Alzheimer's Classification with MRI Images

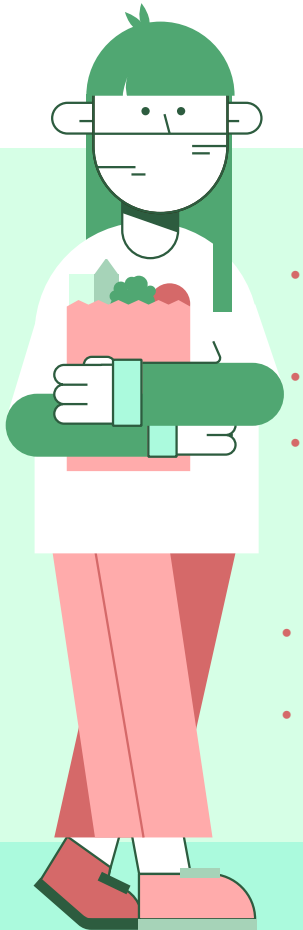
An Approach to Early Diagnosis

01.

NON-TECHNICAL OVERVIEW

Introduction to Alzheimer's Disease / Problem Statement

Non-Technical Overview

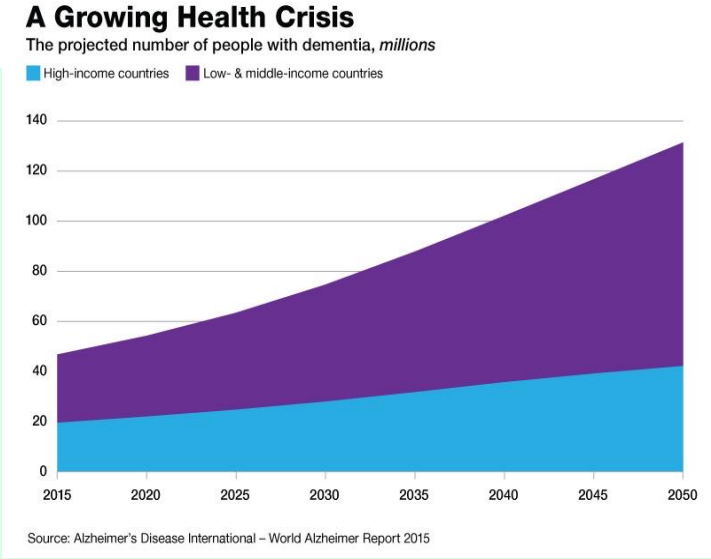


Introduction to Alzheimer's Disease:

- Alzheimer's Disease is a progressive neurological disorder leading to memory loss, cognitive decline, and behavioural changes.
- Affects millions worldwide, with cases increasing due to aging populations.
- Significant emotional and financial burden on patients, families, and healthcare systems.

Problem Statement:

- Traditional diagnostic methods are time-consuming and often detect the disease at later stages.
- Late diagnosis leads to fewer treatment options and worse outcomes for patients.



02.

