A Comprehensive Analysis of Alzheimer's Disease Detection using Machine Learning and XAI

Group Members:

- MD. Tanvir Zahid - 22366028
- SK. Mamunur Rashid - 22366050
- MD. Asaduzzaman Sarker Anik - 23166031

Student Tutor

- MEHNAZ ARA FAZAL

Research Assistant

- SANIA AZHMEE BHUIYAN

Introduction

➔ **What is Alzheimer's disease?**

Progressive and irreversible brain disorder.

➔ **Our Goal**

Detect AD in the early stage.

➔ **Further work**

Analyse the models.

Literature Review

- **Eke et al. [1]**
  Support Vector Machine.(96%)

- **Shoukry et al. [2]**
  CNN, RNN and others. Requires large datasets and ideal bias selection.

- **Datta and Pazzani [3]**
  Six ML algorithms.

  Takes responses from patients.

- **Escudero et al. [4]**
  Personalized ML approach. (80%)

  Cost effective

- **Alvarez et al. [5]**
  Automatic diagnostic tool. PCA,SVM.

  Too many features.

Methodology

➔ **Dataset**

A famous publicly available dataset from OASIS.

➔ **Dataset PreProcessing**

Removed unrelated features, categorized ‘converted’ type as ‘dementia’.

➔ **Data Normalization**

StandardScaler is used for our research benefit.

➔ **Train-Test Splits**

Splitting in 80%-20% the data for now.

Algorithms and XAI

We planned to use some famous ML algorithms and may include XAI using LIME for further investigation.

- **Regression Algorithms**
  A basic understanding of our project using the most common type of algorithm.
- **Ensemble Classifiers**
- **Boosting Classifiers**

Result Analysis

For now we are getting good results from the Ensemble Classifier, Random Forest both in terms of Recall and Accuracy.

Challenges

- ➔ Nature of Data
- ➔ Model Interpretability
- ➔ Model Explainability
- ➔ Model Integration
- ➔ Ethical Considerations

Conclusion

ML algorithms are capable of analyzing large datasets to identify patterns and associations that can be used to predict AD risk and progression. However, the development and implementation of ML-based AD detection tools face several challenges and these challenges should be properly addressed

References

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