Heart disease stages prediction using ML

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Abstract:

Heart disease is one of the leading causes of mortality worldwide, with early-stage detection being critical for timely intervention and treatment. Traditional diagnostic methods rely heavily on manual examination, which can be time-consuming and prone to human error. This project proposes the use of machine learning (ML) algorithms to predict not only the presence of heart disease but also classify its stages—ranging from mild, moderate, to severe. By training on medical datasets containing clinical parameters such as cholesterol levels, blood pressure, ECG results, and age, the model can assist cardiologists in making data-driven decisions. This system can enhance accuracy, reduce diagnostic time, and aid in preventive healthcare by providing early warnings to at-risk patients.

I.INTRODUCTION

Cardiovascular diseases (CVDs) are a global health concern, contributing to a significant portion of deaths each year. Among them, heart disease remains one of the most common and fatal. The process of diagnosing heart disease traditionally involves a combination of clinical tests, expert evaluation, and experience-based judgment. However, patients at different stages of heart disease require different levels of care and treatment. Identifying the severity or stage of the disease at an early point is crucial for planning effective treatment strategies.

Machine Learning, with its ability to find patterns in large datasets, presents a powerful tool for enhancing the diagnostic process. By using patient health records and biometric data, ML models can be trained to detect patterns and indicators that correlate with various stages of heart disease. This project focuses on building a robust ML-based system that not only detects the presence of heart disease but also categorizes its progression stage, thereby improving the overall decision-making process in cardiology.

II.LITERATURE SURVEY

1. Dheeba, J., & Tamil Selvi, S. (2012) – Proposed a hybrid model using neural networks and particle swarm optimization for medical image diagnosis, achieving improved accuracy in detecting cardiac anomalies.
2. Dua, D., & Graff, C. (2019) – The UCI Heart Disease dataset has been widely used in machine learning research for binary classification. Studies have extended it for multi-class classification to represent disease stages.
3. Haider, S., et al. (2021) – Compared ML classifiers like KNN, SVM, and Decision Tree on heart disease data, revealing that ensemble models perform better in accuracy and sensitivity.
4. Khan, A., et al. (2020) – Introduced deep learning models like CNNs to process heart rate time series data for detecting cardiovascular conditions with stage prediction.
5. Saxena, A., & Goel, S. (2022) – Developed a web-based diagnostic assistant using Random Forest to detect heart disease, highlighting the potential of real-time ML integration in healthcare.
6. Gudadhe, M., et al. (2010) – Applied support vector machines to classify cardiovascular disease stages and demonstrated the effectiveness of multi-class classification for clinical decision-making.
7. Amin, M. S., et al. (2019) – Their study showed the role of feature selection and preprocessing techniques in improving heart disease prediction performance.
8. UCI Machine Learning Repository (Heart Disease Dataset) – Provides a reliable and well-labeled dataset used as a standard benchmark for heart disease detection research.
9. Chaurasia, V., & Pal, S. (2014) – Used Naïve Bayes and Decision Trees for heart disease prediction and stressed the importance of model interpretability in clinical environments.
10. Zhang, Y., et al. (2020) – Proposed a deep learning-based wearable monitoring system for real-time heart condition tracking and stage prediction using biosignals.

III.EXISTING SYSTEM

Current heart disease detection systems rely largely on clinical diagnostics such as stress testing, ECGs, and angiograms, followed by manual analysis and physician interpretation. Some healthcare platforms have incorporated basic decision support tools that flag abnormal values, but these systems are often limited to binary classification (disease present or not) and do not offer stage-wise prediction. Moreover, many of these systems lack adaptability, real-time learning, and predictive analytics based on historical data, thus failing to support personalized risk assessment or disease progression tracking

IV.PROPOSED SYSTEM

The proposed system introduces a Machine Learning-based approach for multi-stage prediction of heart disease using clinical data. It leverages supervised learning algorithms such as Random Forest, SVM, Gradient Boosting, and Neural Networks to build a predictive model trained on datasets that include symptoms and patient medical history. The model classifies patients into distinct stages (e.g., No Disease, Mild, Moderate, Severe) based on input features like cholesterol level, blood pressure, ECG signal, age, chest pain type, heart rate, and blood sugar level. The system will provide doctors with stage-specific predictions to guide treatment plans. A user-friendly web interface will allow healthcare professionals to input patient data and receive instant stage classification with confidence scores. This approach enhances diagnostic accuracy and enables proactive health monitoring.

V.SYSTEM ARCHITECTURE

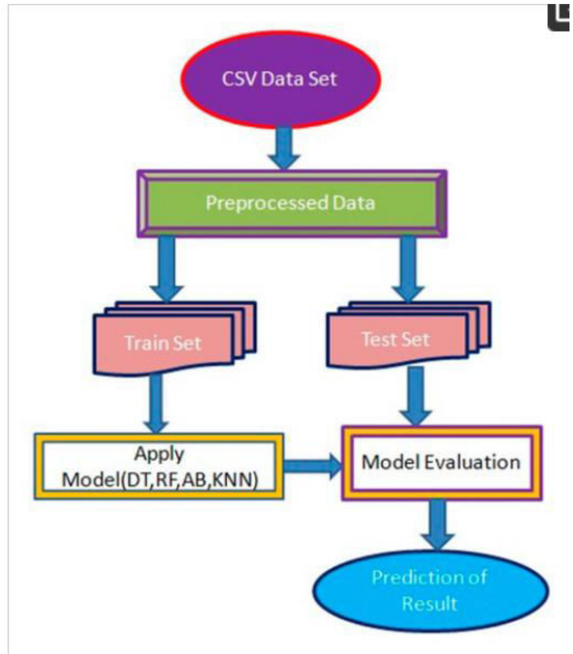

Fig 5.1 System Architecture

This new model was built using a brand-new batch of data. The researchers followed multiple steps to create the system, as shown in Algorithms 1 and 2