PROPOSED VISION

Data Science Approach/Model Development Strategy

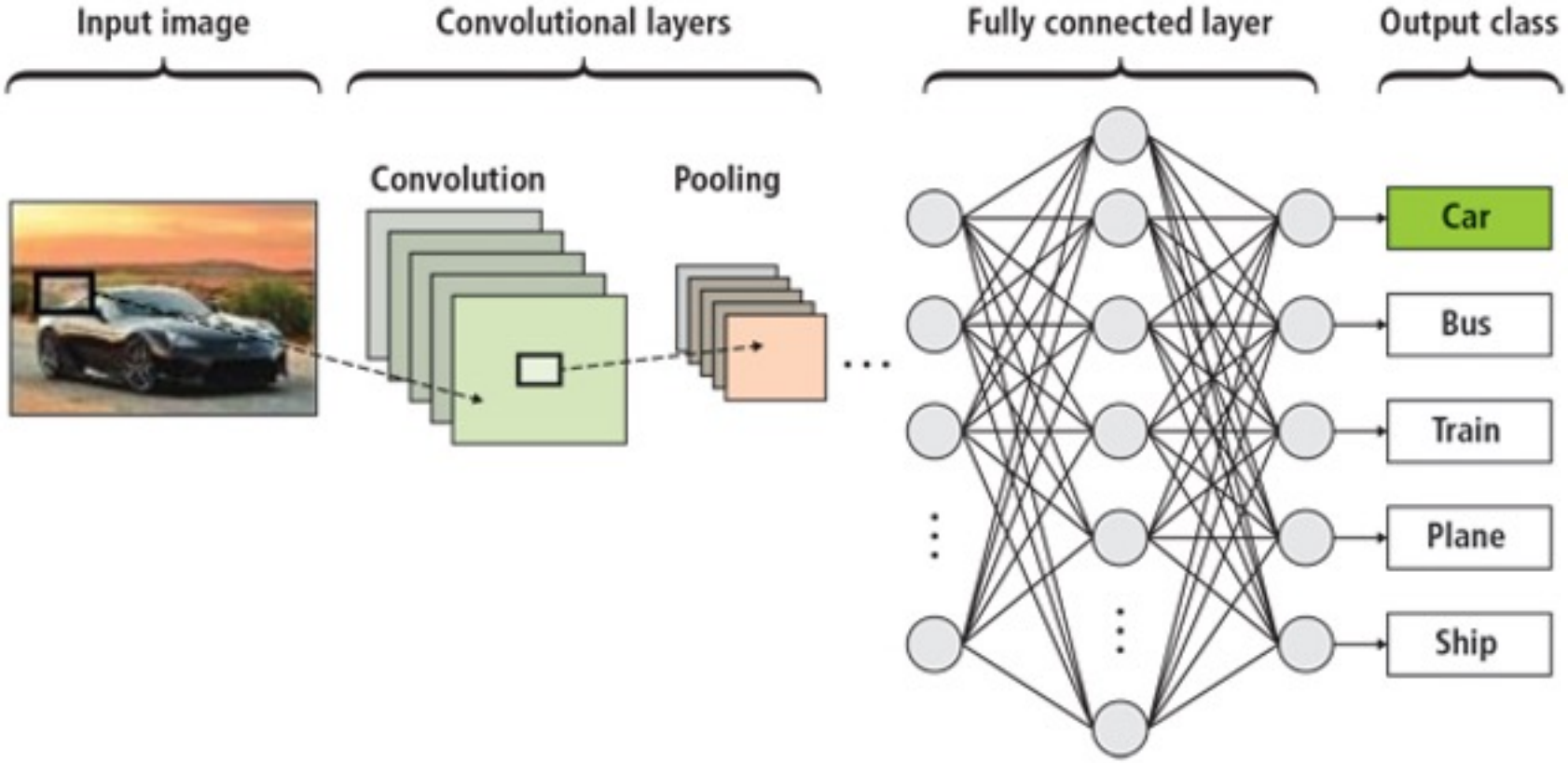
Proposed Vision

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:

- Data Pre-processing: Normalize and resize images for consistent input.
- Feature Extraction: Use CNN layers to extract relevant features from MR images
- Model Training: Fine-tune pre-trained models on the dataset to improve classification performance.


Input image
Convolutional layers
Fully connected layer
Output class
Convolution
Pooling
Car
Bus
Train
Plane
Ship

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:

