**Abstract:**

Alzheimer's disease (AD) is a progressive neurodegenerative disorder affecting millions worldwide. Early detection and prediction of AD are crucial for effective treatment and management. This project aims to develop a machine learning model for predicting and detecting AD based on relevant biomarkers and clinical data. The model is integrated into a web application for easy access and usability.

**Introduction:**

Alzheimer's disease (AD) is a debilitating neurodegenerative disorder characterized by cognitive decline and memory loss. Early detection and prediction of AD are essential for timely intervention and improved patient outcomes. This project focuses on leveraging machine learning techniques to develop a predictive model for AD using biomarkers and clinical data. The purpose of this project is to provide a tool that can assist healthcare professionals in early detection and intervention strategies for AD patients.

**Literature Review:**

Existing research in AD prediction and detection methods emphasizes the importance of accurate and timely diagnosis. Machine learning techniques, such as support vector machines (SVM), random forests, and deep learning algorithms, have shown promising results in predicting AD progression and detecting early stages of the disease. However, there are limitations in existing approaches, including data availability, model interpretability, and generalizability.

**Methodology:**

The project utilizes a dataset containing biomarkers and clinical data collected from AD patients and healthy controls. Preprocessing steps include data cleaning, feature selection, and normalization to prepare the data for model training. Machine learning algorithms such as logistic regression and gradient boosting are employed for prediction and detection tasks. Model evaluation metrics include accuracy, precision, recall, and F1-score.

**Implementation:**

The model is implemented using Python programming language and popular machine learning libraries such as scikit-learn and TensorFlow. Development of the web application is done using Flask framework to provide a user-friendly interface for interacting with the predictive model. Integration of the model into the web application allows users to input relevant data and obtain predictions regarding AD diagnosis.

**Results:**

The model demonstrates promising performance in predicting AD progression and detecting early stages of the disease. Evaluation metrics such as accuracy, precision, and recall indicate the effectiveness of the model in distinguishing between AD patients and healthy controls. Visualization of key findings provides insights into the predictive capabilities of the model.

**Conclusion:**

The developed machine learning model shows potential for aiding in the early detection and prediction of Alzheimer's disease. By leveraging biomarkers and clinical data, the model can assist healthcare professionals in making informed decisions regarding patient care and treatment strategies. Further validation and refinement of the model are necessary for real-world deployment and integration into clinical practice.

**Future Work:**

Future enhancements to the model may include incorporating additional biomarkers and clinical variables to improve predictive accuracy. Expansion of the dataset to include a more diverse population and longitudinal data can enhance the model's robustness and generalizability. Collaboration with healthcare professionals for validation studies and real-world deployment is essential for translating the model into clinical practice.