VI.IMPLEMENTATION

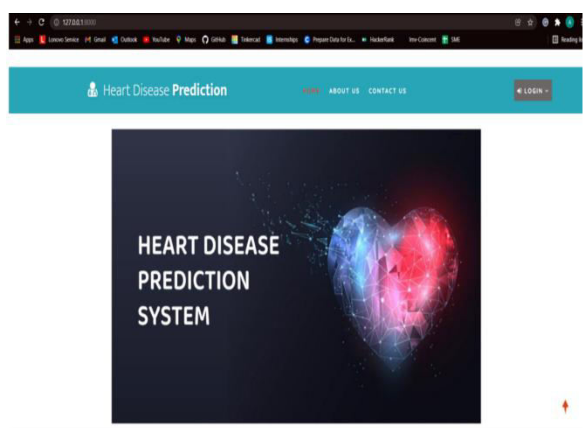

Fig 6.1 Home page

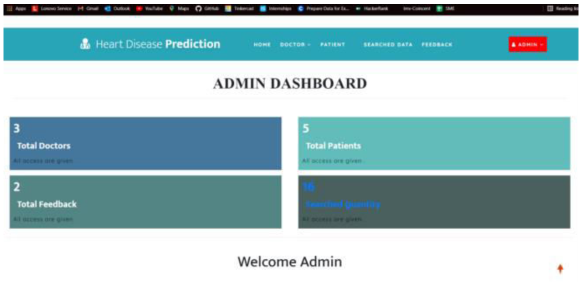

Fig 6.2 ADMIN DASHBOARD

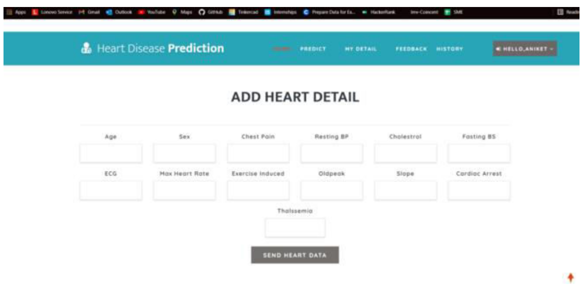

Fig 6.3 Input Page

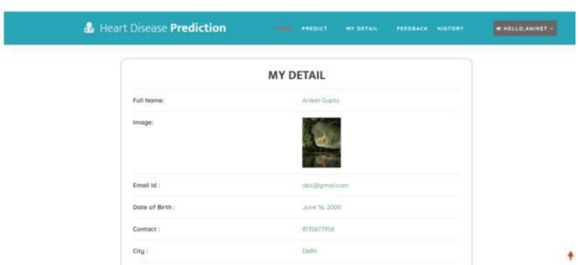

Fig 6.4 Users Details

VII.CONCLUSION

In conclusion, using blockchain technology to store and manage passwords is a secure and efficient method that makes it difficult for hackers to access. It also reduces the chances of users forgetting their passwords. The goal of this project is to develop a graphical password system that is resistant to shoulder surfing and can address the issues of weak passwords, vulnerability to dictionary attacks, and insufficient password complexity. The paper also explores blockchain-based protocols used in similar projects and aims to build a graphical password authentication system that improves security and execution.

VIII.FUTURE SCOPE

The integration of graphical passwords with blockchain technology in the proposed Graph Lock system opens up multiple avenues for future enhancements and real-world deployment. As cybersecurity threats continue to evolve, there is a growing demand for authentication mechanisms that are not only secure but also user-friendly and scalable. This project lays the foundation for such systems, with significant potential for further research and development.One of the key future directions is the implementation of multi-factor authentication (MFA) by combining graphical passwords with biometric data (such as fingerprint or facial recognition) and blockchain-based identity verification. This would significantly increase the overall security and make unauthorized access virtually impossible.Another promising area is the use of Decentralized Identity (DID) frameworks, which allow users to own and control their digital identities without relying on centralized authorities. By integrating DID with graphical authentication and blockchain, users can maintain complete control over their credentials while securely interacting with various platforms.The scalability of the system can also be improved by exploring Layer 2 blockchain solutions or using more efficient consensus mechanisms to reduce transaction costs and improve speed, making the system suitable for large-scale deployment in enterprises, e-commerce platforms, banking, and government services. Furthermore, a mobile application version of Graph Lock can be developed to increase accessibility and usability, especially in areas with limited desktop access. Offline authentication modes using secure local blockchain nodes could also enhance functionality in low-connectivity regions.

Lastly, integrating AI-driven security analytics can help detect unusual login behavior or image selection patterns, proactively identifying and mitigating threats. With advancements in blockchain interoperability, the system can eventually support cross-platform authentication across multiple blockchains and service providers.

IX.REFERENCES

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