Alzheimer's Classification with MRI Images

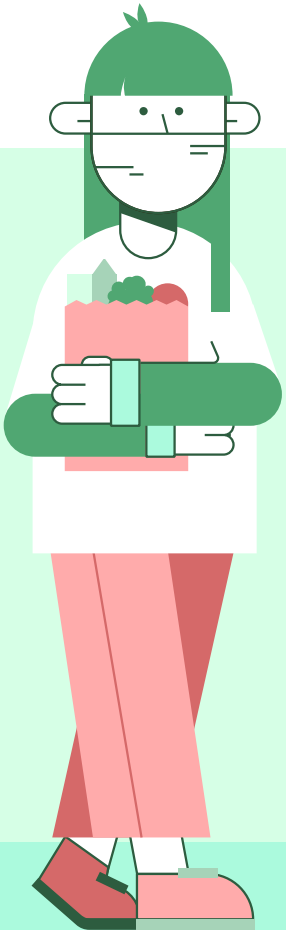
An Approach to Early Diagnosis

01.

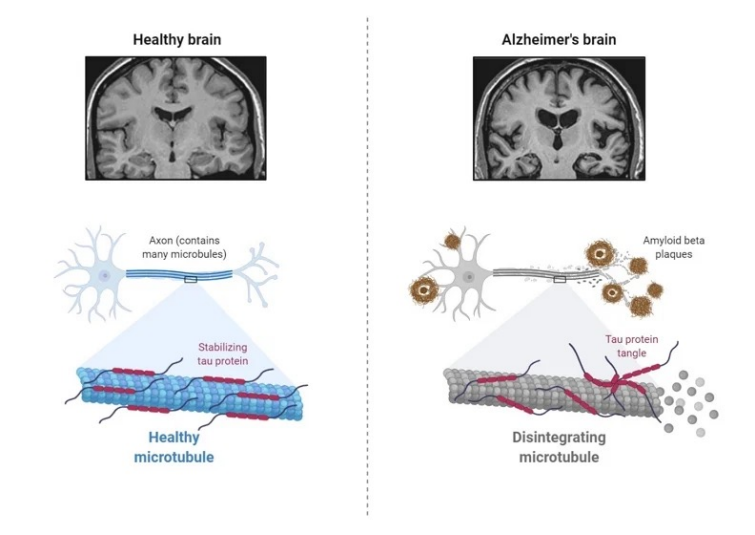
NON-TECHNICAL OVERVIEW

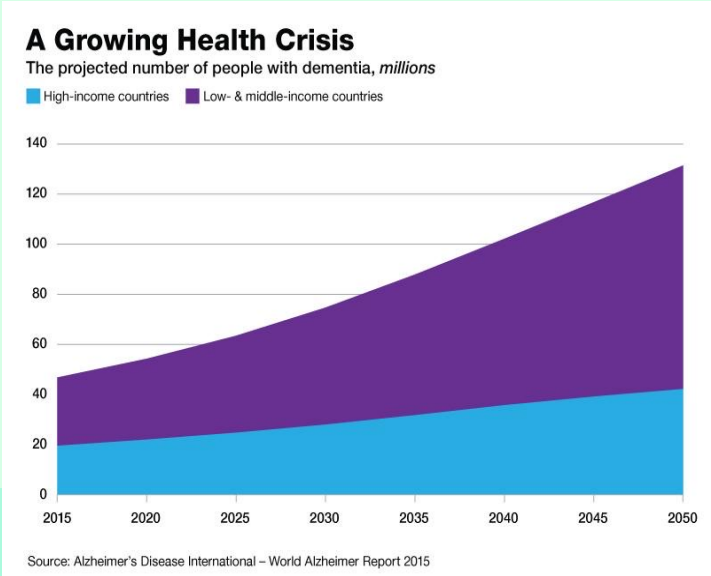
Introduction to Alzheimer's Disease / Problem Statement

Non-Technical Overview



- Progressive neurological disorder
- Leads to memory loss, cognitive decline, and behavioral changes
- Increasing cases worldwide due to aging populations
- Emotional and financial burden on patients, families, and healthcare systems





02.

