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AI-Powered Health Care System for Disease Prediction, Risk Analysis and Smart Appointment System

Ms.Karthika. K*, Bhagyarathis. P**, Dhivya Pratha. R**, Kaviya. S**

*Assistant Professor -Computer Science and Engineering,Anjalai Ammal Mahalingam Engineering College,Kovilvenni,
**UG Students -Computer Science and Engineering,Anjalai Ammal Mahalingam Engineering College,Kovilvenni,
India

***Abstract*—**

Heart disease is a serious condition that can cause death or long-term health problems, so early detection is very important. This project predicts heart disease using Logistic Regression, a machine learning algorithm, based on patient data like age, blood pressure, cholesterol, and other health factors. The system analyses healthcare data to find patterns and provide accurate predictions, helping doctors make better decisions. A dashboard shows nearby hospitals and specialist doctors based on the patient's location. Patients can book appointments, and doctors can accept or reject them and add prescribed medicines for the patient to view. The system also has a chatbot using RNN and NLP that answers health-related questions, giving users guidance and improving access to healthcare services.

***Keywords*—**heart disease prediction, logistic regression, machine learning, RNN, NLP, healthcare chatbot, appointment management.

I. Introduction

Heart disease remains a major global health concern and is among the leading causes of mortality worldwide. The heart plays a vital role in maintaining life by circulating blood and delivering oxygen and essential nutrients to all parts of the body. Any disruption in its normal functioning can result in severe health complications. Several factors, including hypertension, elevated cholesterol levels, poor diet, lack of physical activity, and unhealthy lifestyle choices, significantly contribute to the risk of developing cardiovascular diseases. Hence, identifying potential risks at an early stage is critical for effective treatment and improved survival rates.

Conventional diagnostic practices mainly depend on clinical examinations, laboratory tests, and expert evaluation by healthcare professionals. While these methods are reliable, they can be time-intensive and may sometimes delay diagnosis, especially when dealing with large volumes of patient data. With the increasing availability of digital healthcare data, machine learning offers promising solutions for building efficient and accurate predictive systems. This study presents a heart disease prediction model based on Logistic Regression, which evaluates key health indicators such as age, blood pressure, and cholesterol levels to estimate disease risk. In addition to prediction, the system integrates supportive features including a healthcare dashboard for locating nearby hospitals and specialists, tools for managing appointments and prescriptions, and an intelligent chatbot powered by RNN and natural language processing to assist users with medical queries. These enhancements aim to promote early diagnosis and improve healthcare accessibility.

II. Literature Review

Recent studies highlight the growing importance of machine learning in predicting and diagnosing heart disease at an early stage. In [1], Chang et al. developed an artificial intelligence-based model that applies multiple machine learning algorithms to improve the accuracy of heart disease detection. Their work emphasises how data-driven approaches can support faster and more reliable clinical decisions. Similarly, Nagavelli et al. [2] explored various machine learning techniques and demonstrated their effectiveness in analysing patient data to identify heart-related risks with better precision.

Jevin et al. [3] proposed a classification-based approach within an e-healthcare framework, focusing on improving diagnosis through automated systems. Their study shows how integrating machine learning into digital healthcare platforms can enhance accessibility and efficiency. A comprehensive review by Ahsan and Siddique [4] examined multiple research works and concluded that machine learning models, especially when combined with feature selection techniques, significantly improve prediction performance.

Yilmaz and Yagin [5] focused on the early detection of coronary heart disease using different machine learning methods, highlighting the importance of early intervention in reducing mortality rates. Additionally, Mohan et al. [6] introduced a hybrid machine learning approach, combining multiple algorithms to achieve higher accuracy compared to single-model techniques.

Overall, these studies demonstrate that machine learning plays a vital role in modern healthcare by enabling accurate, efficient, and early detection of heart disease, thereby supporting better patient outcomes and preventive care.

III. Problem Definition

Heart disease is a major life-threatening condition and delayed or inaccurate diagnosis can lead to severe complications or death. Traditional healthcare systems often rely on costly clinical tests and manual analysis, which may not reveal hidden patterns in patient data. There is a lack of intelligent tools that combine predictive analytics with real-time healthcare support for patients. Patients face difficulties in finding nearby hospitals, specialists, and timely medical consultation, which affects treatment efficiency. An integrated system is needed that not only predicts heart disease but also provides recommendations, appointment management, medicine tracking, and interactive healthcare guidance through a chatbot.

