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Automated Health Alerts for in Home Residents (Senior Citizens) Using Sensors and Machine Learning Techniques

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Abstract- The techniques and methods used in the automatic alerts of getting chances of one's health is getting into trouble are described in this paper. A thorough Analysis on the existing systems that helps to identify the health issues and the problems of that Systems Helped to do some advancements in this work, through this work Focus More on Heart diseases by the introduction of sensors that can capture the impacts occurs in heart; Respiratory Rate Sensors ZEPHYRx (respiratory monitoring), and MAX30102 which Uses photoplethysmography (PPG) to measure heart rate by detecting blood flow changes in the skin. Addressing the difficulties of existing system and improving the general functionality of the current system is the main goal of this work. One of the Challenges faced an individual is getting into a stage where disease cannot be cured "Prevention is better than cure" this is the motivation behind this work. health alert systems significantly aid in chronic disease management, addressing the escalating prevalence of conditions like diabetes, hypertension, and heart disease.

Index Terms- SVM, KNN, NN, Heart Diseases, Sensors

I. INTRODUCTION

Embedded health assessment plays a pivotal role in promoting healthcare and enabling individuals to live independently. By continuously monitoring health indicators through behaviour and activity analysis, these systems provide a proactive approach to maintaining well-being. Early detection of health changes not only enhances overall health outcomes but also preserves independence and functionality, particularly in aging populations.

The World Health Organization (WHO) recognizes the significance of healthcare monitoring systems in improving health outcomes globally. These systems align with WHO's objectives of promoting universal health coverage, ensuring access to quality healthcare services, and enhancing health equity. By leveraging technology to monitor health remotely and detect early warning signs, such systems contribute to preventive healthcare strategies, reducing the burden on healthcare systems and improving the quality of life for individuals. There are numerous ML algorithms, EML algorithms, and deep learning techniques available for the identification and prediction of diseases. By using the K-nearest Neighbour Hood, Neural Network and Support Vector Machine to improvethe accuracyof the system.

These algorithms which are above mentioned classifiers performance will be increased. Monitoring using sensors of Motion Sensors, Temperature Sensors, Humidity Sensors: Smoke and Carbon Monoxide Detectors, Occupancy Sensors, Pressure Sensors, Air Quality Sensors, Pathogen Activity Sensors. introduction of sensors that can capture the impacts occurs in heart; Respiratory Rate Sensors ZEPHYRx (respiratory monitoring), and MAX30102 which Uses photoplethysmography (PPG) to measure heart rate by detecting blood flow changes in the skin, Researchers Used EHR stands for Electronic Health Record. It is a digital version of a patient's paper chart that contains all of the patient's medical history from one practice. EHRs are real-time, patient-centered records. A common application of artificial intelligence is machine learning, which uses knowledge and data to predict illness. To improve performance, it makes use of several strategies, including as optimization, a probabilistic approach, and statistical analysis.

II. MOTIVATION

One of the main driving forces behind the development of this architecture was the steadily rising incidence of Heart Diseasesand Heart Attack rates in world for the last 4 years is increasedto 60% the peopleare dying instantly since no one is really caring about the symptoms .Even if wearable health monitors are integrated in watch who spent just a 10 minutes to check that? really no one ! that made me think of this architecture

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.By employing the Machine learning Algorithms we are ensuring the Quality of prediction Alerting whether you have a chance of getting diseseaded is far better than cure. This System provides the Alert on your Heart Health "Prevention is always better than cure". As a result, machine learning has a big chance to lower the death rate.