PROPOSED VISION

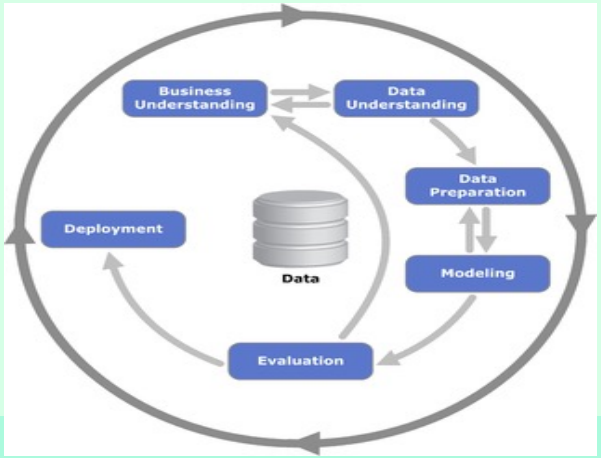
Data Science Approach/Model Development Strategy

Proposed Vision

Data Science Approach:

- Leverage CNNs: Use Convolutional Neural Networks (CNNs) to analyse MR images.
- Transfer Learning: Implement transfer learning with pre-trained models to improve accuracy and efficiency.
- Data Augmentation: Apply data augmentation techniques to increase the diversity and size of the training dataset.

Model Development Strategy:



03.

POTENTIAL IMPACT

Benefits of Early Diagnosis/ Scalability

Anticipated Benefits

01.

Early Diagnosis

02.

Scalability

03.

Improved Patient

Potential Impact

Early Diagnosis:

- Timely Intervention: Enables earlier intervention, potentially slowing the progression of Alzheimer's disease.
- Improved Treatment Options: Provides patients with more treatment options and the opportunity to participate in clinical trials earlier.

Scalability:

- Automated Process: The use of machine learning models allows for widespread implementation across various healthcare settings.
- Cost Efficiency: Reduces the costs associated with manual diagnosis and allows for more efficient use of medical resources.

Improved Patient Outcomes:

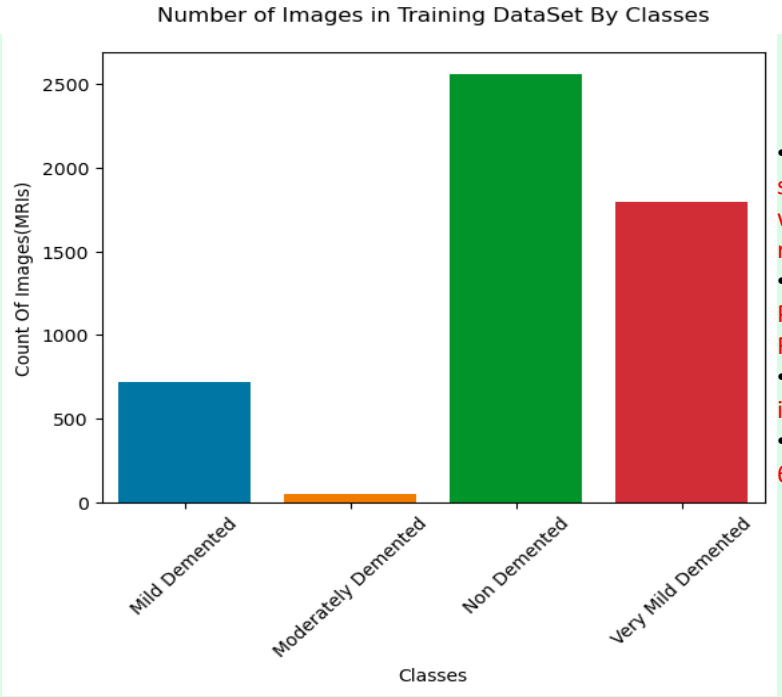
- Quality of Life: Enhances the quality of life for patients by allowing for more effective disease management.
- Emotional Relief: Offers peace of mind to patients and their families by providing a clear diagnosis and a structured treatment plan.

04.

