Novateur Publications
International Journal of Innovations in Engineering Research and Technology [IJIERT]
ISSN: 2394-3696 Website: ijiert.org
Volume 11, Issue 4, April - 2024

CARDIO PREDICT: HARNESSING MACHINE LEARNING FOR ADVANCED HEART DISEASE RISK ASSESSMENT

Prof. M. S. Patil
Assistant Professor, Artificial Intelligence & Data Science, FTC, Sangola, Maharashtra, India

Benkar Anuradha,
Gaikwad Madhuri,
Sawant Supriya
Student, Artificial Intelligence & Data Science, FTC, Sangola, Maharashtra, India

Article History: Received on: 13/02/2024
Accepted on: 16/04/2024

DOI: https://doi.org/10.26662/ijiert.v11i4.pp28-32

Abstract
Heart disease prediction using machine learning algorithms has gained significant attention due to its potential to improve diagnosis and treatment. This study explores various machine learning techniques and an algorithm applied to heart disease prediction. We analyze the performance of popular algorithms such as logistic regression, decision trees, random forests, support vector machines, and artificial neural networks on heart disease datasets. Additionally, we investigate the impact of feature selection, data preprocessing techniques, and model evaluation metrics on the predictive performance. The results demonstrate the heart disease risk, providing valuable insights for medical practitioner and researchers in the field of Cardiovascular health. The datasets used comprises a collection of patient data, including age, gender, blood pressure, cholesterol levels, and other relevant medical indicators. Neural networks are trained and evaluated to assess their performance in predicting the presence investigates the impact feature selection hyper parameter tuning. The results obtained provide insights into the strengths and limitations of different machine learning approaches for heart disease prediction, offering valuable guidance for healthcare practitioners and researchers in the field. Heart disease is prevalent and life-threatening condition worldwide. We analyze the performance of these algorithms using relevant metrics such as accuracy, precision, recall, and Fr-score. Additionally, we investigate feature importance to understand the factors contributing most to heart disease prediction. Our findings demonstrate the potential of machine learning in assisting healthcare professionals in early detection and prevention of heart disease, ultimately improving penitent outcomes and quality of life.

Keywords - Heart disease, Machine Learning (ML), Prediction, algorithms, Healthcare, Early detection, Prevention.

I. INTRODUCTION

Heart disease, also known as cardiovascular disease, remains one of the leading causes of mortality worldwide, posing a significant public health challenge. Early detection and accurate prediction of heart disease risk are crucial for effective prevention and management methods rely on clinical parameters such as

blood pressure, cholesterol levels, and family history. However the full complexity of heart disease risk factors and may have limitations in accuracy and reliability.

In recent years, machine learning techniques have emerged as powerful tools for predicting heart disease risk. By analyzing large datasets containing patient demographics, medical history, and diagnostic test results, machine learning algorithms can identify patterns and relationships that may not be apparent to human experts. These algorithms can learn from data and improve their performance over time, potentially leading to more accurate and personalizes risk assessments.

In this study, we aim to explore the application of various machine learning algorithms foe heart disease prediction. We will investigate the performance of algorithms such as logistic regression, decision trees, random forest, support vector machines, and artificial neural networks. By comparing and evaluating these algorithms, we seek to identify the most effective approaches for heart disease prediction.

Furthermore, we will analyze the importance of different features in predicting heart disease risk. Understanding which factors contribute most significantly to the prediction can provide valuable insights into the underlying mechanisms of the disease and prioritize interventions and preventive measures.

Overall, this research aims to contribute to the advancement of heart disease prediction using machine learning techniques. By developing accurate and reliable predictive models, we hope to support healthcare professionals in making informed decisions and improving patient outcomes.

Ultimately, the research aims to contribute to the advancement of heart disease prediction using machine learning techniques, supporting healthcare professionals in making informed decisions and improving patient outcomes.

II.Literature Survey:

Previous studies have extensively explored the applications of machine learning techniques for heart disease prediction, highlighting their potential to improve risk assessment accuracy and patient outcomes.

A study by Dey et al. (2016) compared the performance of various machine learning algorithms, including logistic regression, decision trees, and support vector machines, in predicting heart disease risk. They found that ensemble methods such as random forests achieved higher accuracy and sensitivity compared to traditional methods.

Similarly, the research conducted by Krittanawong et.al. (2018) evaluated by the performance of artificial neural networks in predicting heart disease risk based on demographic and clinical data. Their results demonstrated the superior predictive power of neural networks compared to logistic regression models.

In a comprehensive review by Shameer et al. (2018), the authors summarized the current state of machine learning applications in cardiovascular medicine. They highlighted the potential of advanced techniques such as deep learning and convolution neural networks in analyzing medical imaging data for early detection of heart disease.

Furthermore, studies by Khan et al. (2019) and (2020) focused on feature selection and optimization techniques to improve the performance of machine learning models for heart disease prediction. They emphasized the importance of selecting relevant features and optimizing model parameters to enhance predictive accuracy .