IV. Existing System

Traditional heart disease diagnosis relies on clinical tests and manual evaluation by doctors, which can be time-consuming and expensive. Existing healthcare systems often provide only basic patient record management without predictive analytics for disease detection. There is no integration of patient location data to recommend nearby hospitals or specialists automatically. Appointment booking and medicine tracking are generally handled offline or through separate platforms, causing inefficiency and delays. Current systems lack intelligent interactive support, such as chatbots, to answer patient queries or provide guidance on health-related issues.

V. Proposed System

A. Data Collection and Preprocessing

Patient health data, including age, blood pressure, cholesterol, and other risk factors, is collected and preprocessed for accurate model training.

B. Heart Disease Prediction

Logistic Regression is applied to predict the likelihood of heart disease based on the patient's health parameters.

C. Dashboard and Recommendations

A patient dashboard shows nearby hospitals and specialist doctors based on the patient's location.

D. Appointment and Prescription Management

Patients can book appointments; doctors can accept or reject requests and update prescribed medicines, which patients can view on their dashboard.

E. Healthcare Chatbot

An intelligent chatbot using RNN and NLP answers patient queries, provides health guidance, and improves overall healthcare accessibility.

VI. System Architecture

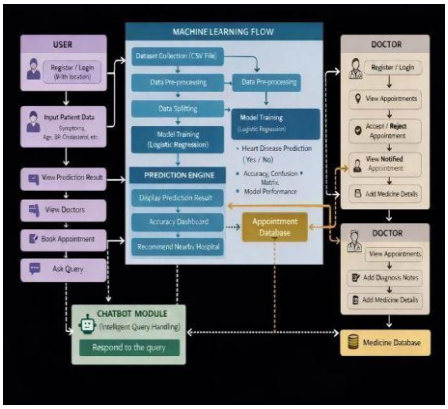

Fig. 1. System architecture of the AI-powered healthcare prediction system.

VII. Implementation Details

The system is implemented using a machine learning model where Logistic Regression is used to train the healthcare dataset and predict the probability of heart disease based on patient medical parameters.

Data preprocessing techniques such as data cleaning, normalisation, and feature selection are applied to prepare the dataset for accurate model training and prediction.

A web-based dashboard is developed where patients can register, log in, enter health details, and view prediction results along with nearby hospital and specialist doctor recommendations.

The appointment management module allows patients to book consultations, while doctors can review requests, accept or reject appointments, and update prescriptions for patients to access.

A healthcare chatbot module is integrated using Recurrent Neural Network (RNN) and Natural Language Processing (NLP) techniques to understand user queries and provide appropriate healthcare-related responses.

VIII. Results and Discussion

TABLE I
PERFORMANCE COMPARISON OF MACHINE LEARNING MODELS

Model	Acc. (%)	MSE	R^2	Time (s)
LogR	84.5	0.155	0.74	0.8
SVM	88.2	0.132	0.74	2.5
RNN	91.6	0.098	0.81	12.4

The Heart Disease Prediction System provides an effective solution for the early detection of heart-related health risks using machine learning techniques. By analysing important health parameters such as age, blood pressure, cholesterol levels, and other medical factors, the system predicts the likelihood of heart disease using the Logistic Regression

algorithm. This approach helps in identifying potential health issues at an early stage, allowing patients to take preventive measures and seek timely medical attention.

The system also improves healthcare accessibility by integrating additional features such as a dashboard for hospital and specialist recommendations. Patients can easily locate nearby hospitals and doctors based on their location and book appointments directly through the platform. Doctors can manage appointment requests and update prescriptions, which patients can view through their dashboard.

Furthermore, the integration of an intelligent healthcare chatbot enhances user support and accessibility. The chatbot uses Recurrent Neural Networks and Natural Language Processing to understand user queries and provide relevant responses related to heart health. Overall, the system combines disease prediction, healthcare service access, and intelligent user interaction to improve patient care and promote early detection of heart disease.

IX. Conclusion and Future Work

This project presents an intelligent system designed to predict the likelihood of heart disease using the Logistic Regression algorithm applied to patient health data. The main goal is to support early identification of potential heart-related risks, enabling individuals to seek timely medical advice and adopt preventive measures. By analysing key health parameters, the system provides a simple yet effective way to assist both patients and healthcare professionals in decision making.

In addition to prediction, the system includes a user-friendly dashboard that enhances healthcare accessibility. It helps users find nearby hospitals and specialist doctors based on their location. The appointment management feature ensures smooth communication between patients and doctors, allowing doctors to manage requests and share prescriptions digitally. An integrated chatbot built using RNN and NLP offers instant responses to user queries, making the system more interactive and supportive.

Future work may explore deep learning models with larger datasets, integration of wearable health device data, multi-language chatbot support, and real-time alert systems for critical health conditions.

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