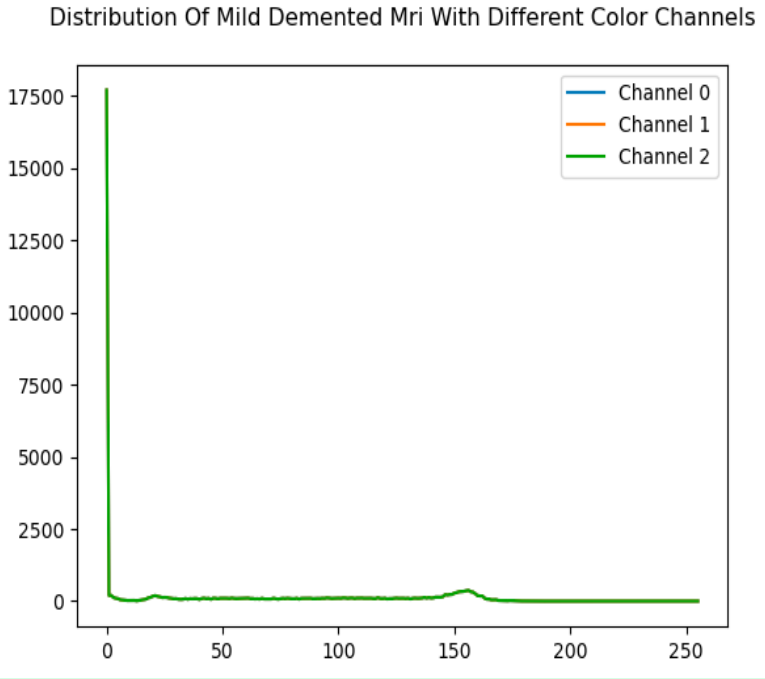
DATASET INTRODUCTION

Overview of MR□□mages

Graphs and Images



- The Data is collected from several websites/hospitals/public repositories.
- The Dataset is consists of Preprocessed MRI (Magnetic Resonance Imaging) Images.
- The Dataset has four classes of images.
- The Dataset is consists of total 6400 MRI images.



