CET2001 – Artificial Intelligence
Assignment 2: Intelligent Prototype Development

AI Assignment Execution Plan

1. Assignment Objective

The objective of this assignment is to design, implement, and evaluate machine learning models that can classify Alzheimer's disease patients as either Demented or Non-demented using a provided clinical and MRI-derived dataset. The project demonstrates practical AI skills aligned with industry and academic standards.

2. Key Deliverables

- A fully reproducible Jupyter Notebook (.ipynb) containing data analysis, preprocessing, model training, and evaluation.
- An evaluative academic report (~3000 words) explaining the methodology, results, and critical analysis.

3. Project Workflow Overview

The project follows a structured machine learning pipeline beginning with data understanding and ending with evaluation and interpretation of results. Each stage directly supports the learning outcomes LO2, LO3, and LO4.

4. Phase-by-Phase Plan

Phase 1: Data Understanding

- Load the Alzheimer's CSV dataset into Python.
- Inspect dataset structure, variables, and data types.
- Identify missing values and class distribution.

Phase 2: Data Preprocessing

- Handle missing values using appropriate statistical methods.
- Encode categorical variables such as Gender and Group.
- Scale numerical features using standardisation.
- Remove non-informative identifiers such as MRI ID.

Phase 3: Model Development

- Train Logistic Regression as a baseline model.
- Train Random Forest to capture non-linear relationships.

- Train Support Vector Machine for robust classification.
- Train K-Nearest Neighbors for distance-based comparison.

Phase 4: Model Evaluation

- Evaluate models using Accuracy, Precision, Recall, and F1-score.
- Generate confusion matrices for error analysis.
- Plot ROC curves and calculate AUC values.
- Compare all models using a summary performance table.

Phase 5: Critical Analysis & Discussion

- Interpret model results in a healthcare context.
- Discuss strengths and weaknesses of each algorithm.
- Highlight ethical considerations and limitations of the dataset.

5. Priority Execution Steps

- Step 1: Generate and verify the Jupyter Notebook pipeline.
- Step 2: Ensure the notebook runs from scratch without errors.
- Step 3: Extract figures and metrics for the report.
- Step 4: Write the evaluative report aligned with the marking rubric.

6. Expected Outcome

Following this plan will result in a well-structured AI prototype and academic report that demonstrates strong technical competence, critical thinking, and adherence to the CET2001 assessment criteria, targeting a First-Class grade.