III. PROBLEM STATEMENT

Using various machine learning algorithms and variety of other sensors yields better results for health detection and prediction. However, when using various machine learning algorithms, one factor that affects the system's performance is the choice of data sets and how well they are selected. The researchers Employed PCA While PCA reduces dimensionality, it may not necessarily improve prediction accuracy unless the reduced set of principal components captures most of the variance related to the target variable. PCA is valuable for reducing the dimensionality of sensor data and exploring its structure, it is not a direct feature selection method. Instead, consider using PCA in conjunction with other feature selection techniques to preprocess and manage high- dimensional sensor data effectively before applying machine learning algorithms for prediction tasks Thus, one of the primary issues is with using the unwanted type of sensors and features that extract through the sensor data's I utilized the Univariate Feature Selection: ANOVA feature selection strategy to solve this problem. Predict health outcomes related to cardiovascular conditions, stress levels, or exercise performance. Respiratory rate, breathing pattern, tidal volume Predict respiratory health outcomes, detect anomalies in breathing patterns Apply chi-square test to determine if respiratory rate categories (e.g., normal vs. abnormal) are significantly associated with health outcomes. So Employing all these techniques improve feature selection and Accuracy of the system.

IV. PROPOSED METHODOLOGY

The primary goal of this work is to create an automated machine learning system for heart disease detection and Diseases prediction. It Focuses more on heart diseases This system will user-friendly graphical interface (GUI) developed with Spring Boot By employing Anova Feature Selection it will ANOVA helps in filtering out noisy features that do not contribute significantly to the prediction task. This leads to cleaner datasets and more robust models. This approach also addresses existing methodology issues through the application of Anova Feature Selection.

The initial stage in the automatic identification and assessment of heart disease involves data preprocessing. This begins with importing relevant heart disease datasets for preprocessing, handling any missing values, and eliminating undesirable columns.

The next phase is Train-Test Splitting, where the dataset is divided into training and testing sets. The third step is feature selection. In this step, of Anova Feature algorithm is initialized and used to perform feature selection. Feature selection is the process of automatically choosing the most impactful features from the data that influence the output or prediction variable of interest. Additionally, we utilize the Spring Boot framework and employ ANOVA feature selection with K- Nearest Neighbors (KNN), Neural Networks (NN), and Support Vector

Machine (SVM) classifiers to enhance the prediction model's performance Prior to modelling data, feature selection has the following advantages:

- Feature selection is a valuable approach for identifying relevant features from optical heart rate and respiratory rate sensor data. By focusing on the individual relationship between each feature and the target variable, this method helps streamline the feature selection process and improve the interpretability of machine learning models in healthcare applications. Simplicity: Straightforward method that evaluates features independently.
- **Interpretability:** Provides insights into which individual features are most relevant for prediction.
- **Computational Efficiency:** Suitable for datasets with a large number of features and relatively small sample sizes Implementing the Classifier Model at the last stage Create the KNN-NN-SVM architecture in this way. This leads to the model being trained using a training set, performance being evaluated, and trained models being saved for diagnosis and prognosis. In order to improve model performance or handle particular issues K cross validation is used. Cross validation is a technique used in machine learning to evaluate the performance of a model on unseen data. It involves dividing the available data into multiple folds or subsets, using one of these folds as a validation set, and training the model on the remaining folds. This process is repeated multiple times, each time using a different fold as the validation set. Finally, the results from each validation step are averaged to produce a more robust estimate of the model's performance. KNN stands as a fundamental yet crucial classification algorithm in machine learning, falling within the domain of supervised learning. Its applications span across pattern recognition, data mining, and intrusion detection due to its versatile nature and effectiveness.

Support Vector Machine (SVM) is a potent machine learning algorithm utilized for both linear and nonlinear classification, regression, and outlier detection tasks. Its versatility extends to applications such as text classification, image recognition,

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spam filtering, handwriting recognition, gene expression analysis, facial recognition, and anomaly detection. SVMs excel in managing high- dimensional data and capturing complex relationships, making them adaptable and efficient across a wide range of domains. Data set

A dataset is a structured collection of data. It can be thought of as a table or a matrix where each row represents a single record and each column represents a particular attribute or variable of that record. Dataset are used in various fields, including statistics, machine learning, and data analysis, to organize and analyze data.

Classifiers

Classifiers are algorithms or models used in machine learning and statistics to assign labels to data points based on their features. The primary goal of a classifier is to predict the category or class to which a new observation belongs, based on a training set of data containing observations whose category membership is known. Here are some key aspects and types of classifiers: Here I Use 3 classifiers KNN, NN and SVM whose output is given to a meta classifier which will predict the final result.

