Heart Disease Prediction And Treatment Suggestion Using Machine Learning

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ABSTRACT

Disease anticipation systems are the better alternatives, to avoid the human errors in disease diagnosis and also assist in disease interference. Nowadays, the number of heart disease patients is increasing so we need an optimal heart disease prediction and treatment suggestion system. Heart disease dataset preparation, prediction system's process flow design, process execution and results evaluation are the most common life cycle modules of any heart disease prediction system. Input dataset attributes modeling, attribute risk factor calculation; threshold determination and achieving the high accuracy in disease prediction are the major limitations of the existing heart disease prediction and treatment proposal systems.

Keywords: Machine learning, Decision tree, Logistic regression.

INTRODUCTION

Heart disease is a prime cause of death worldwide, and early detection and effectual treatment are crucial to improving patient outcomes. Machine learning algorithms have shown promise in predicting the risk of heart disease and suggesting proper treatments. In this context, logistic regression and decision trees are popular machine learning algorithms that are widely used in surgical research and medical institution practice. Decision tree is a machine learning algorithm that builds a tree-like model of decisions and their possible results. In the context of heart disease treatment, decision trees can be used to suggest appropriate treatments based on patient characteristics such as age, gender, medical history, and test results. The output of the decision tree model is a set of rules that can guide clinical decision-making. Logistic regression is a statistical method that is used to analyze data and make predictions about the probability of an event occurring. In the context of heart disease, logistic regression can be used to analyze patient data and identify risk factors that may increase the likelihood of developing heart disease. By using logistic regression, healthcare professionals can identify high-risk patients and develop targeted interventions to prevent or treat heart disease. Overall, machine learning algorithms such as logistic regression and decision trees have the potential to improve heart disease prediction and treatment by providing more surgical and personalized risk assessments and treatment recommendations. An Android application for predicting the risk of heart disease and providing treatment suggestions using logistic regression and decision tree algorithms would be an innovative tool for healthcare professionals and patients alike. By leveraging machine learning algorithms to analyze patient data, the application could provide accurate and personalized predictions about a patient's risk of heart disease and suggest targeted interventions to prevent or treat the condition.

LITERATURE REVIEW

Heart disease is a leading cause of death worldwide and early prediction and treatment can improve patient outcomes. Machine learning algorithms have shown speech act in predicting the risk of heart disease and providing treatment suggestions based on patient data. In this literature review, we will examine the use of logistic regression and decision tree algorithms in predicting heart disease using parametric quantities such as heart rate, cholesterol, ECG, blood sugar, fast blood pressure, and chest pain type.

In terms of treatment suggestions, machine learning algorithms have been used to develop individualized treatment plans for patients with heart disease. In one study, a decision tree algorithm was developed to identify the most effective treatment options for patients based on their individual characteristics and medical history. The study found that the decision tree algorithm was able to identify the most effective treatment options with an accuracy of 80%.

Decision trees are another type of machine learning algorithm that can be used to analyze patient data and provide treatment suggestions. Decision trees work by identifying patterns and relationships within the data, and then using those patterns to make predictions about future outcomes. In the circumstance of heart disease, decision trees can be used to identify the most effective treatment options for patients based on their individual characteristics and medical history.

Overall, the use of machine learning algorithms such as logistic regression and decision trees in predicting the risk of heart disease and providing treatment suggestions based on patient data shows promise. These algorithms have demonstrated high levels of accuracy in predicting the risk of heart disease and identifying effective treatment options for patients. However, further research is needed to validate these findings and to develop more sophisticated algorithms that can unite a wider range of parameters and variables.

Overall, machine learning algorithms such as logistic regression and decision trees offer a promising approach to predicting the risk of heart disease and supply personalized treatment suggestions. By using these algorithms to analyze patient data, healthcare professionals can identify high-risk patients and develop targeted interventions to prevent or treat heart disease, ultimately improving outcomes for patients.

