NeuroDiag - Alzheimer's Disease Detection using machine learning model

01/06/2023

Project Member

Mossa. Sumaiya Akter
BKH2025017F

Md. Saiful Islam
MUH2025033M

Irfanul Haque Nabil
ASH192502lM

01/06/2023

Supervised By

Nazmun Nahar
Lecturer
Institute of Information Technology
Noakhali Science and Technology University

01/06/2023

Table of contents

Introduction

Alzheimer's disease is a progressive neurodegenerative disorder that affects millions of people worldwide. Early diagnosis of Alzheimer's disease is crucial for managing the symptoms and improving the quality of life of patients. Magnetic resonance imaging (MRI) is a non-invasive technique that can detect structural changes in the brain associated with Alzheimer's disease.

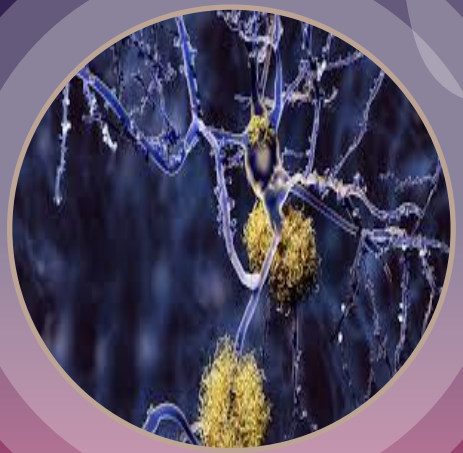
In this project, we propose to develop a deep learning model based project called "NeuroDiag" for Alzheimer's detection using MRI images. The goal of this project is to provide an accurate and efficient tool for early diagnosis of Alzheimer's disease, which can ultimately lead to better patient outcomes.

Problem Statement

The current methods for Alzheimer's detection rely heavily on clinical assessment and cognitive testing.

These methods are subjective and may not accurately diagnose Alzheimer's disease in its early stages.

These tests are time-consuming, expensive, and require specialized expertise.



Proposed Solution

A **deep learning model based** project called **"NeuroDiag"** for **Alzheimer's** detection using MRI images. The model will be trained on a large dataset of MRI images to identify patterns of brain atrophy and other structural changes associated with Alzheimer's disease.

Users will be able to **upload MRI images** of probable patients to a web application, which will then run the **NeuroDiag model** to predict whether the patient has Alzheimer's disease or not.

