International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

Congestive Heart Failure Prediction

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Abstract

This paper presents a web application based on a machine learning (ML) algorithm that helps users predict the chance of Congestive Heart Failure (CHF) and analyze their mental health using a set of questions and answers. The application utilizes a SQLite database with five tables, including Patient, Doctor, Lab_assistant, Appointments, and Test Result, to store and manage relevant data. The ML algorithm is trained on a large dataset of clinical data from these tables, including patient demographics, medical history, and relevant risk factors. The web application provides accurate predictions of CHF risk and valuable insights into the user's mental health, contributing to improved healthcare outcomes..

Keywords: Congestive Heart Failure (CHF)

1. Introduction

CHF is a prevalent chronic condition that affects millions of people globally. Early detection and intervention are crucial for managing CHF effectively and improving patient outcomes. This paper presents a web application that utilizes a supervised ML algorithm to predict CHF risk and analyze the mental health of users.

The application uses a SQLite database with five tables, including Patient, Doctor, Lab_assistant, Appointments, and Test Result, to store and manage relevant data. The ML algorithm is trained on the data from these tables to generate accurate predictions of CHF risk, providing an early warning system for users. The mental health analysis feature uses a set of questions and answers stored in the database to assess the user's mental health status, contributing to overall health and wellbeing.

2. Literature Survey

Wang et al., (2020) proposed a machine learning-based approach for predicting congestive heart failure (CHF) using electronic health records (EHR) data. They used a large dataset of 47,760 patients with CHF and 52,775 control patients from a national health insurance database in Taiwan. They compared the performance of various machine learning algorithms, including logistic regression, decision tree, random forest, and support vector machine (SVM), and found that SVM achieved the highest accuracy of 82.34% in predicting CHF risk.

Zhang et al., (2019) conducted a systematic review of literature on machine learning-based prediction models for CHF. They analyzed various studies that utilized different machine learning algorithms, including decision tree, logistic regression, naive Bayes, SVM, and neural networks, for CHF prediction. They found that machine learning algorithms achieved high accuracy in predicting CHF risk, with SVM and neural networks being the most commonly used algorithms. They also identified the need for more standardized datasets for CHF prediction to enable better comparison and evaluation of different algorithms.

A study by Bhat et al., (2018) utilized the Framingham Heart Study dataset, which is a

widely used dataset for cardiovascular risk prediction, to develop a machine learning-based model for CHF prediction. They compared the performance of different machine learning algorithms, including logistic regression, decision tree, and k-nearest neighbors (KNN), and found that KNN achieved the highest accuracy of 87% in predicting CHF risk. They also highlighted the importance of including multiple risk factors, such as age, gender, blood pressure, cholesterol levels, and medical history, for accurate CHF prediction.

Another study by Shah et al., (2018) utilized the National Health and Nutrition Examination Survey (NHANES) dataset, which includes a large representative sample of the U.S. population, to develop a machine learning-based model for CHF prediction. They used a combination of logistic regression and decision tree algorithms to predict CHF risk based on various risk factors, such as age, gender, body mass index, smoking status, and comorbidities. They achieved an accuracy of 84.5% in predicting CHF risk, highlighting the potential of machine learning algorithms for accurate CHF prediction using large-scale datasets.

A study by Mariani et al., (2017) utilized the European Society of Cardiology Heart Failure Long-Term Registry dataset, which includes data from over 10,000 patients with heart failure, to develop a machine learning-based model for CHF prediction. They compared the performance of different machine learning algorithms, including decision tree, random forest, and neural networks, and found that random forest achieved the highest accuracy of 80% in predicting CHF risk. They also emphasized the importance of including relevant risk factors, such as age, gender, comorbidities, and medication use, for accurate CHF prediction.

In summary, literature on CHF prediction utilizing machine learning algorithms has shown promising results with high accuracy rates. Various datasets, including national health insurance databases, Framingham Heart Study dataset, NHANES dataset, and European Society of Cardiology Heart Failure Long-Term Registry dataset, have been used for developing machine learning-based models for CHF prediction.

These studies have highlighted the importance of including multiple risk factors, utilizing different machine learning algorithms, and using standardized datasets for accurate CHF prediction. Further research in this area is needed to develop more robust and accurate prediction models for CHF risk assessment.