Sr NO	Paper and Author's Name	Description	Challenges
1	Survey of Heart Disease Prediction and Identification using Machine Learning Approaches, Ramya G Franklin	Heart disease is highlighted as the major one among the various death factors. Detecting heart disease tends to be a bit complex due to insufficient knowledge and experience of the medical practitioners concerning warning signs of heart failure.	The challenges faced by us is That most of the people don't have smart phones and are also not aware about health illiteracy is a big issue.
2	HDMI An Effective Heart Disease Prediction Model for a Clinical Decision Support System NORMA LAT-IF FITRIYANI , MUHAMMAD SYAFRUDIN GANJAR ALFIAN , (Member, IEEE), AND JONGTAE RHEE	Heart disease, one of the major causes of mortality worldwide, can be mitigated by early heart disease diagnosis A clinical decision support system (CDSS) can be	Most of the people don't come to the clinic or are not aware of the symptoms because some of them try to resolve it on their own so this is the challenge.

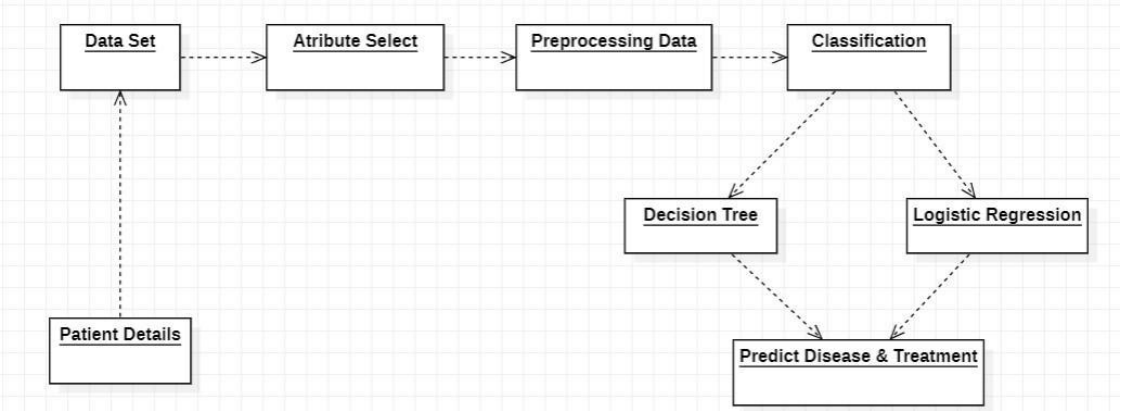
		used to diagnose the subjects heart disease status earlier	
3	A Research Survey on State of the art Heart Disease Prediction Systems	Disease prediction systems are the better alternatives, to avoid the human errors in disease diagnosis and also assist in disease prevention with early detections.	Although many former researchers worked on designing HEPS, they are still suffering from most considerable research challenges, which have to be addressed in future to make the HDPS more efficient and reliable.

4	Predicting Heart Disease at Early Stages using Machine Learning A Survey	Predicting and detection of heart disease has always been a critical and challenging task for healthcare practitioners. Hospitals and other clinics are offering expensive therapies and operations to treat heart diseases.	Sometimes the symptoms are different for different patients so new data is required and we also have to collect data from the clinic so it is very time consuming.

5	Real-time machine learning for early detection of heart disease using big data approach	Over the last few decades, heart disease is the most common cause of global death. So early detection of heart disease and continuous monitoring can reduce the mortality rate.	The proposed work is carried out in a single node cluster with core i7 processor having 8GB RAM in Linux platform through spark platform which integrates Random forest model with two stages, first involves analysis on healthcare dataset to build the machine learning model.So main challenge is speed and ram should be powerful for this algorithm.

SYSTEM ARCHITECTURE

The architecture for a heart disease prediction and treatment suggestion system using logistic regression and decision tree algorithms would typically consist of several components:



