# Alzheimer's Disease Prediction Model

**1. Dataset Overview**

* **Accessible Features:** Age, M/F (Gender), EDUC (Education), SES (Socioeconomic Status), and MMSE (Mini-Mental State Examination).
* **Target Variable:** Group (binary classification - Nondemented and Demented).
* **Filtered Out:** The Converted class was excluded to ensure a binary classification task.

**2. Methodology**

* **Models Trained:**
  + **Random Forest**: Ensemble method for classification.
  + **XGBoost**: Gradient boosting framework for optimized performance.
* **Evaluation Metrics:**
  + **Classification Report:** Precision, recall, and F1-score for each class.
  + **AUC-ROC Score:** Measures the model's ability to distinguish between classes.

**3. Results**

**Random Forest**

* **Classification Report:**

|  |  |  |  |
| --- | --- | --- | --- |
| Metric | Nondemented | Demented | Overall / Average |
| Precision | 0.71 | 0.77 | 0.75 (Weighted Avg) |
| Recall | 0.42 | 0.92 | 0.76 (Weighted Avg) |
| F1-Score | 0.53 | 0.84 | 0.74 (Weighted Avg) |
| Accuracy | - | - | 0.76 |

* **AUC-ROC Score:** 0.89

**XGBoost**

* **Classification Report:**

|  |  |  |  |
| --- | --- | --- | --- |
| Metric | Nondemented | Demented | Overall / Average |
| Precision | 0.71 | 0.77 | 0.75 (Weighted Avg) |
| Recall | 0.42 | 0.92 | 0.76 (Weighted Avg) |
| F1-Score | 0.53 | 0.84 | 0.74 (Weighted Avg) |
| Accuracy | - | - | 0.76 |

* **AUC-ROC Score:** 0.92

**4. Analysis**

* **Random Forest:**
  + Strength: High recall for Demented class, making it effective for identifying cases of dementia.
  + Weakness: Lower precision and recall for Nondemented class, leading to more false positives.
* **XGBoost:**
  + Strength: Improved overall accuracy and AUC-ROC score, indicating better discrimination ability.
  + Weakness: Similar challenges in identifying the Nondemented class as Random Forest.

**5. Conclusion**

* Both models are viable for predicting Alzheimer's disease using accessible features.
* **XGBoost** outperformed Random Forest in accuracy and AUC-ROC, demonstrating its strength in this scenario.
* For early detection and resource-limited settings, XGBoost provides a promising approach.