Analysis of Alzheimer's Disease using Supervised ML Algorithms

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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.

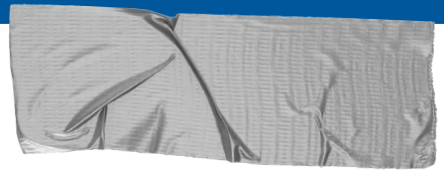
- **Datta and Pazzani [3]**
  Six ML algorithms.

  Takes responses from patients.

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

  Cost effective

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



Dataset

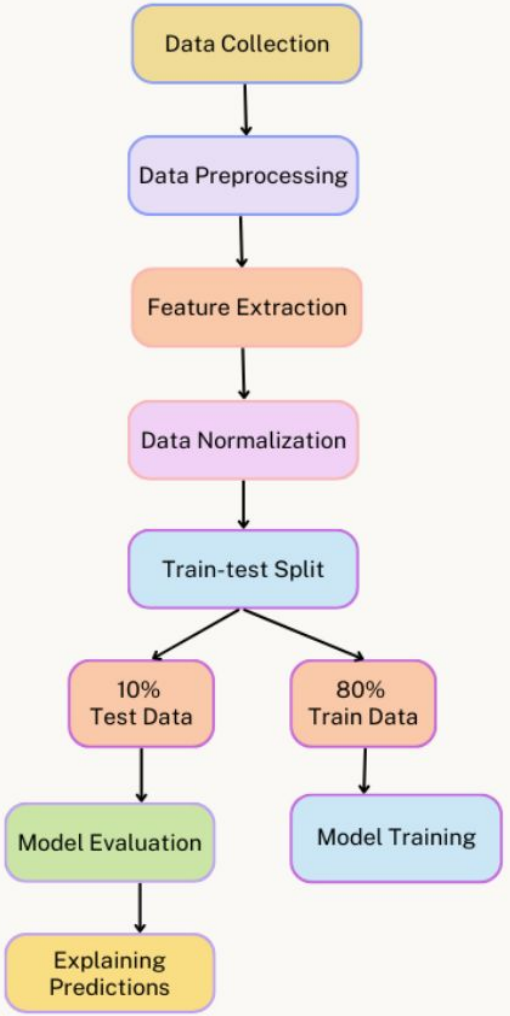
- Dataset is taken from the famous Open Access Series of Imaging Studies (OASIS) website.
- Two dataset files contains some pre-determining factors such as MMSE, eTIV, ASF etc.
- We omit some unwanted features from our dataset such as OASIS_ID, MRI_ID etc.

FEATURE DESCRIPTION OF THE DATASET

Feature Name	Feature Description
Gender	Gender of the individual
Age	Age of the individual
Educ	Years of education
SES	Socioeconomic status
MMSE	Mini-Mental State Examination (MMSE) score
CDR	Clinical Dementia Rating (CDR)
eTIV	Estimated total intracranial volume
nWVB	normalized whole-brain volume
ASF	Atlas Scaling Factor

Methodology

- Data Normalization
- Splitting
- Model Training



Algorithms

- Logistic Regression
- Random Forest
- Gradient Boosting
- SVM
- AdaBoost
- XGBoost
- KNN
- Voting Classifier(Hard)
- Voting Classifier(Soft)
- Gaussian NB

References

1. “Dementia.” World Health Organization, www.who.int/news-room/fact-sheets/detail/dementia. Accessed 16 May 2023.
2. Al-Shoukry, Suhad, Taha H. Rassem, and Nasrin M. Makbol. "Alzheimer's diseases detection by using deep learning algorithms: a mini-review." IEEE Access 8 (2020): 77131-77141.
3. Shankle, W. R., Mani, S., Pazzani, M. J., Smyth, P.(1997). Dementia Screening with Machine Learning Methods. In Springer eBooks (pp. 149–165). https://doi.org/10.1007/978-1-4615-6059-39.
4. Machine Learning-Based Method for Personalized and Cost-Effective Detec- tion of Alzheimer's Disease. (2013, January 1). IEEE Journals Magazine — IEEE Xplore. https://ieeexplore.ieee.org/document/6263281.
5. Ivarez, I., Go ŕriz, J. M., Ram írez, J., Salas-Gonzalez, D., Lopez, M. A., Segovia, F., Puntonet, C. G., Prieto, B. (2009). Alzheimer's Diagnosis Using Eigenbrains and Support Vector Machines. In Springer eBooks (pp. 973–980). https://doi.org/10.1007/978-3-642-02478-8122.