Dil-Ki-Dharkan

AI-Driven Self-Aware approach to detect early onset Heart Attacks

Abstract

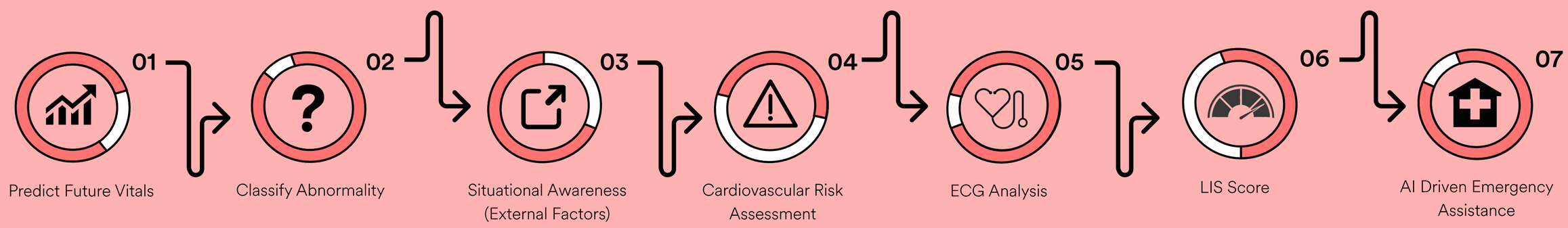
As stress, cholesterol, diet-related issues, and smoking among middle-aged generations become increasingly prevalent, **signs of early onset heart attacks are progressively becoming more and more alarming**. Through the use of AI-driven health monitoring systems, individuals can actively track their cardiac health and detect early signs or symptoms of a potential heart attack. **Real-time monitoring** of vital parameters enables users to identify any abnormalities or irregular patterns, prompting them to seek immediate medical attention before a full-blown cardiac event occurs.

Through the use of this technology, we aim to develop an **autonomous self-aware system** which can detect anomalies and irregularities through continuous monitoring and data analysis to **detect potential red flags** prompting the user about their well-being and consult medical authorities and physicians.
As widespread and extensive heart attacks keep occurring at younger ages, early detection is paramount to curbing this concerning trend.

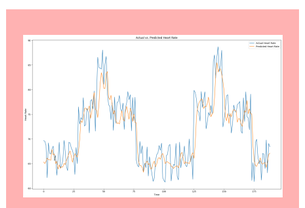
Objectives

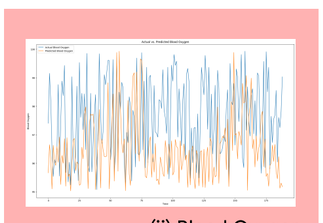
- The ultimate objective is to establish an autonomous **self-aware system that utilizes diverse machine learning algorithms and computer vision techniques** to continuously analyze data, identifying potential red flags in an individual's well-being.
- Being able to **accurately identify** the effects and reasons behind the change in a person's vital readings (**Situational Awareness**).
- Using patient history and other **cardiovascular risk assessment analysis** to determine how much impact it causes on a person's health.