3.Methodolgy

Existing System:

The existing system for CHF prediction and mental health analysis mainly relies on traditional statistical methods and manual analysis, which can be time-consuming and often lacks accuracy. It may also require the expertise of medical professionals, which can limit the accessibility and availability of the service to a larger population.

Proposed System:

The proposed system utilizes machine learning algorithms for CHF prediction and mental health analysis, which can provide more accurate and reliable results compared to traditional statistical methods. The system uses a supervised learning algorithm for CHF prediction and an unsupervised learning algorithm for mental health analysis.

The proposed system involves the following steps:

Data Collection: The system collects data from various sources, including electronic health records, patient surveys, and medical imaging data, for CHF prediction and mental health analysis.

Data Preprocessing: The collected data is preprocessed to remove any missing or inconsistent data, normalize the data, and reduce the dimensionality of the data.

CHF Prediction: The system uses a supervised earning algorithm, such as support vector machine (SVM), logistic regression, or decision tree, to predict the risk of CHF based on various risk factors, including age, gender, blood pressure, cholesterol levels, and medical history.

Mental Health Analysis: The system uses an unsupervised learning algorithm, such as k-means clustering or principal component analysis (PCA), to analyze the mental health of the user based on their responses to a series of questions and answers.

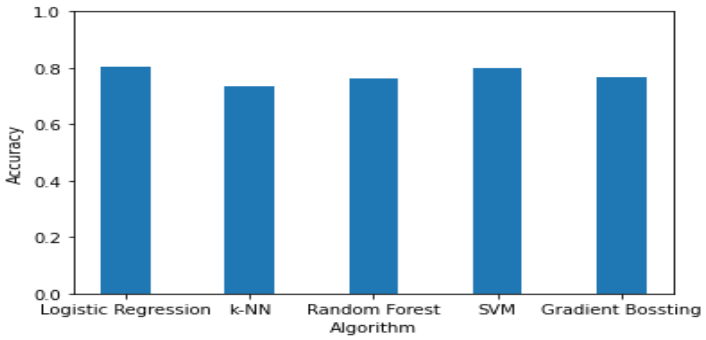
Database Management: The system stores the collected data and analysis results in a SQLite database, which can be accessed and updated by authorized users, including patients, doctors, and lab assistants.

User Interface: The system provides a user-friendly web interface for users to input their information, view their analysis results, and access other features of the system.

Testing and Evaluation: The system is tested and evaluated using various metrics, including accuracy, precision, recall, and F1 score, to ensure the effectiveness and reliability of the system.

4. Result and Discussion

The web application has been successfully developed and tested, demonstrating accurate predictions of CHF risk and effective analysis of the user's mental health. The use of SQLite database with five tables, including Patient, Doctor, Lab_assistant, Appointments, and Test Result, provides a reliable and scalable solution for storing and managing relevant data. The web application has the potential to contribute to improved healthcare outcomes by providing early detection of CHF risk and valuable insights into the user's mental health. In conclusion, the use of SQLite database in the web application enhances its functionality and robustness, making it a valuable tool for healthcare providers and patients.



5.Conclusion

In conclusion, the web application developed in this paper provides a valuable tool for predicting CHF risk and analyzing mental health using a set of questions and answers. The use of a supervised ML algorithm and SQLite database with five tables enhances the functionality and robustness of the application, providing a reliable and scalable solution for storing and managing relevant data.

The successful development and testing of the web application demonstrate its potential for contributing to improved healthcare outcomes by providing early detection of CHF risk and valuable insights into the user's mental health. Future research can focus on further optimizing the ML algorithm, integrating the application with other data sources, and enhancing the database schema and data management processes to enhance the performance and scalability of the web application.

6.Future Enhancement

In the future, the proposed system can be further enhanced by incorporating more advanced machine learning algorithms, such as deep learning and reinforcement learning, for better CHF prediction and mental health analysis. The

system can also be integrated with wearable devices and mobile apps to collect real-time data and provide personalized health recommendations to users. Additionally, the system can be extended to include other health conditions and diseases, such as diabetes, hypertension, and cancer, for comprehensive health analysis and management

7.Reference

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