Project Proposal

# Title:

Alzheimer’s Disease Diagnosis and Classification from Brain MRI using Convolutional Neural Networks

# Team Members:

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# Problem Statement:

Alzheimer’s Disease (AD) is a chronic neurodegenerative disorder that progressively affects cognitive abilities and memory. Early and accurate detection is essential for managing the disease and improving patient outcomes. Manual diagnosis through MRI scans is time-consuming, prone to human error, and not scalable. This project aims to develop an automated classification system that detects Alzheimer’s Disease stages from MRI brain scans using deep learning.

# Motivation:

With the rising prevalence of Alzheimer’s Disease and limited medical resources, there's an urgent need for intelligent systems that assist in early diagnosis. Deep learning, particularly Convolutional Neural Networks (CNNs), has shown great promise in medical image analysis, and this project aims to leverage that capability for AD classification to support clinical decision-making.

# Dataset:

The dataset consists of labeled MRI images categorized into four classes: NonDemented, VeryMildDemented, MildDemented, and ModerateDemented. It is publicly available via Kaggle and contains grayscale brain scans pre-classified by medical experts. The dataset includes some imbalance among classes.

# Proposed Approach:

The project will follow these steps:  
- Search for Suitable Dataset   
- Data preprocessing (resizing, normalization, and cleaning corrupted files).  
- Splitting the data into training, validation, and test sets.  
- Designing a CNN model for image classification.  
- Training the model with class weights to handle imbalance.  
- Evaluating the model using accuracy, loss curves, and confusion matrix.  
- Documenting results and preparing a final report.

# Expected Outcomes:

We expect to achieve a reliable and automated classification system capable of distinguishing between stages of Alzheimer’s Disease with high accuracy. The project should also demonstrate how CNNs can be utilized effectively in medical imaging and contribute to the understanding of model limitations.

# Tools & Libraries:

The project will use Python, TensorFlow/Keras, NumPy, Matplotlib, and scikit-learn for implementation, visualization, and evaluation.

# Timeline:

- Week 1: Problem definition and dataset preparation& Model design and initial training.  
- Week 2: Evaluation and analysis.  
- Week 3: Final report writing and presentation preparation.