- **Step 1:** Start
- **Step 2:** Input data set for prediction
- **Step 3:** Preprocess the data set

Removed unwanted attributes from the data set

- Perform feature selection

Use ANOVA feature selection method Step4: Split the data set for Testing and Training

- **Step 5:** Train the system
- **Step 6:** After training do classification
- **Step 7:** Then test the system using test data
- **Step 8:** Stop

V. RESULT AND ANALYSIS

Accuracy=Number of correct prediction / All samples

Table 1: Comparison of ML classifiers. Average accuracy in percentage

Machine Learning Model	Prediction Range in %
Support Vector Machine	98.10
Naive Bayes	93.56
K-Nearest Neighborhood	98.10
Artificial Neural Network	98.24

Table 2: Proposed Model. Average accuracy in percentages as calculated

Machine Learning Model	Prediction
Machine Learning Algorithm(NN+KNN+SVM)	93.50%

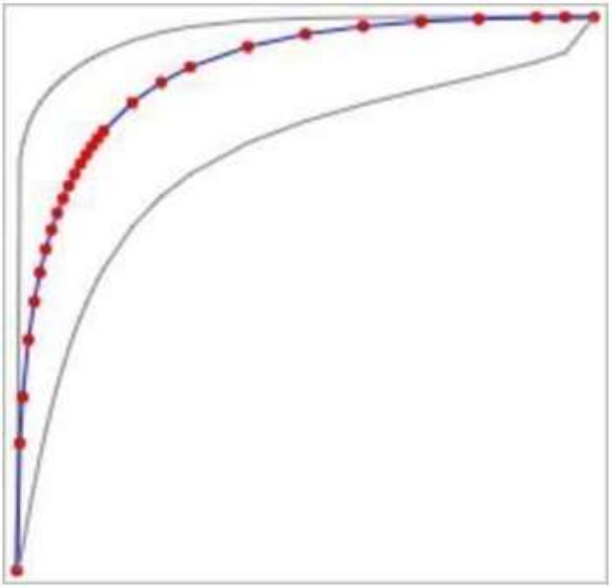

Figure 1: ROC Curve

The receiver operating characteristic curve, or ROC curve, is a graph that displays a classification model's performance over all categorization levels. It displays two parameters as a curve: Actual Positive Ratio. rate of false positives.

The F1 score is a metric used in machine learning and statistics to evaluate the performance of a classification

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model. It combines precision and recall into a single measure, providing a balance between these two metrics.

VI. CONCLUSION

IN Worldwide, Healthcare is crucial for maintaining the well-being of individuals and communities. It ensures that people have access to medical services, treatments, and preventive measures to address their physical and mental health needs.

1. Preventive Care
Healthcare helps prevent diseases through vaccinations, screenings, and health education, leading to a healthier population and reducing the burden on healthcare systems.

2. Treatment and Management
It provides medical care and treatments for illnesses, injuries, and chronic conditions, improving quality of life and longevity.

3. Health Promotion
Healthcare promotes healthy lifestyles and behaviors, encouraging individuals to makeinformed choices regarding diet, exercise, and mental well-being.

4. Community Well-being
Accessible healthcare contributes to the overall well-being of communities by addressing public health issues, reducing the spread of infectious diseases, and promoting social equity.

5. Economic Stability
Health care is vital for economic stability, as healthy individuals are more productive atwork, reducing absenteeism and healthcare costs associated with preventable diseases.

6. Research and Innovation
Health care drives medical research and innovation, leading to advancements in treatments, technologies, and medical practices that benefit society as a whole. Overall, healthcare plays a fundamental role in ensuring the health, safety, and prosperity of individuals and societies. This proposed model will help us in the betterment of ones living conditions as well as the health, identifying health decline early provides a window of opportunity for early treatment and intervention that can address health problems before they become catastrophic. This offers the potential for improved health outcomes, reduced health care costs, continued independence, and better quality of life.

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