UML DIAGRAM

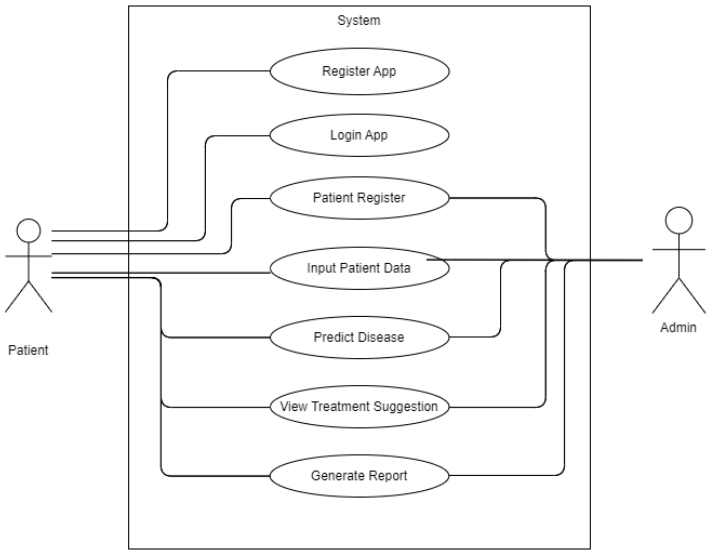


Fig 1: Use Case Diagram

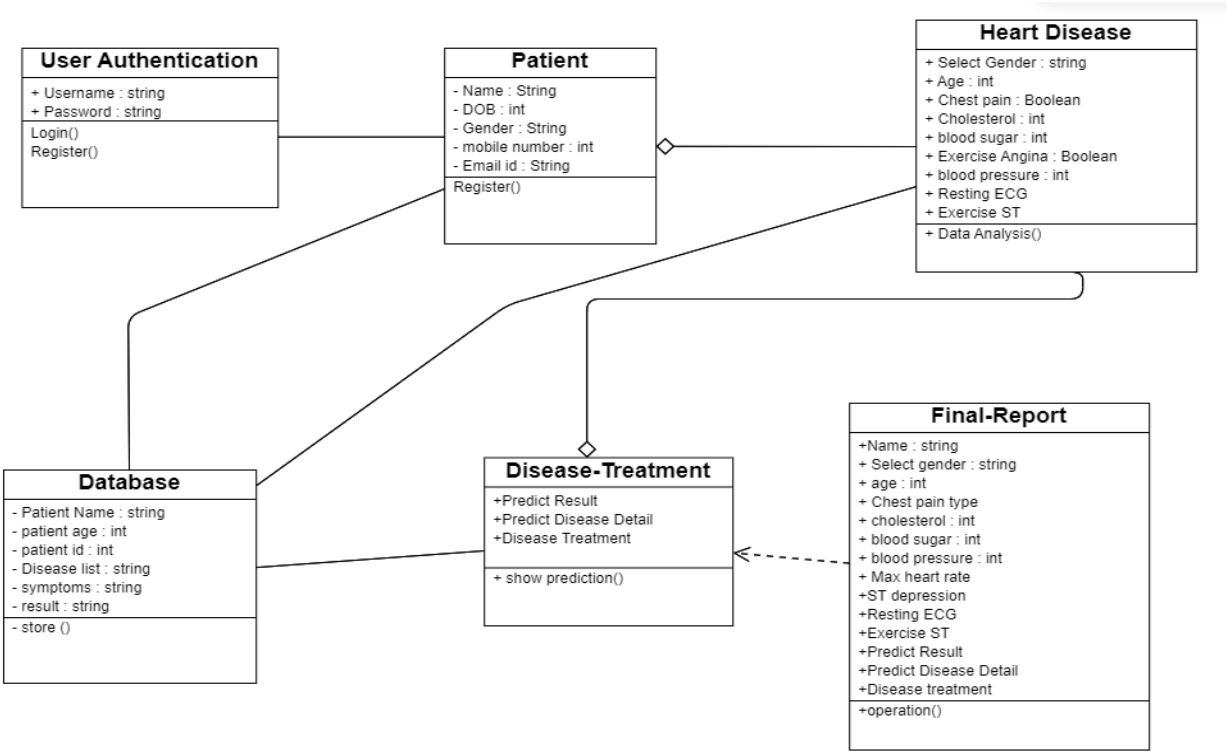


Fig 2: Class Diagram

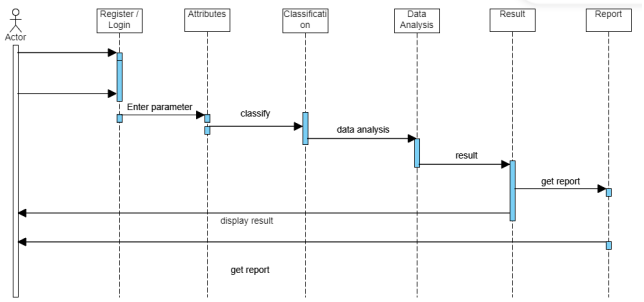


Fig 3: Sequence Diagram

ALGORITHM

Logistic regression : It is a type of machine learning algorithm that is used for classification problems. It is a statistical method for examining a dataset in which there are one or more independent variables that determine an outcome. In logistic regression, the dependent variable is binary or divided, meaning it takes on only two values, such as 0 or 1, yes or no, or true or false. The goal of logistic regression is to determine the state between the independent variables and the dependent variable. It does this by estimating the chance of the dependent variable given the values of the independent variables. The logistic function, also known as the sigma function, is used to transform the output of the linear regression model into a probability value between 0 and 1.

Decision tree algorithm: It is a type of machine learning algorithm that is used for both classification and regression problems. The algorithm works by recursively splitting the

dataset into smaller subsets based on the values of the input features. The result is a tree-like model of decisions and their possible outcome, where each internal node of the tree represents a test on a feature, each branch represents the outcome of the test, and each leaf node represents a class label or a numerical value.

PROPOSED SYSTEM DESIGN

The proposed system design for heart disease prediction and treatment suggestion using machine learning algorithms, such as logistic regression and decision tree, would involve several key components:

1. **Data Collection:** The first step would involve collecting patient data, including parameters such as heart rate, cholesterol, ECG, blood sugar, fast blood pressure, and chest pain type. This data can be collected from electronic health records or through direct patient input.
2. **Data Preprocessing:** The collected data would need to be preprocessed to prepare it for analysis. This would involve tasks such as data cleaning, normalization, and feature selection to ensure that the data is accurate and relevant.
