. A multimodal approach is needed to improve classification accuracy by combining multiple data sources.

AIM

- To develop a multimodal deep learning model that combines MRI image data and clinical features for accurate classification of Alzheimer's Disease stages.

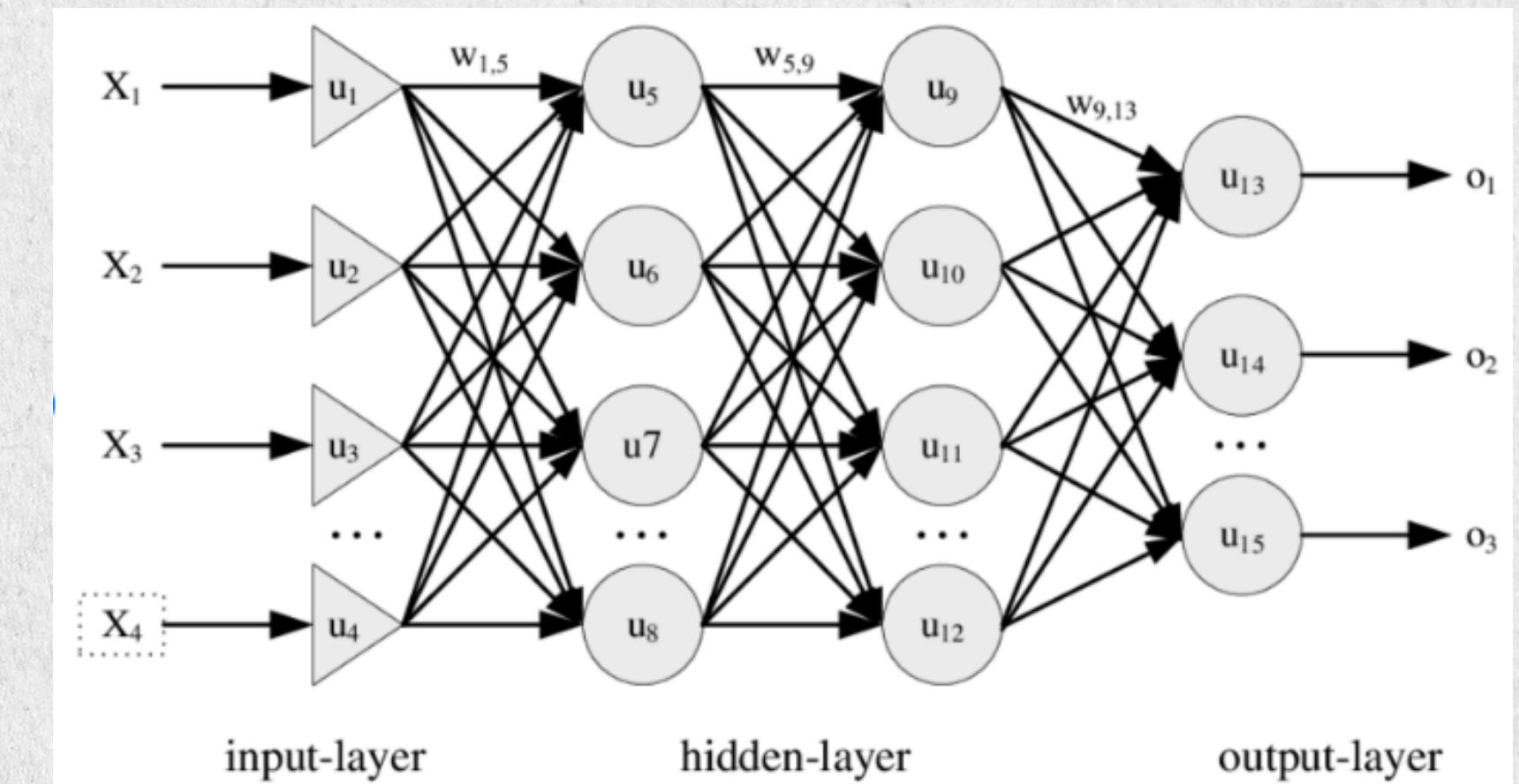
Objectives

- To preprocess and extract features from MRI scans using Convolutional Neural Networks (CNN).
- To analyze clinical data (e.g., MMSE, age, education) using a Multilayer Perceptron (MLP).
- To fuse image and tabular features for multimodal classification.

