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Heart Disease Prediction

Sneha V. Doiphode[1], Rutuja P. Kamane[2], Neha S. Tembhare[3], Minal A. Pardhi[4], Neha Waghale[5], Deepak S. Bhiogade[6].

[1]*Computer Engineering, MPCOE Bhandara.*
[2]*Computer Engineering, MPCOE Bhandara.*
[3]*Computer Engineering, MPCOE Bhandara.*
[4]*Computer Engineering, MPCOE Bhandara.*
[5]*Computer Engineering, MPCOE Bhandara.*
[6]*Computer Engineering, MPCOE Bhandara.*

Abstract - One of the leading causes of death worldwide is still heart disease. Reducing its impact and prevalence requires prompt intervention and early detection. In this study, a K-Nearest Neighbors (KNN) algorithm-based machine learning system for heart disease prediction is presented. To deliver real-time risk evaluations, the model is implemented via a Flask web application after being trained on structured medical datasets. The system helps users make preventive healthcare decisions by providing an instantaneous estimate of the chance of heart disease based on certain medical factors they enter.

Key Words: Flask Web Application, K-Nearest Neighbors, Machine Learning, Real-time Risk Assessment, and Heart Disease Prediction.

1. Introduction

With millions of fatalities each year, cardiovascular diseases—collectively referred to as heart disease—continue to pose a serious threat to public health. For the illness to be managed and consequences to be avoided, prompt diagnosis is essential. Traditional diagnostic techniques, however, frequently call for a significant amount of professional knowledge and time. Machine learning (ML), which offers effective and precise illness prediction skills, has become a useful tool in healthcare with the development of artificial intelligence.

This thesis investigates how patient data can be used to predict cardiac disease using machine learning. The goal is to create an intelligent system that helps medical practitioners identify those who are at risk by evaluating a variety of clinical characteristics, including age, blood pressure, cholesterol levels, and more. The K-Nearest Neighbors (KNN) algorithm, which is well-known for its ease of use and efficiency in classification issues, is used in the selected methodology.

2. Existing System

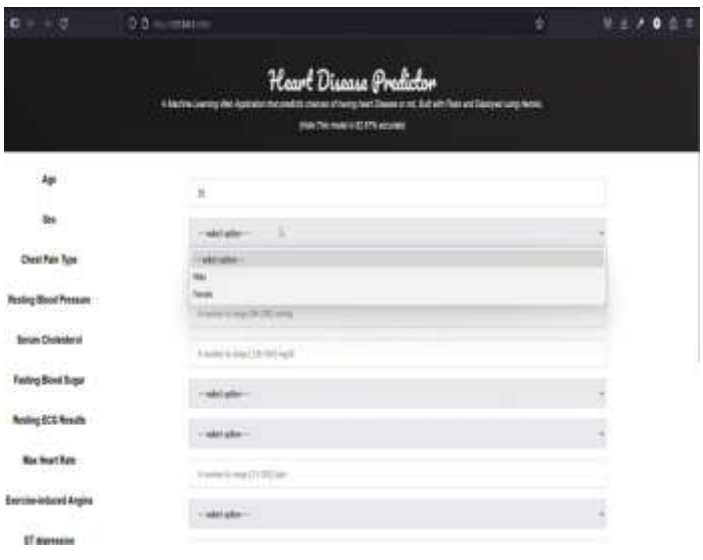
Clinical assessments, patient histories, physical examinations, and the findings of diagnostic procedures including ECGs, echocardiograms, and stress tests are usually combined to diagnose cardiac disease. Despite their effectiveness, these approaches need a lot of time, resources, and the knowledge of medical specialists.

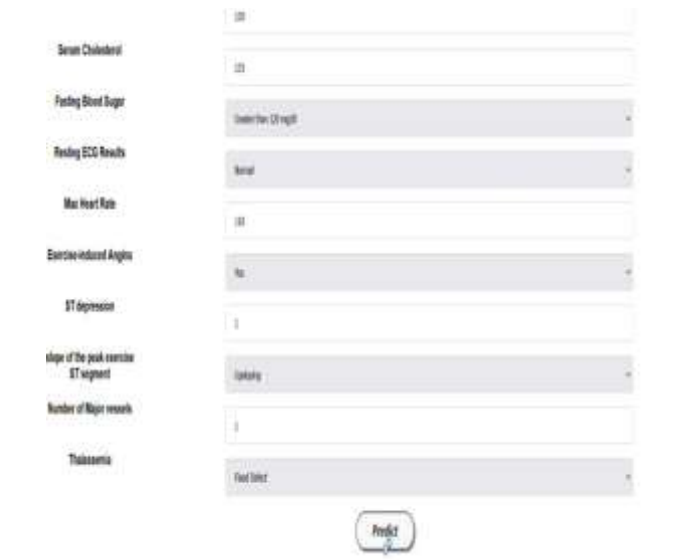
A few computerized systems, mostly based on rule-based expert systems, have been introduced. Nevertheless, these systems frequently lack flexibility and are unable to effectively handle massive amounts of data. They can also have trouble understanding intricate and nonlinear correlations between patient characteristics and the risk of heart disease, and they neither learn nor become better with time. More sophisticated, flexible, and scalable prediction techniques are therefore desperately needed in order to facilitate early diagnosis and enhance clinical decision-making.