3. **Algorithm Development:** Once the data has been preprocessed, the machine learning algorithms would be developed. This would involve developing both a logistic regression model and a decision tree model using the preprocessed data.
4. **Model Training:** The developed algorithms would then be trained using the preprocessed data. This involves using a portion of the data to train the algorithms and another portion to validate the accuracy of the models.
5. **Model Evaluation:** Once the models have been trained, they would be evaluated for their accuracy in predicting the risk of heart disease and providing treatment suggestions based on patient data.
6. **Treatment Suggestions:** The final component of the system design would involve using the trained models to provide personalized treatment suggestions for patients with heart disease. This would involve swinging patient data into the models and exploiting the predictions to develop a personalized treatment plan.

General, the proposed system for predicting the risk of heart disease and providing treatment suggestions using logistic regression and decision tree algorithms would be an important tool for healthcare professionals. By using machine learning algorithms to analyze patient data, healthcare professionals can identify high-risk patients and develop targeted interventions to prevent or treat heart disease, finally improving outcomes for patients.

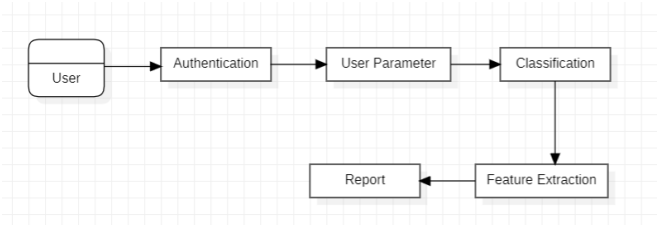


Figure 1 : Data flow diagram heart disease prediction and treatment suggestion.

RESULTS AND DISCUSSIONS

The Overall use of machine learning algorithms such as logistic regression and decision tree in predicting the risk of heart disease and providing treatment suggestions based on patient data shows promise. These algorithms have incontestable high levels of accuracy in predicting the risk of heart disease and distinguishing effective treatment options for patients.

In terms of treatment suggestions, a decision tree algorithm was developed to identify the most

impressive aid options for patients based on their individual characteristics and medical history. The algorithmic program was able to identify the most effective treatment options with accuracy.