MODEL DIAGRAMS AND ARCHITECTURE

MLP Architecture Diagram

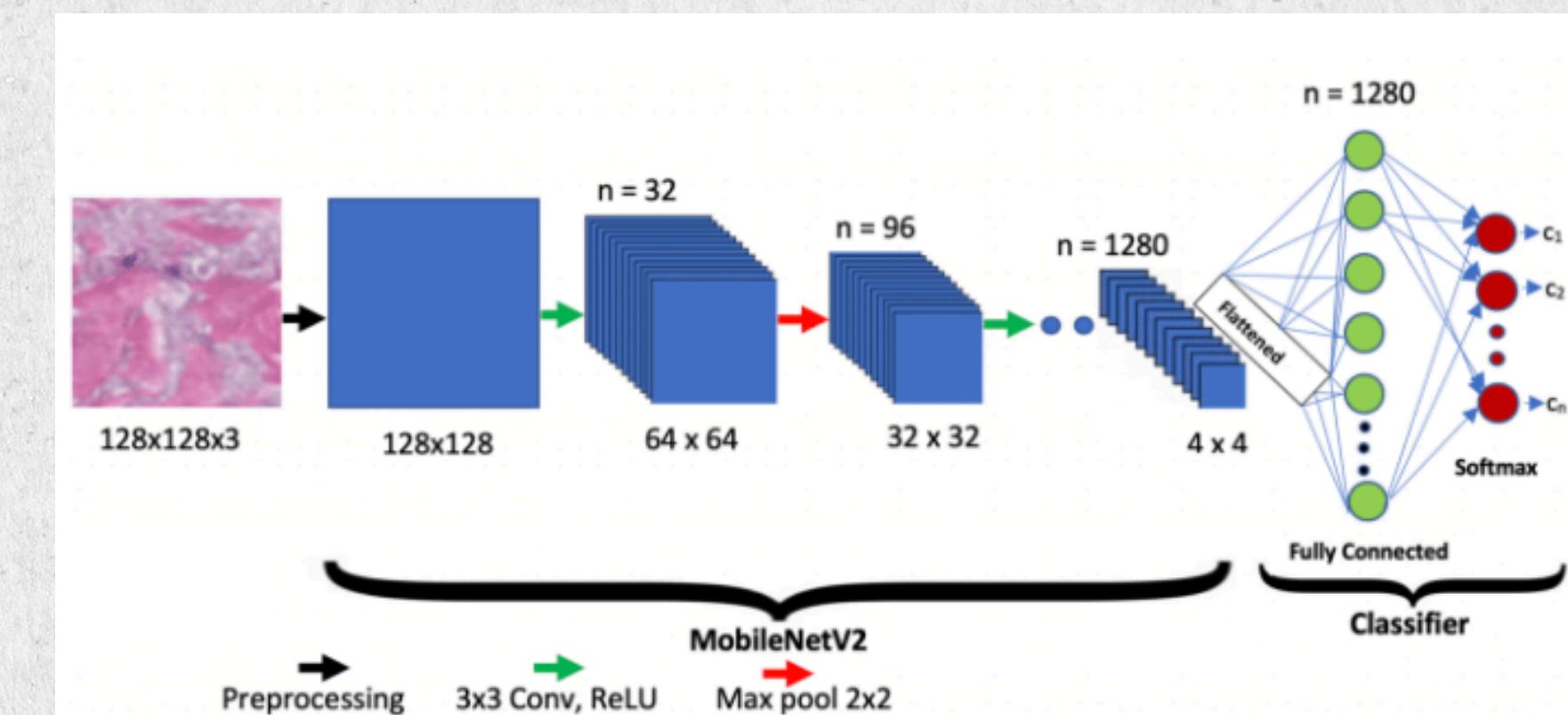
- Multilayer Perceptron (MLP) is a type of neural network that models complex patterns in structured (tabular) data.
- MLP complements CNNs, which extract features from MRI images.
- Together, they form a multimodal deep learning model.



MODEL DIAGRAMS AND ARCHITECTURE

Mobilenet V2 Architecture

- MobileNetV2 is a lightweight and efficient Convolutional Neural Network (CNN) architecture.
- It is designed for fast and accurate image processing with low computational cost.
- In Alzheimer's classification, it is used to extract features from MRI brain images.
- Captures spatial patterns and structural brain changes linked to disease stages.