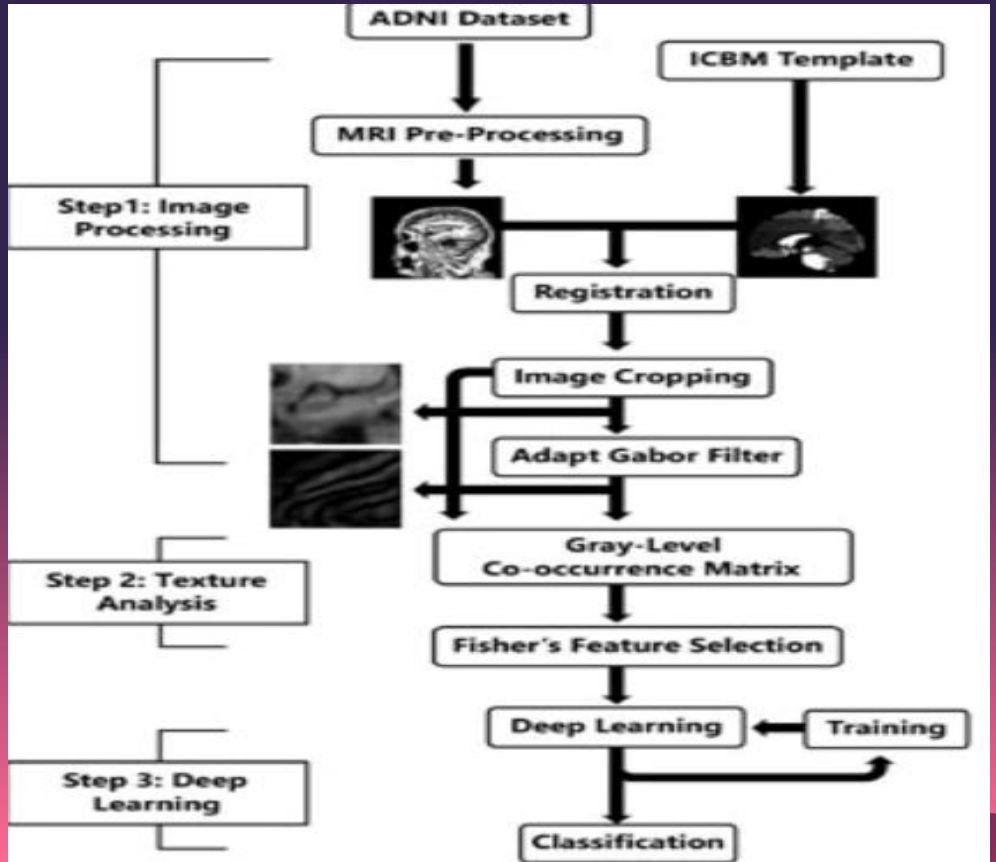
Data Collection and Preprocessing

- MRI images will be collected from publicly available datasets such as ADNI and OASIS.
- The MRI images will be preprocessed to remove noise, correct for bias field, and normalize the intensity values.
- Additionally skull stripping and brain segmentation will be performed to isolate the brain tissue from the rest of the image.
- The preprocessed images will be split into training, validation, and test sets.
- he training set will be used to train the NeuroDiag model while the validation set will be used for hyperparameter tuning.
- The test set will be used to evaluate the performance of the model.

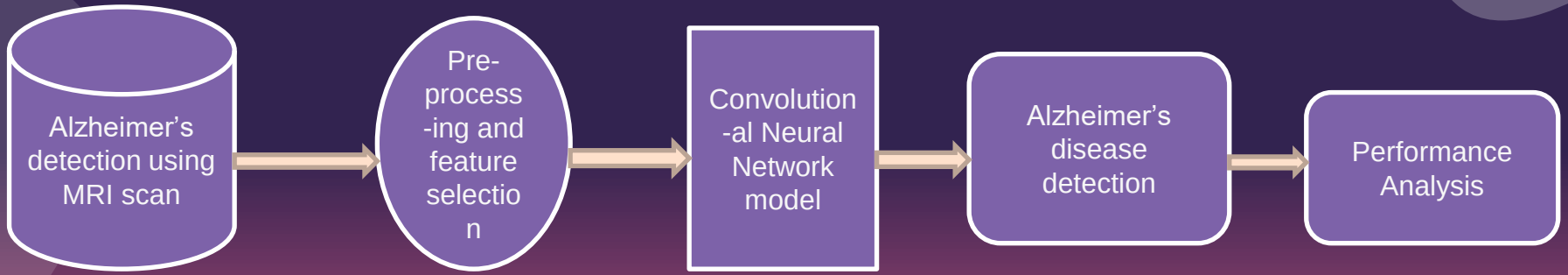
Model Development and Evaluation

- A convolutional neural network (CNN) architecture will be developed for the NeuroDiag model. The CNN will take in MRI images as input and output a binary classification (Alzheimer's or not Alzheimer's).
- Transfer learning will be used with pre-trained models such as VGG, ResNet, and Inception to improve the performance of our model.
- Performance will be evaluated of the NeuroDiag model using metrics such as accuracy, precision, recall, Fl score, and area under the receiver operating characteristic curve (AUC-ROC).

Model Development and Evaluation(DIAGRAM)



Model Development and Evaluation(DIAGRAM)



