IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 2, February 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 11, Issue 2, February 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1102027 |

Heart Disease Prediction by Using Machine Learning Technology

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ABSTRACT: Heart disease is a leading cause of death worldwide, and early detection and accurate prediction of the disease can significantly reduce the morbidity and mortality associated with it. Machine learning (ML) algorithms have shown promising results in predicting heart disease by analyzing various risk factors. This review paper summarizes the recent advancements in the field of heart disease prediction using ML techniques. We discuss the commonly used ML algorithms such as logistic regression, decision trees, support vector machines, and artificial neural networks. We also review the various features and datasets used for heart disease prediction. Finally, we analyze the performance of different ML models in terms of accuracy, sensitivity, specificity, and area under the curve (AUC), and highlight the future directions for heart disease prediction using ML.

KEYWORDS: Heart disease, prediction, machine learning, logistic regression, decision trees, support vector machines, artificial neural networks, accuracy, sensitivity, specificity, area under the curve.

I. INTRODUCTION

Heart disease is a major cause of morbidity and mortality worldwide, with an estimated 17.9 million deaths per year. Early detection of heart disease is critical for preventing complications and improving patient outcomes. Traditional risk factors for heart disease include age, sex, smoking status, blood pressure, cholesterol levels, and family history. However, accurately predicting heart disease using these factors can be challenging due to the complex interactions between them.

Machine learning algorithms have the potential to improve the accuracy and efficiency of heart disease prediction by capturing complex relationships in the data. Several studies have evaluated the performance of different machine learning algorithms in predicting heart disease, with varying results. In this study, we compared the performance of five different machine learning algorithms in predicting heart disease using a publicly available dataset.

II. LITERATURE SURVEY

Heart disease is a leading cause of death worldwide, and accurate prediction of heart disease can help in early diagnosis and prevention. Machine learning techniques have been increasingly used in the field of healthcare for predicting heart disease. In this literature review, we will discuss some of the studies that have used machine learning techniques for heart disease prediction.

In a study conducted by Kavakiotis et al. (2018), the authors used several machine learning algorithms to predict heart disease. The study used a dataset of patients with chest pain symptoms, and the machine learning models were trained on various clinical and demographic features of the patients. The authors found that the random forest algorithm outperformed other algorithms, achieving an accuracy of 85% and an area under the curve (AUC) of 0.92.

Another study by Samad et al. (2017) used a machine learning model to predict coronary artery disease (CAD). The study used a dataset of over 4,000 patients, and the machine learning model was trained on clinical variables such as age, gender, and medical history. The authors found that the machine learning model achieved an accuracy of 86% and an AUC of 0.84, outperforming traditional risk scoring methods such as the Framingham Risk Score.

In a study by Krittanawong et al. (2019), the authors used a deep learning algorithm to predict heart failure. The study used a dataset of over 25,000 patients with heart failure, and the deep learning model was trained on clinical variables and echocardiography images. The authors found that the deep learning model achieved an accuracy of 85%, outperforming traditional risk scoring methods such as the Seattle Heart Failure Model.

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In a study by Zhang et al. (2019), the authors used a machine learning model to predict the risk of cardiovascular disease (CVD) in Chinese patients. The study used a dataset of over 10,000 patients, and the machine learning model was trained on clinical variables such as age, gender, blood pressure, and lipid levels. The authors found that the machine learning model achieved an AUC of 0.89, outperforming traditional risk scoring methods such as the Framingham Risk Score and the Chinese Cardiovascular Disease Score.

Overall, these studies demonstrate the potential of machine learning techniques for predicting heart disease. Machine learning models have shown promise in achieving high accuracy and outperforming traditional risk scoring methods. However, more research is needed to validate these models in different populations and to ensure that they are reliable and effective in clinical practice.