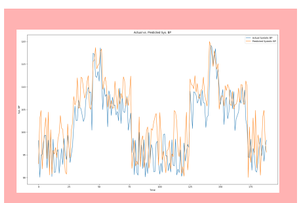
Methodology

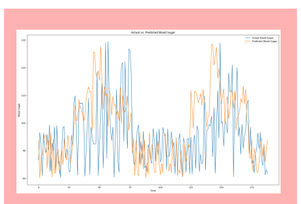


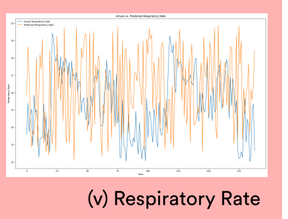
Results

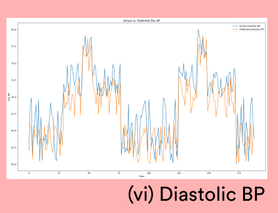

(i) Heart Rate


(ii) Blood Oxygen


(iii) Systolic BP

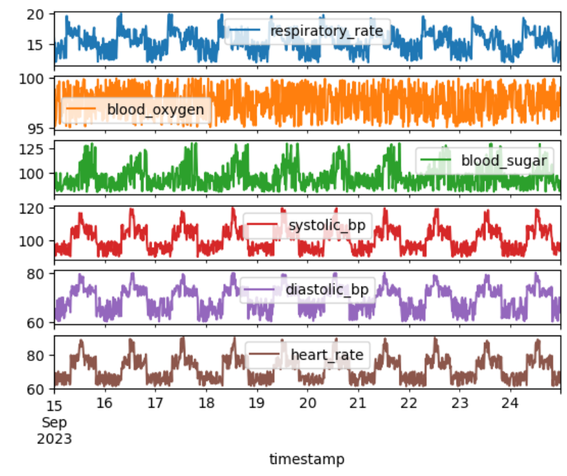

(iv) Blood Sugar


(v) Respiratory Rate

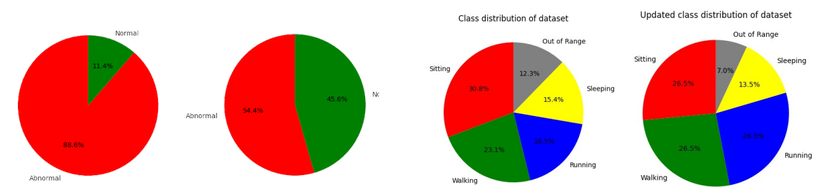

(vi) Diastolic BP

Initial Prediction results with LSTM model using time series dataset of 15 minute intervals for 24h over 10 days. Mean Square Error of 3.00 (MSE) and Root Mean Square Error (RMSE) of 3.923

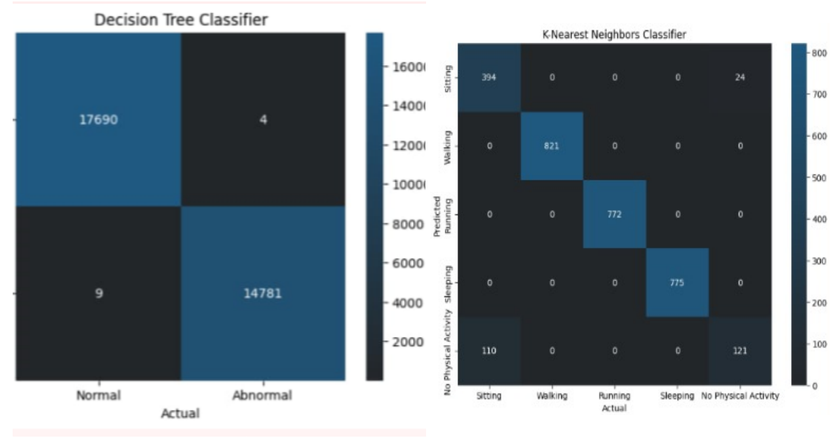
Data Used to generate results



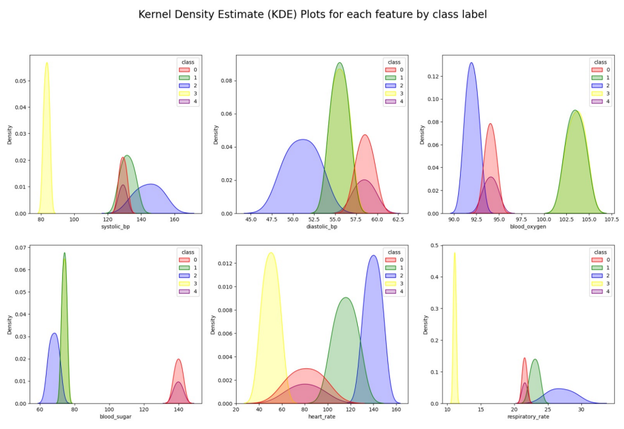
Class Distributions (Before and After sampling)



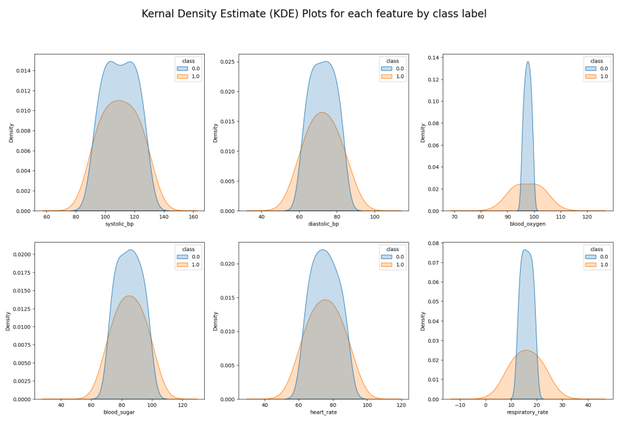
Abnormality Detection using Random Forest Classifier, achieving avg. 10 fold cross-validation 99% accuracy and Self-Awareness module using KNN produced 96% accuracy - Confusion Matrix/ROC curve