Mild Cognitive Impairment

Duration: 7 years

Disease begins in Medial Temporal Lobe

Symptom:
Short-term memory loss

Mild Alzheimer's

Duration: 2 years

Disease spreads to Lateral Temporal and Parietal Lobes

Symptoms include:
Reading problems
Poor object recognition
Poor direction sense

Moderate Alzheimer's

Duration: 2 years

Disease spreads to Frontal Lobe

Symptoms include:
Poor judgment
Impulsivity
Short attention

Severe Alzheimer's

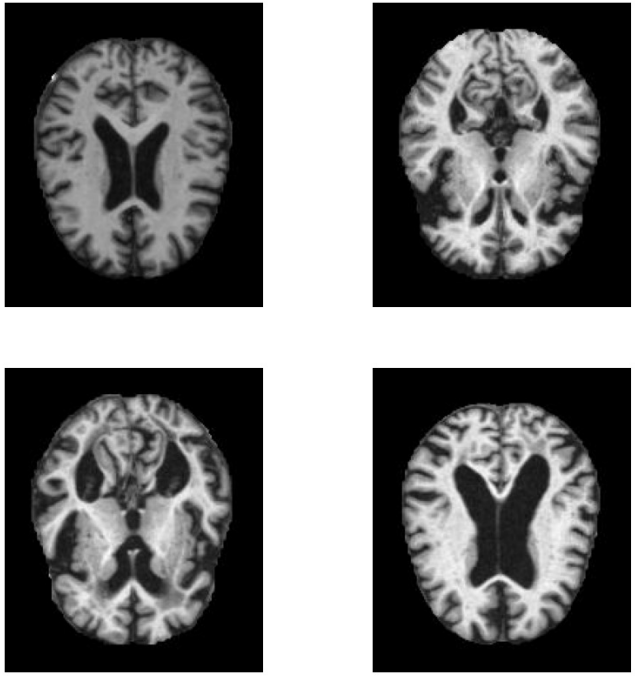
Duration: 3 years

Disease spreads to Occipital Lobe

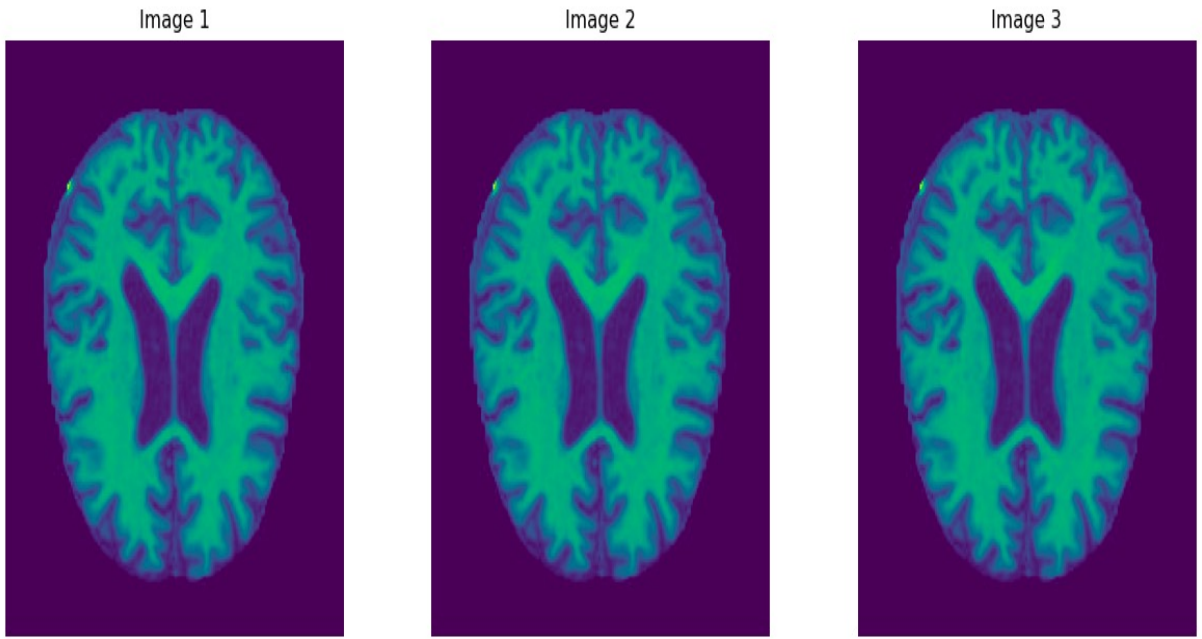
Symptoms include:
Visual problems

Graphs and Images

Mild Demented MRIs



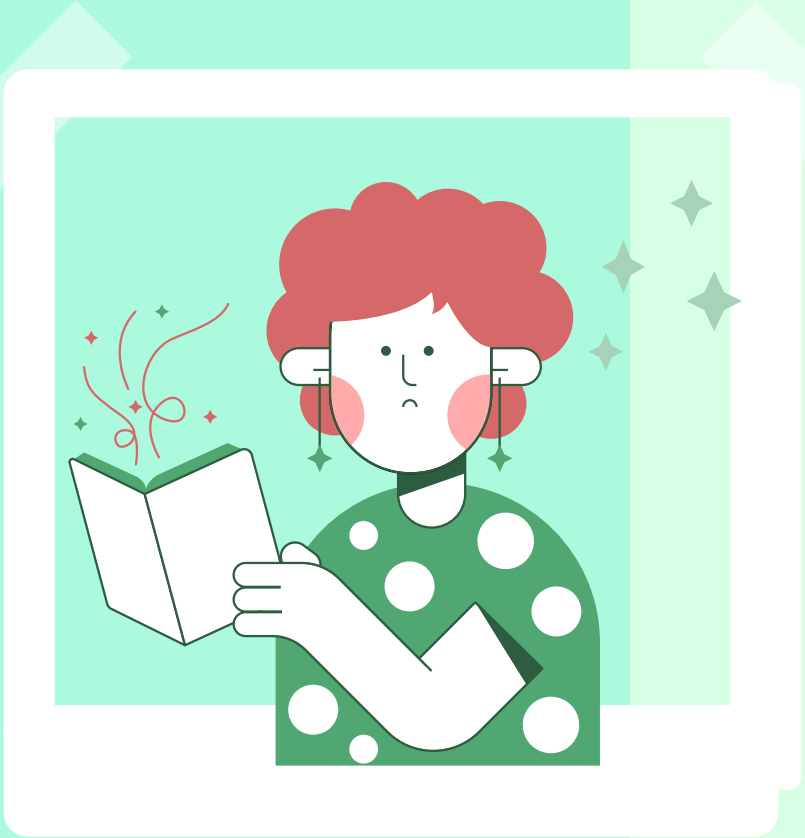
Mild Demented MRI image in 3 different colour channels