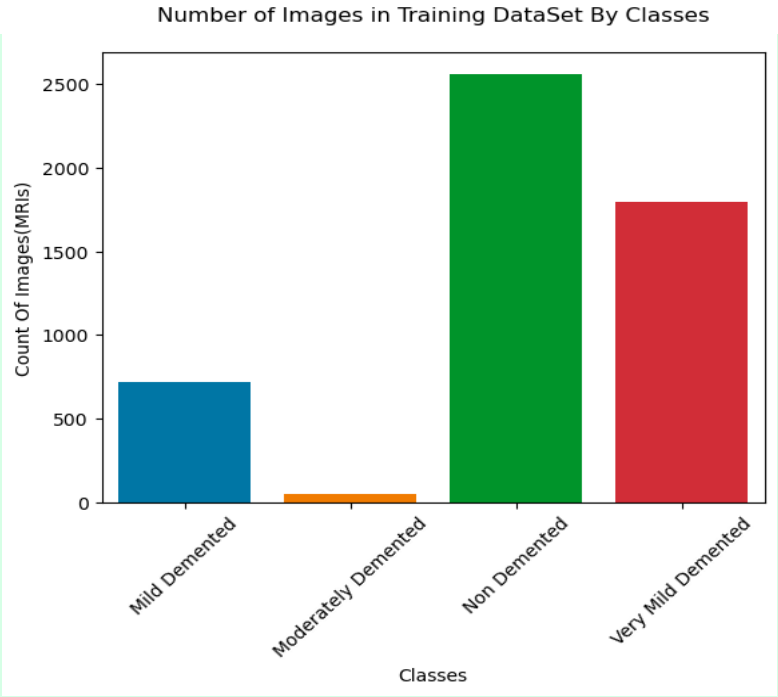
- Quality of Life: Enhances the quality of life for patients by allowing for more effective disease management.
- Emotional Relief: Offers peace of mind to patients and their families by providing a clear diagnosis and a structured treatment plan.

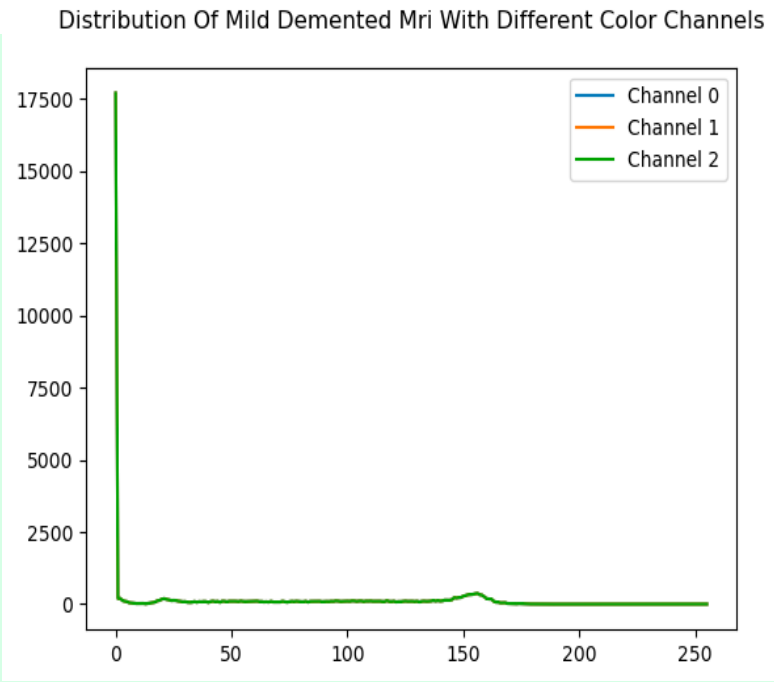
04.