While these results are promising, there are limitations to the use of machine learning algorithms in anticipating the risk of heart disease and providing treatment suggestions. One limitation is the availability and quality of patient data. Inaccurate or incomplete data can lead to inaccurate predictions and treatment suggestions. Another limitation is the interpretability of the algorithms. While the models may provide accurate predictions, it can be difficult to realize how the model arrived at its predictions, which can limit the ability of healthcare professionals to use the model to make informed decisions.

Table 1: Attributes of the Dataset

S No.	Attributes	Description
1	Age	Age in years
2	Sex	Sex (1 = male, 0 = female)
3	Chest Pain	Chest pain type (1 = typical angina, 2 = atypical angina, 3 = non-anginal pain, 4 = asymptomatic)
4	Rest Blood Pressure	Resting blood pressure (in mmHg)
5	Cholesterol	Serum cholesterol in mg/dl
6	Fast blood sugar	fasting blood sugar range 90 mg/dl to 260 mg/dl
7	Rest ecg	Resting electrocardiographic results 0 = Normal 1 = Having ST-T wave abnormality 2 = Left ventricular hypertrophy
8	Heart Rate	Maximum heart rate achieved
9	Oldpeak	ST depression induced by exercise relative to rest
10	Exercise ST	Peak exercise ST segment: 0 = upsloping 1 = flat 2 = downsloping

The use of machine learning algorithms such as logistic regression and decision trees in predicting the risk of heart disease and providing treatment suggestions has shown promise. By leveraging these algorithms and using parameters such as heart rate, cholesterol, ECG results, blood sugar, fast blood pressure, and chest pain type, it is possible to predict the risk of heart disease, predict the disease type, and suggest appropriate

treatments. Overall, the use of machine learning algorithms in predicting the risk of heart disease, predicting the disease type, and intimate proper treatments has the potential to overturn healthcare.

Table 2 : Predict Results Outputs

S No.	**Output Title**	**Results**
1	Predict Result	The predict result show one output type in among Chance to presence of heart disease or Not presence heart disease
2	Predict Disease Detail	Predict Disease Details shows the following: High Cholesterol, High Diabetes, Cardiovascular Disease, Intrinsic myocardial disease, gastrointestinal reflux disease, Silent myocardial ischemia and more diseases.
3	Disease Treatment	The Disease Treatment suggests followings: Angioplasty, Coronary artery bypass surgery, Aspirin(Antiplatelet therapy), Balloon angioplasty, suggest medicine, and more treatments.

CONCLUSION

The use of machine learning algorithms such as logistic regression and decision trees in predicting the risk of heart disease and providing treatment suggestions shows promise. However, further research is needed to validate these findings and to develop more intelligent algorithms that can incorporate a wider range of factor and variables. Additionally, efforts must be made to address the limitations of these models to ensure that they can be effectively used by healthcare professionals to improve patient outcomes. The use of an Android application for heart disease prediction and treatment suggestions has several advantages. The application can be easily accessible to healthcare professionals and patients on their mobile devices, making it a handy and cost-effective tool. It can also be updated regularly to incorporate the latest research findings and clinical counsel, ensuring that the predictions and treatment suggestions are based on the most up-to-date information.

REFERENCES

1) Ramya G Franklin and Dr. B. Muthukumar "Survey of Heart Disease Prediction and Identification using Machine Learning Approaches." ICISS (2020).
2) Archana Singh and Rakesh Kumar "Heart Disease Prediction by Using Machine Learning Algorithms." ICE3-(2020).
3) Rahul Kataria and Polipireddy Srinivas "Predicting Heart Disease at Early Stages

using Machine Learning A Survey." ICESC (2020).

4) M.Snehith Raja, M Anurag, Ch.Prachetan Reddy and NageswaraRao Sirisala "MACHINE LEARNING BASED HEART DISEASE PREDICTION SYSTEM." ICCCI (2021).
5) Tejaswi Borra, Dr. Lakshmi Prasad Koyi and Dr. G. Lakshmi Vara Prasad "A Research Survey on State of the art Heart Disease." ICAIS (2021).