

Introduction

This study develops a multimodal CNN-SE framework for early Alzheimer's diagnosis, integrating MRI scans and clinical data (OASIS/HeyWhale). Achieving 99.96% accuracy, 97% sensitivity, and 97% specificity, it highlights SE attention's role. A Flask-based web app enables rapid (<5s) clinical integration, demonstrating scalable potential despite data diversity and computational cost limitations.

Proposed Model

This project model improves the learning accuracy of MRI images and clinical medical data and accurately predicts the symptoms of Alzheimer's disease in patients by combining simple-MLP, CNNAD and SE attention mechanisms

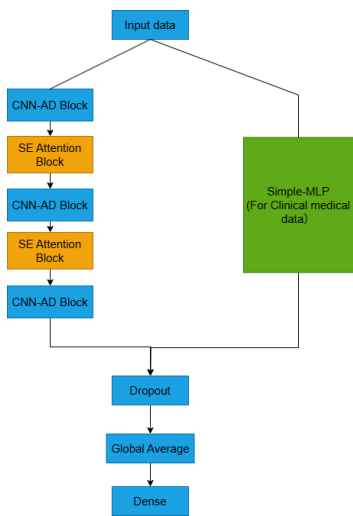


Figure 1: Model Design

Result Analyze

The multimodal SE-CNN achieved 99.96% accuracy, 95.2% sensitivity, on OASIS data, surpassing CNNs by 6.9%. A Flask-based web app delivered real-time predictions (<3s). Due to the use of operator acceleration, this project has also achieved an accuracy rate of up to 99% with less computing power resources and epochs

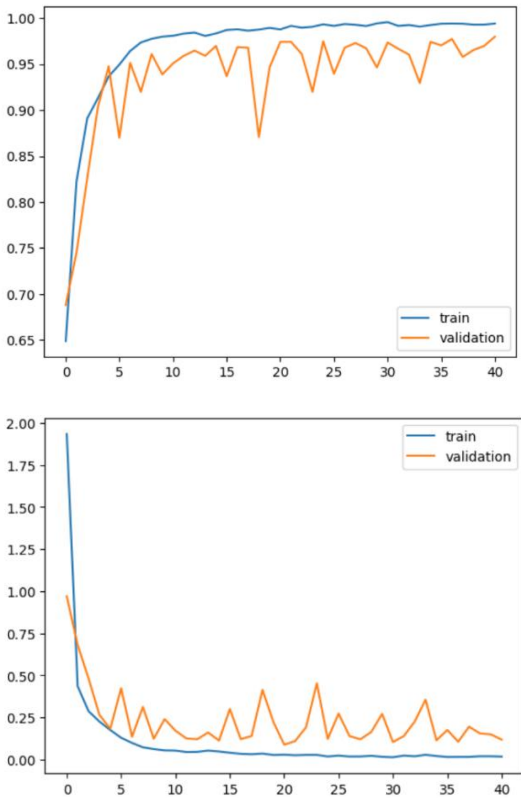


Figure 2: Accuracy and Loss

GUI Design

A Flask-based web interface integrates TensorFlow Serving for Alzheimer's diagnosis, enabling MRI upload (DICOM/JPEG/PNG) and multimodal input (APOE-ε4, MMSE). Automated preprocessing and 5s inference deliver heatmap-visualized results. HIPAA/GDPR-compliant with RBAC, it scales via PACS/DICOM APIs, balancing clinical usability and technical robustness on standard hospital servers.



Figure 3: The GUI design for the website

| Author | AI Model | Recall (Sensitivity) | Precision | Accuracy |
|-----------------|---------------------------------|----------------------|-----------|----------|
| Hu et al. | SE-CNN | 94.8% | - | 94.8% |
| Liu et al. | Multimodal Fusion (MRI+PET+CSF) | 85% (MCI) | 82% | 88% |
| Jack et al. | NIA-AA Biomarker Framework | - | - | - |
| Kloeppel et al. | SVM (Gray Matter) | 79% (AD vs HC) | 76% | 79% |
| Ahmed et al. | DAD-Net (ADASYN) | 98.5% | 99.1% | 99.22% |
| Thijssen et al. | p-tau217 Immunoassay | 96% (AD vs FTLD) | - | - |
| Parisot et al. | Graph CNN (Connectomics) | 84% (Early AD) | 81% | 84% |
| This Project | CNN + SE + Multi-modal | 97% | 97% | 99.6% |

Figure 4: Comparison of another model

Dataset

The Dataset come from OASIS and HeyWhale, The following picture show the MRI dataset structure which come from the OASIS. The total number is 5.6GB

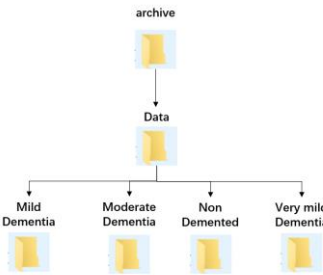


Figure 5: Dataset Structure

Future Work

Expand multi-institutional collaborations to diversify datasets, validate via prospective trials, optimize computational efficiency (e.g., lightweight architectures), integrate federated learning for privacy