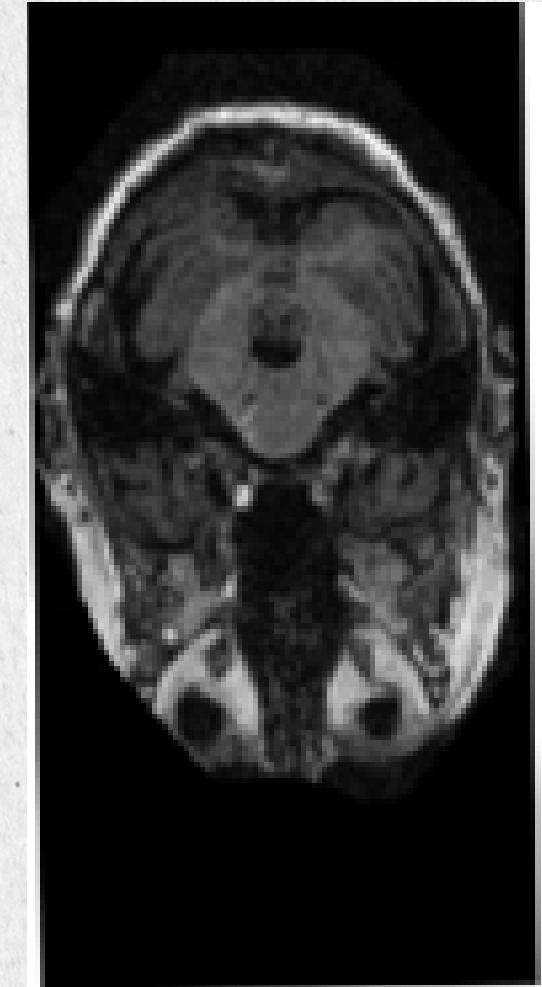
DATASET DESCRIPTION

MRI Images

- Type: Structural brain MRI scans
- Purpose: Capture detailed anatomical information of the brain
- Data: 3D or 2D MRI slices showing brain regions affected by Alzheimer's
- Classes: Images labeled according to Alzheimer's stages (e.g., No Impairment, Mild Impairment, Moderate, Severe)

MMSE Clinical Tabular Data

- Type: Structured clinical data in tabular format
- Features include:
 - MMSE (Mini-Mental State Examination) scores – cognitive assessment results
 - Age – patient's age
 - Gender
 - Education level
 - Other clinical/demographic info (e.g., SES, CDR, brain volume metrics)