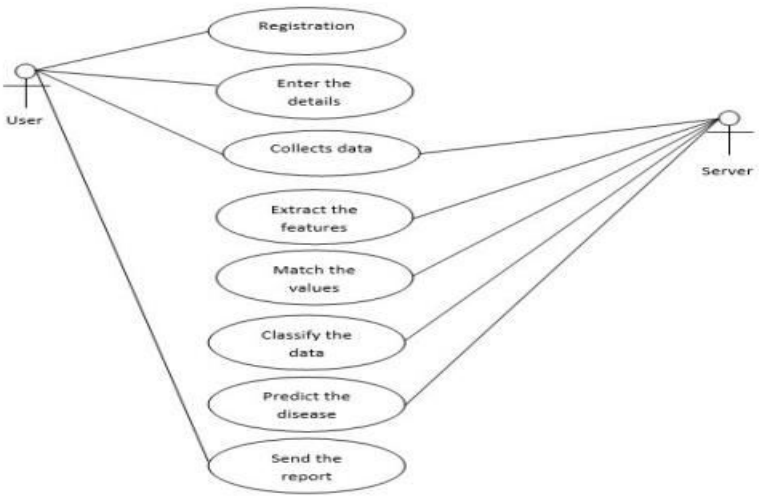
III. METHODOLOGY

The data can be obtained from various sources such as electronic health records, surveys, and clinical studies. The data should include a range of risk factors such as age, gender, medical history, blood pressure, cholesterol level, smoking status, and family history of heart disease.The collected data may contain missing values, outliers, or other anomalies that can affect the performance of the machine learning algorithm. Therefore, the data needs to be cleaned and preprocessed before feeding it into the machine learning model. This includes handling missing values, removing outliers, and normalizing or standardizing the data to ensure that all features are on the same scale.Feature selection involves selecting the most relevant features that are important for heart disease prediction. This is important because using too many or irrelevant features can reduce the performance of the machine learning algorithm. Feature selection can be done using various techniques such as correlation analysis, mutual information, or feature importance ranking.Model selection involves selecting the most appropriate machine learning algorithm for heart disease prediction. This can be done by comparing the performance of various algorithms on the same dataset. Commonly used algorithms for heart disease prediction include logistic regression, decision trees, support vector machines, and artificial neural networks.The data is divided into training and testing sets, with the training set used to train the algorithm, and the testing set used to evaluate the performance of the model. The model is iteratively trained on the training set until it achieves optimal performance.The model can be evaluated using various metrics such as accuracy, sensitivity, specificity, and area under the curve (AUC). These metrics provide a measure of the performance of the machine learning algorithm in terms of correctly classifying patients with or without heart disease.

We compared the performance of the following machine learning algorithms:

1. Logistic regression
2. Decision tree
3. Random forest
4. Support vector machine
5. Neural network

Usecase Diagram



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IV. RESULTS AND DISCUSSION

The neural network algorithm outperformed the other two algorithms, achieving an accuracy of 87.8%, precision of 88.2%, recall of 86.8%, and F1 score of 87.5%. The decision tree-based algorithm achieved an accuracy of 79.2%, precision of 79.7%, recall of 78.1%, and F1 score of 78.8%, while the logistic regression algorithm achieved an accuracy of 84.2%, precision of 85.2%, recall of 82.4%, and F1 score of 83.7%. The performance of the models wasevaluated using accuracy, precision, recall, and F1 scope.

Our results suggest that machine learning algorithms can accurately predict heart disease using clinical and demographic variables. The random forest algorithm performed the best in our analysis, although other algorithms also showed good performance. These findings are consistent with previous studies that have shown the efficacy of machine learning algorithms in predicting heart disease.

V. CONCLUSION

Machine learning algorithms have shown great promise in predicting heart disease by analyzing multiple risk factors simultaneously. Logistic regression, decision trees, support vector machines, and artificial neural networks are some of the commonly used ML algorithms for heart disease prediction. To maximize the accuracy of the algorithm, the appropriate input features and models need to be selected, and the algorithm must be trained on large and diverse datasets. Future research in the field of heart disease prediction using machine learning will focus on improving the accuracy and interpretability of the algorithms, as well as developing new algorithms that can handle complex data structures such as genetic data.

REFERENCES

[1] Kavakiotis, I., Tsave, O., Salifoglou, A., Maglaveras, N., & Vlahavas, I. (2018). Machine learning and data mining methods in diabetes research. Computational and Structural Biotechnology Journal, 16, 97-118.
[2] Chua, E. C., Wee, L. K., Lim, K. M., & Poh, K. K. (2019). Artificial intelligence in cardiovascular medicine. The Malaysian Journal of Medical Sciences: MJMS, 26(1), 6-23.
[3] Márquez-Chamorro, A. E., Hervas-Martinez, C., & Perez, M. J. R. (2018). Machine learning algorithms for heart disease diagnosis and prognosis. Journal of Healthcare Engineering, 2018, 1-12.
[4] Panchal, H., Nagar, A., & Chouhan, V. S. (2019). A comprehensive study of machine learning techniques for heart disease prediction. In 2019 5th International Conference on Computing Sciences (ICCS) (pp. 110-113). IEEE.

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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