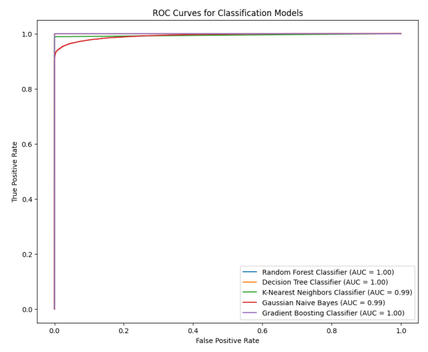
(i) External Factors on Vitals Dataset



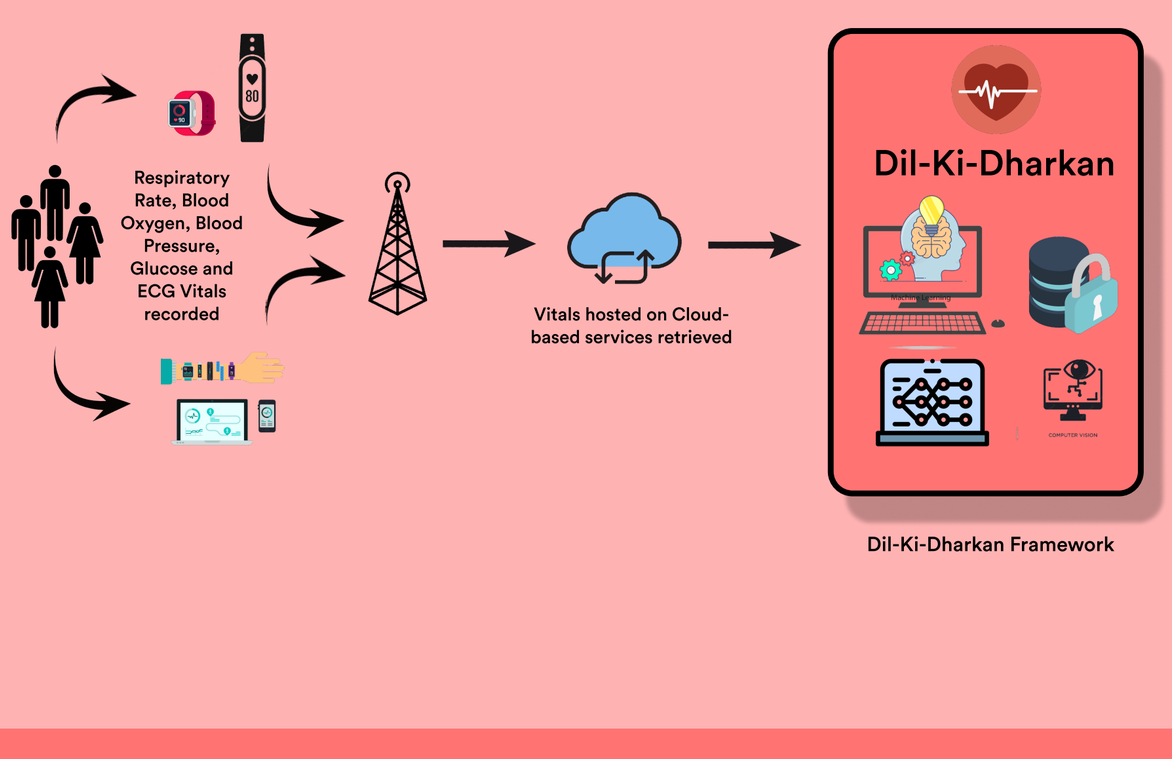
(ii) Normal/Abnormal Vitals Dataset



KDE Plots for each class label



Framework



Technologies Used

matplotlib, seaborn, pandas, Imbalanced learn, NumPy

Dr. Muhammad Farrukh Shahid
Supervisor

Rayyan Minhaj
20K-0143

Ayaan Danish
20K-0245

Zorays Asif
20I-1820