DATASET INTRODUCTION

Overview of MR□□mages

Graphs and Images





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

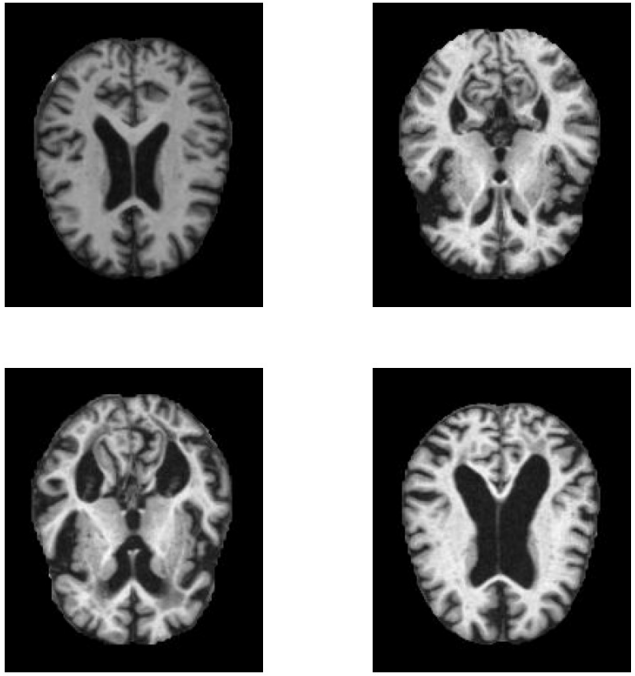
Duration: 3 years

Disease spreads to Occipital Lobe

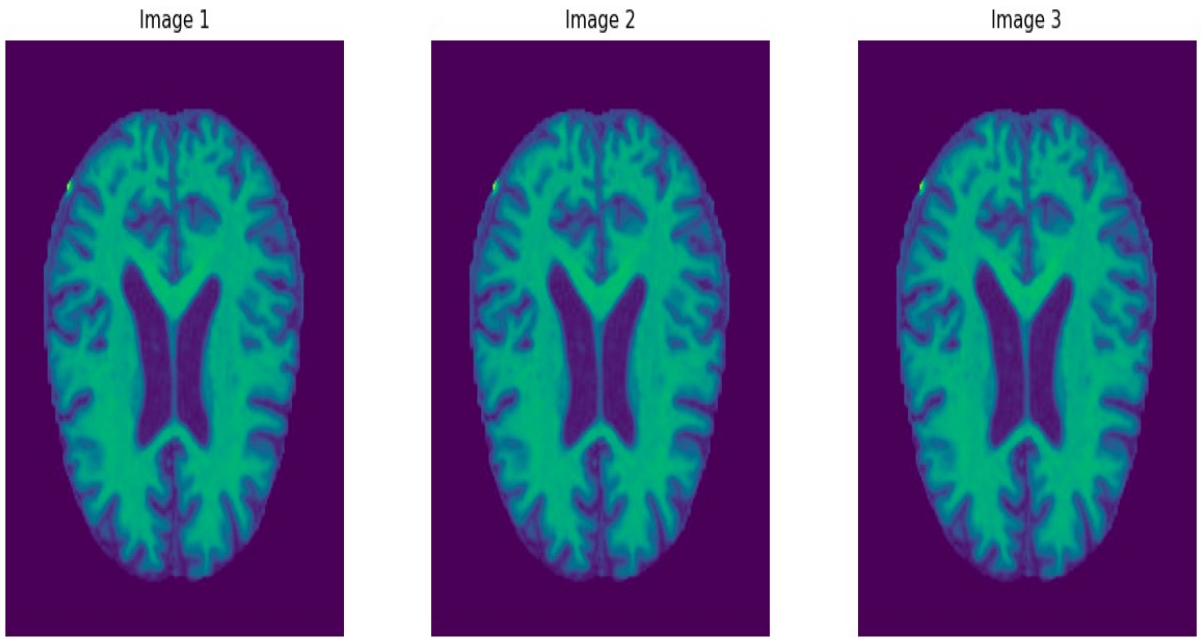
Symptoms include:
Visual problems

Graphs and Images

Mild Demented MRIs



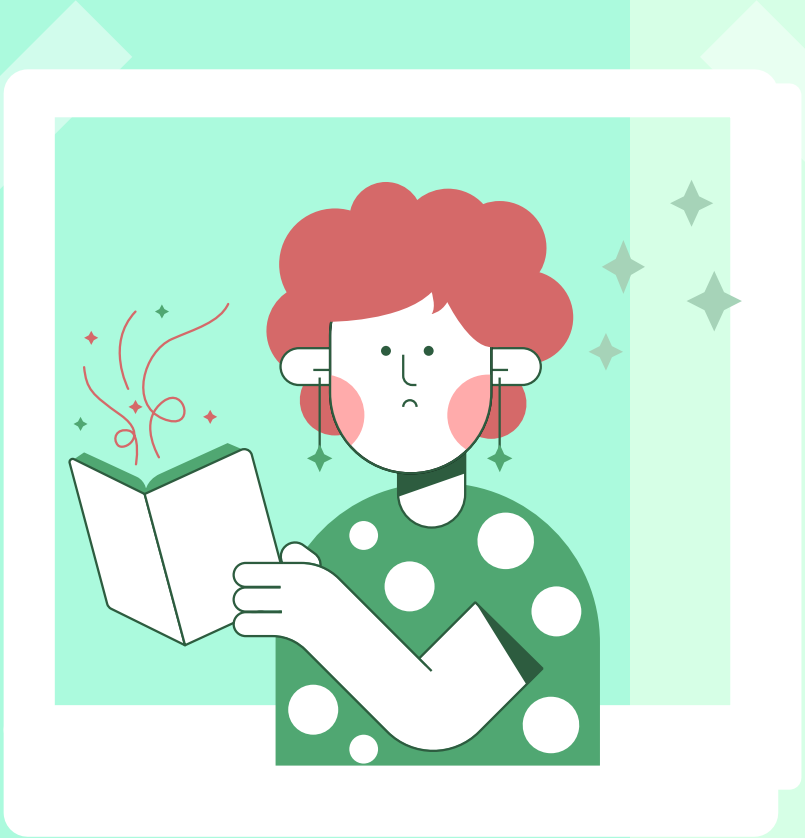
Mild Demented MRI image in 3 different colour channels



05.

Sprint 2 actions:

Pre-processing/ Feature Engineering/Baseline Modelling



Baseline Modelling of Image Classification

Data Pre-processing:

- Converted all images to grayscale by removing the three-color channels, ensuring uniformity in the dataset.
- Converted all images to NumPy arrays for efficient manipulation and computation.
- Reshaped the NumPy array to 2 dimensions so it is compatible with the model
- Created a corresponding array with image labels to serve as the target variable.

Model Selection:

- Chose logistic regression as the initial model for image classification to establish a baseline performance.

Initial Model Training:

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

Data Scaling:

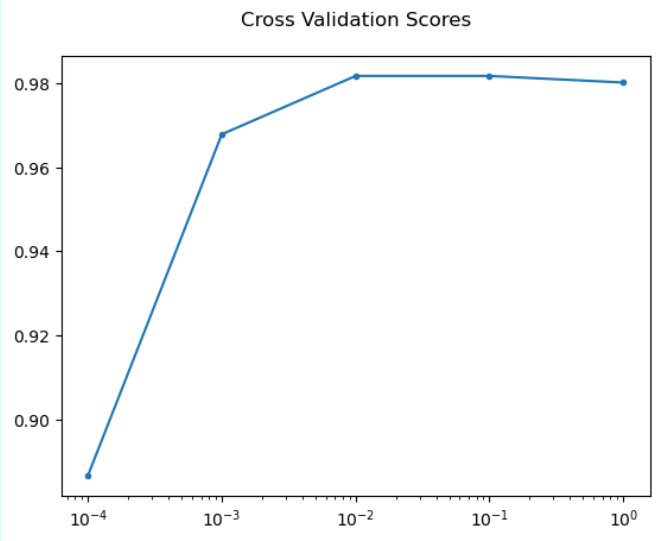
- Applied data Standard Scaling to normalize the feature values, ensuring all features contribute equally to the model training process.

Hyperparameter Optimization:

- Utilized a for loop to iterate through different values of the regularization parameter C in logistic regression.
- Employed cross-validation scoring to evaluate model performance for each value of C.

Model Evaluation:

- Selected the optimal C value based on cross-validation scores.
- Assessed the performance of the logistic regression model with the optimized C parameter to establish that logistic regression may not be the best choice for modeling image classification due to its limitations in capturing complex patterns in the data.




QUESTIONS?