Heart disease remains a significant global health concern, demanding effective early detection methods for timely intervention. This project proposes a comprehensive approach to predicting heart disease through electrocardiogram (ECG) signals, employing machine learning techniques. It aims to develop a data pipeline integrating demographic information and ECG signals from the PhysioNet's WFDB database, processing raw inputs into CSV files for analysis. Additionally, image-based ECG signal processing is explored, with separate pipelines converting ECG images into signals for prediction by the same machine learning models. The trained models are deployed on a cloud service, integrated into a user-friendly web interface enabling bulk ECG input and demographic data. This interface includes user authentication, patient record maintenance, and access to past predictions. Furthermore, a medical chatbot aids result interpretation and offers medical guidance. A mobile app facilitates individual ECG image capture for prediction, with chatbot support and patient data recording. This project strives to advance heart disease prediction methodologies, providing a scalable and accessible solution for healthcare professionals and individuals seeking early detection and intervention.

Introduction:

Heart disease remains one of the leading causes of mortality worldwide, necessitating effective strategies for early detection and intervention. According to the World Health Organization (WHO), coronary heart disease accounted for 16.49% of all fatalities in Pakistan, ranking the country 30th globally for heart disease-related deaths, with a death rate of 193.56 per 100,000 people. This alarming statistic underscores the urgent need for improved diagnostic methods to address the growing burden of cardiovascular diseases in Pakistan.

In response to this critical health crisis, this project proposes a novel approach to predict heart disease through the analysis of electrocardiogram (ECG) signals, augmented by demographic information to enhance predictive accuracy. The project aims to establish a robust data pipeline capable of retrieving, processing, and integrating demographic data and ECG signals obtained from the PhysioNet's WFDB database. By incorporating demographic factors such as age, gender, and medical history into the analysis, the project seeks to develop more comprehensive predictive models.

Furthermore, the project explores the potential of image-based ECG signal processing to broaden the scope of prediction methods. This approach involves developing pipelines to convert ECG images into interpretable signals, enabling the utilization of machine learning models trained on image data. By integrating image-based processing techniques, the project aims to improve prediction accuracy and accommodate diverse data sources.

The deployment of trained machine learning models on a cloud service offers enhanced accessibility and scalability, enabling users to submit bulk ECG data for prediction via a user-friendly web interface. This interface features functionalities for user authentication, maintaining patient records, and accessing previous predictions, thereby enhancing usability for both healthcare professionals and individuals.

Moreover, the project aims to enhance user engagement and accessibility by integrating a medical chatbot within the web interface, providing real-time assistance and guidance to users. Additionally, a mobile application is designed to allow individuals to capture ECG images for prediction, catering to personalized assessments. The mobile app includes a chatbot feature for immediate support and maintains a record of patient data, ensuring continuity of care.

Through these integrated components, the project endeavors to advance the field of heart disease prediction, offering a comprehensive and accessible solution for early detection and intervention. By leveraging machine learning and innovative data processing techniques, this project aims to empower individuals and healthcare professionals in the fight against heart disease in Pakistan.