GRAPHS

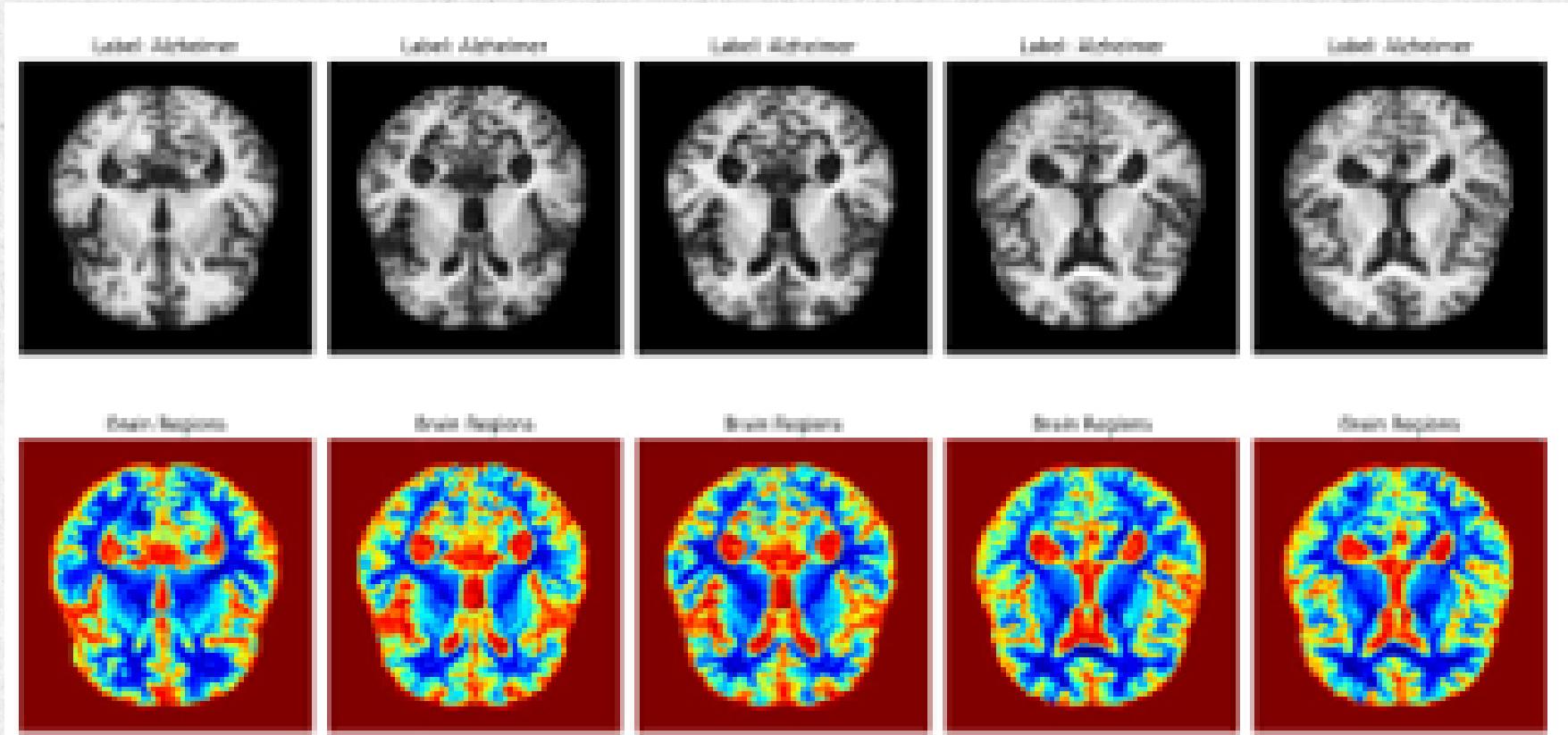


Fig. 2: Feature Map Visualization

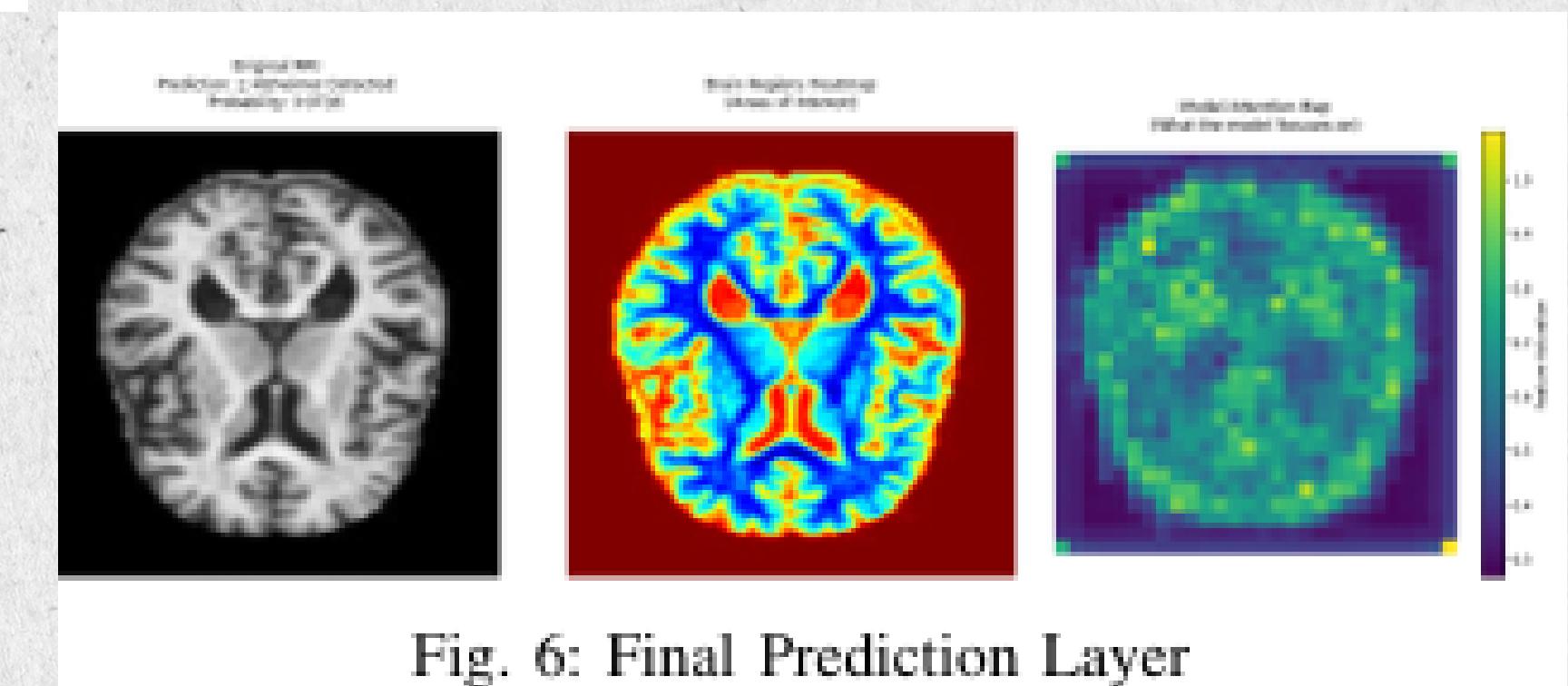


Fig. 6: Final Prediction Layer

GRAPHS

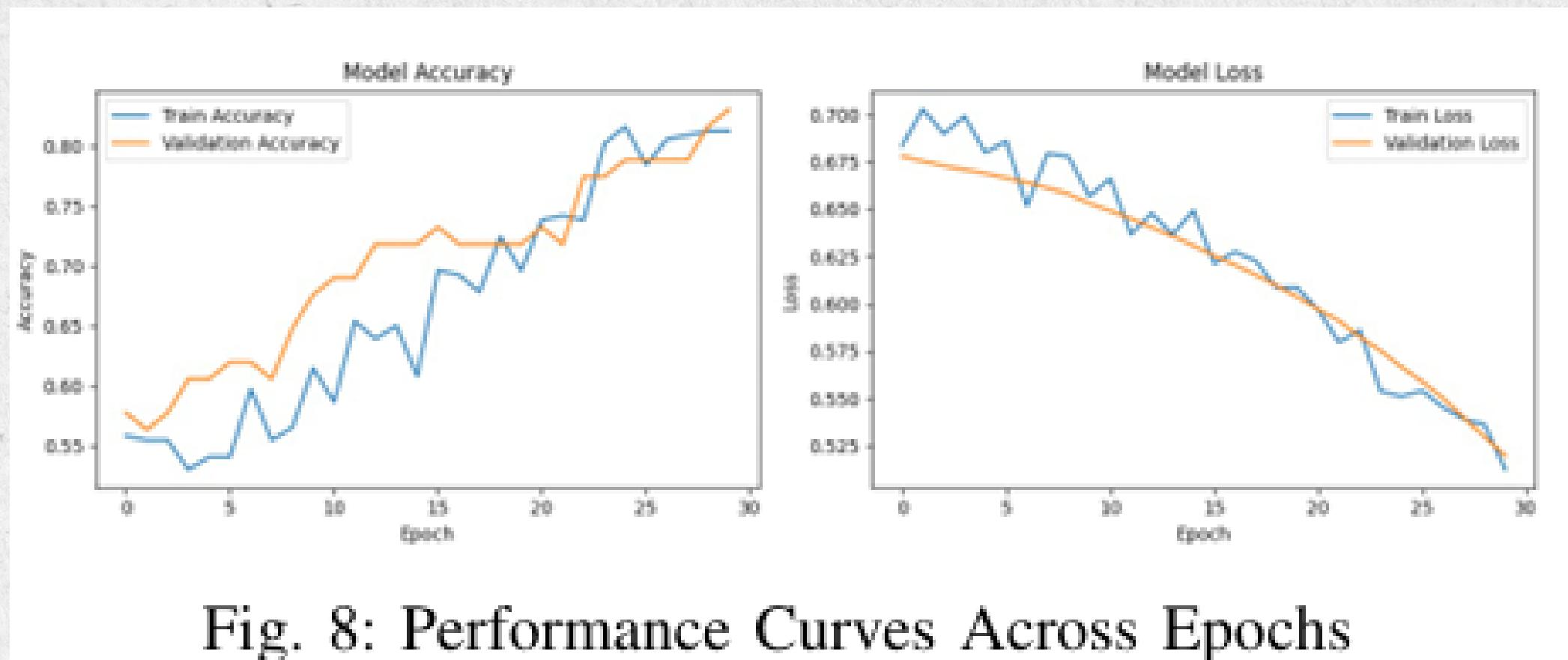


Fig. 8: Performance Curves Across Epochs

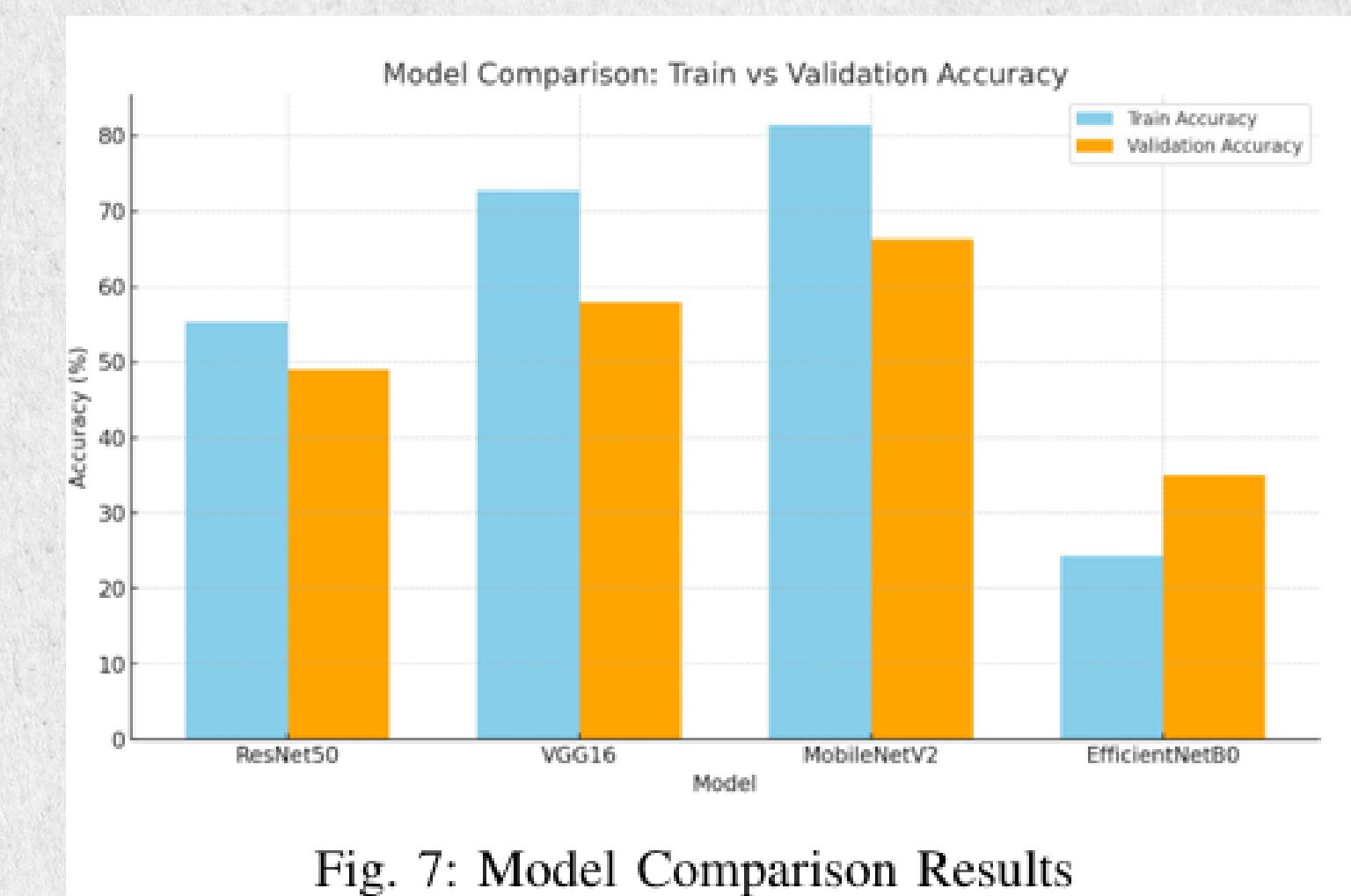


Fig. 7: Model Comparison Results

RESULT ANALYSIS

TABLE : PERFORMANCE METRICS OF THE FINAL MODEL (MOBILENETV2 + MLP)

Metric	Value
Accuracy	0.86
Precision	0.87
Recall	0.88
F1-Score	0.87



CONCLUSION

Early and accurate diagnosis of Alzheimer's Disease is essential for timely intervention and effective patient care. By combining MRI images with clinical data such as MMSE scores through a multimodal deep learning approach, we can leverage the strengths of both data types. Using MobileNetV2 for extracting features from MRI scans and MLP for analyzing clinical tabular data leads to improved classification accuracy of Alzheimer's stages. This integrated model enhances the potential for early detection and provides a more comprehensive understanding of disease progression. Future work can explore incorporating additional data modalities and further optimizing the model for practical clinical applications.

THANK YOU....