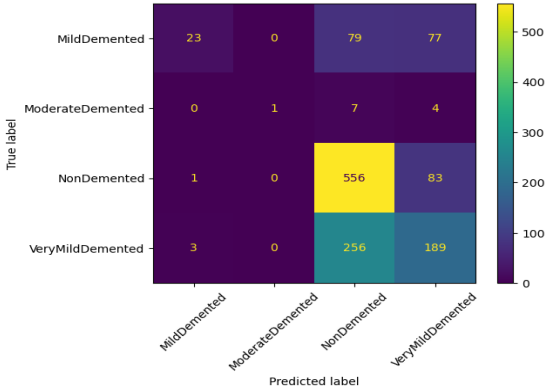
05.

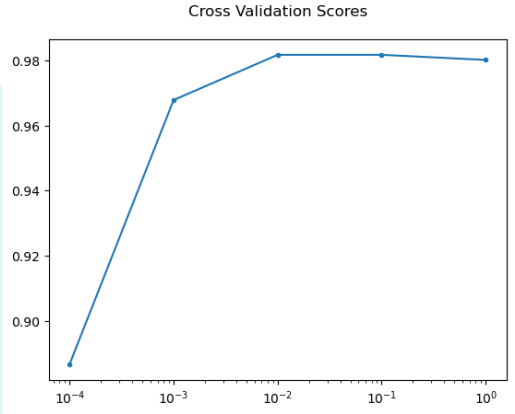
Sprint 2 actions:

Pre-processing/ Feature Engineering/Baseline Modelling



Baseline Modelling of Image Classification





Data Pre-processing:

- Converted all images to NumPy arrays for efficient manipulation and computation.
- Created a corresponding array with image labels to serve as the target variable.

Initial Model Training:

- Trained the logistic regression model on the pre-processed image data.

Data Scaling:

- Applied data Standard Scaling to normalize the feature values, ensuring all features contribute equally to the model training process.

Hyperparameter Optimization:

- Utilized a for loop to iterate through different values of the regularization parameter C in logistic regression and cross-validation.

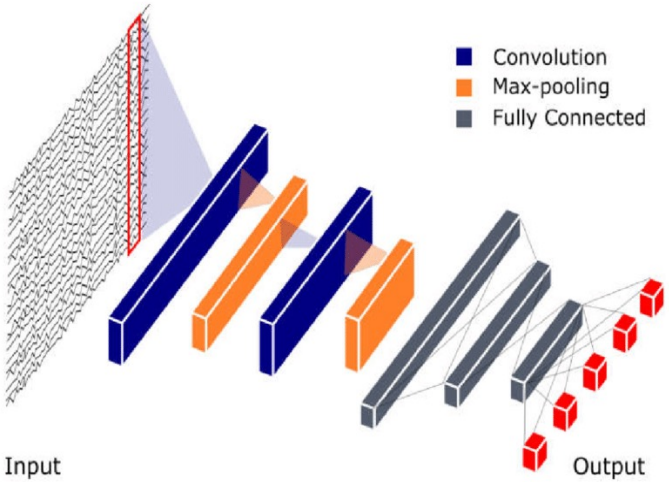
Model Evaluation:

- Assessed the performance of the logistic regression model with the optimized C parameter to establish that there may be better choices for modeling image classification due to its limitations in capturing complex patterns in the data.

06.

Sprint 3 actions:

Final Modelling

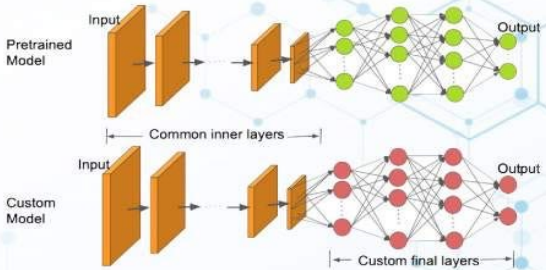


DATA AUGMENTATION

datacamp

analytic Steps

Transfer Learning



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QUESTIONS?