3. Proposed System

The suggested system is a model for predicting cardiac disease that makes use of the K-Nearest Neighbors (KNN) algorithm. It predicts the risk of heart disease by analyzing patterns in patient data using supervised learning. Important medical characteristics like age, sex, kind of chest pain, resting blood pressure, serum cholesterol, fasting blood sugar, resting electrocardiogram results, maximum heart rate attained, and exercise-induced angina are all included in the input data.

The Flask web framework is used in the system's deployment to make it usable and accessible. Users can enter patient characteristics onto the online interface to get predictions right away. The trained KNN model classifies the user's condition as either having heart disease or not after preprocessing the input data behind the scenes. Both individuals and medical professionals can benefit from this decision-support system by using it to make well-informed health decisions and possibly pursue early medical action.





4. Conclusion

There have been a few automated systems established, primarily based on rule-based expert systems. However, these systems often lack adaptability and can't manage large volumes of data efficiently. Additionally, they may struggle to comprehend complex and nonlinear relationships between patient features and heart disease risk, and they do not improve or learn over time. Therefore, there is an urgent need for more advanced, adaptable, and scalable prediction methods to support clinical decision-making and enable early diagnosis.

By incorporating these predictive models into clinical procedures, medical staff may make better judgments more quickly, which will ultimately benefit patients. Although encouraging, this work also provides opportunities for more improvements, such adding more algorithms, growing the dataset, and implementing the system in actual medical settings. The study emphasizes how AI-driven solutions have the potential to improve diagnostic accuracy for serious illnesses like heart disease and revolutionize preventative healthcare.

5. References

1. Iswisi A.F.A., Karan O., Rahebi J. Diagnosis of Multiple Sclerosis Disease in Brain Magnetic Resonance Imaging Based on the Harris Hawks Optimization Algorithm. BioMed Res. Int. 2021;2021:3248834. doi: 10.1155/2021/3248834. [DOI] [PMC free article] [PubMed] [Google Scholar] [Retracted].
2. Al-Safi H., Munilla J., Rahebi J. Harris Hawks Optimization (HHO) Algorithm based on Artificial Neural Network for Heart Disease Diagnosis; Proceedings of the 2021 IEEE International Conference on Mobile Networks and Wireless Communications (ICMNWC); Tumkur, India. 3–4 December 2021; pp. 1–5. [Google Scholar].
3. Ternacle J., Côté N., Krapf L., Nguyen A., Clavel M.-A., Pibarot P. Chronic kidney disease and the pathophysiology of valvular heart disease. Can. J. Cardiol. 2019;35:1195–1207. doi: 10.1016/j.cjca.2019.05.028. [DOI] [PubMed] [Google Scholar].
4. House A.A., Wanner C., Sarnak M.J., Piña I.L., McIntyre C.W., Komenda P., Kasiske B.L., Deswal A., DeFilippi C.R., Cleland J.G.F. Heart failure in chronic kidney disease: Conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. Kidney Int. 2019;95:1304–1317. doi: 10.1016/j.kint.2019.02.022. [DOI] [PubMed] [Google Scholar]
5. Nguyen T., Wang Z.A. Cardiovascular screening and early detection of heart disease in adults with chronic kidney disease. J. Nurse Pract. 2019;15:34–40. doi: 10.1016/j.nurpra.2018.08.004. [DOI] [Google Scholar].
6. Liu R., Ren C., Fu M., Chu Z., Guo J. Platelet Detection Based on Improved YOLO_v3. Cyborg Bionic Syst. 2022;2022:9780569. doi: 10.34133/2022/9780569. [DOI] [PMC free article] [PubMed] [Google Scholar].
7. Mohamed A.A.A., Hançerlioğullari A., Rahebi J., Ray M.K., Roy S. Colon Disease Diagnosis with Convolutional Neural Network and Grasshopper Optimization Algorithm. Diagnostics. 2023;13:1728. doi: 10.3390/diagnostics13101728. [DOI] [PMC free article] [PubMed] [Google Scholar].
8. Rahebi J. Fishier mantis optimiser: A swarm intelligence algorithm for clustering images of COVID-19 pandemic. Int. J. Nanotechnol. 2023;20:25–49. doi: 10.1504/IJNT.2023.131111. [DOI] [Google Scholar].
9. Al Shalchi N.F.A., Rahebi J. Human retinal optic disc detection with grasshopper optimization algorithm. Multimed. Tools Appl. 2022;81:24937–24955. doi: 10.1007/s11042-022-12838-8. [DOI] [Google Scholar].
10. Sameni R., Clifford G.D. A review of fetal ECG signal processing; issues and promising directions. Open Pacing Electrophysiol. Ther. J. 2010;3:4–20. doi: 10.2174/1876536X01003010004. [DOI] [PMC free article] [PubMed] [Google Scholar].
11. Al-Safi H., Munilla J., Rahebi J. Patient privacy in smart cities by blockchain technology and feature selection with Harris Hawks Optimization (HHO) algorithm and machine learning. Multimed. Tools Appl. 2022;81:8719–8743. doi: 10.1007/s11042-022-12164-z. [DOI] [PMC free article] [PubMed] [Google Scholar].