Model (Software Development Methodology) &Tools

Agile software development methodology will be used for this project

Tools

- JIRA
- Trello
- GitHub

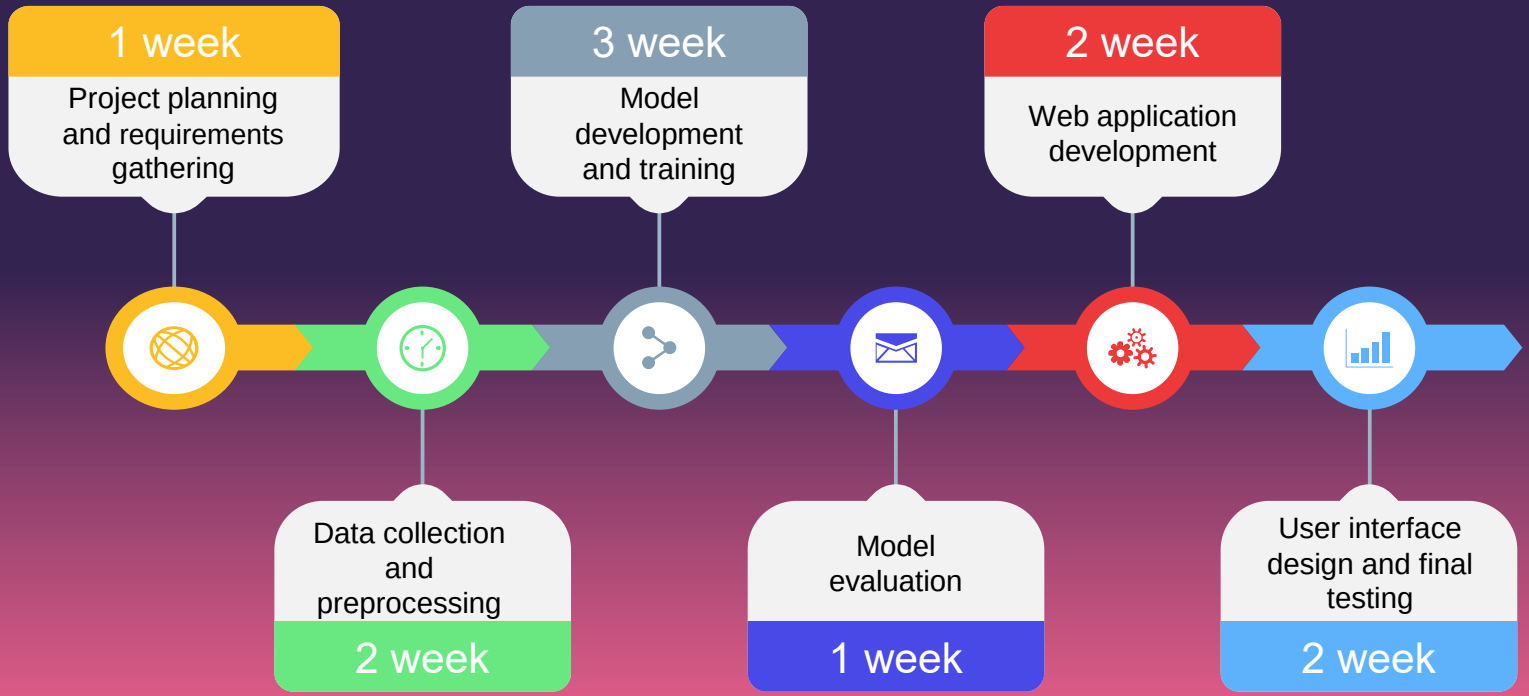
Model & Tools(Stacks)

The web application will be built using **Flask**, which is a lightweight web framework in Python. We will use **JavaScript libraries** such as **React and D3.js** for data visualization and user interface design.

Datasets

- ADNI
- OASIS

Timeline


1 week
Project planning and requirements gathering
Data collection and preprocessing
2 week
3 week
Model development and training
Model evaluation
1 week
2 week
Web application development
User interface design and final testing
2 week

References

Using deep learning to investigate the neuroimaging correlates of psychiatric and neurological disorders: Methods and applications Neurosci. Biobehav. Rev. (2017)

Prevalence and incidence of Alzheimer's disease in Europe: A meta-analysis Neurología (Engl. Ed.) (2017)

Ali, E.M., Seddik, A.F., Haggag, M.H.: Automatic detection and classification of Alzheimer's disease from MRI using TANNN. Int. J. Comput. Appl. 148(9), 30–34 (2016)

- Warsi, M.A.: The fractal nature and functional connectivity of brain function as measured by BOLD MRI in Alzheimer's disease. (2012)
- Liu, F., Shen, C.: Learning deep convolutional features for MRI based Alzheimer's disease classification. arXiv preprint (2014) G. Mckhang
- Report of the NINCDS-ADRDA work group under the auspices of department of health and human service task force on Alzheimer's disease Neurology, 34 (1984)

Thank You

01/06/2023