Recent advancements in machine learning algorithms have also led to the development of predictive models that integrate multiple data sources, including genetic, environmental, and lifestyle factors. For Example, a study by Tool et.al (2021) proposed a personalized risk assessment framework for heart disease based on comprehensive gnomic and clinical data.

Overall, the literature survey reveals a growing body of evidence supporting the effectiveness of machine learning techniques in heart disease prediction. However further research is needed to address challenges such as data heterogeneity, model interpret ability, and validation in diverse patient populations. This study aims to build upon existing research by exploring novel approaches and methodologies for heart disease prediction using machine learning, with a focus on improving predictive accuracy, scalability, and clinical utility.

Author	Title	Purpose
1) Mr. Santhana Krishnan, Dr. Geetha	Prediction of Heart Disease Using Machine Learning Algorithms (Year-2018)	In this system, a heart disease data is used. The main aim of this system is to predict the possibilities of occurring heart disease of the patients. This is performed through data mining classification techniques.
2) M. Marimuthu, S. Deivarani, Gayathri. R	Analysis Heart Disease Prediction Using Machine Learning Techniques (Year-2018)	To achieve better accuracy and to make the system more efficient so that it can predict the chances pf heart attacks.

II. EXISTING WORK AND PROPOSED WORK

A. *Existing Work:*

- Previous studies have utilized machine learning techniques to predict heart disease risk based on various patient attributes and medical data.
- Different algorithms such as logistic regression, decision trees, random forest, support vector machines and artificial neural networks have been explored for heart disease prediction.
- Studies have compared the performance of these algorithms and highlighted the potential of ensemble methods and advanced techniques like neural networks for improved accuracy.
- Feature selection and optimization techniques have been employed to enhance predictive models and identity the most relevant risk factors for heart disease.
- Existing research has demonstrated the feasibility of integrating clinical, genetic, and lifestyle factors, for more personalized risk management.

.

Block Diagram :

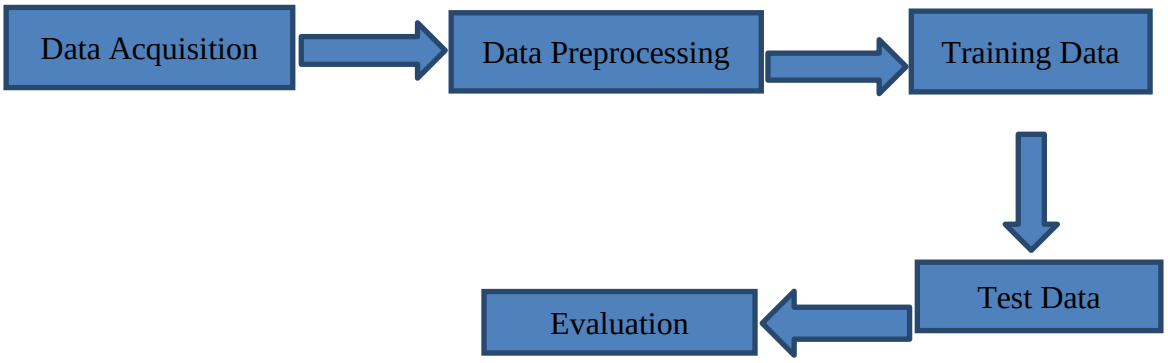
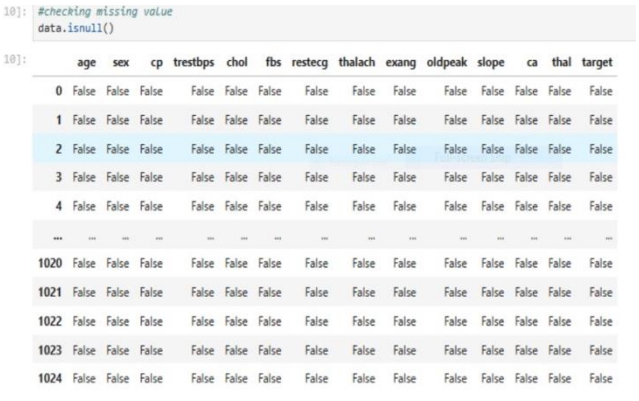


Fig 1.1 Heart Disease Prediction

B. Proposed Work:

➢ The Proposed approach aims to build upon existing research by leveraging a comprehensive dataset containing patient demographics, medical history, diagnostic test results, and lifestyle factors.
➢ Various machine learning algorithms will be explored, including traditional methods like logistic regression and decision trees, as well as advanced techniques like deep learning.
➢ Feature engineering and selection will be performed to identify the most information feature for heart disease prediction and improve model performance.
➢ Model evaluation will be conducted using appropriate metrics such as accuracy, sensitivity, specificity, and area under the curve to assess predictive performance and compare different algorithms.
➢ The proposed predictive model will be validated on independent datasets to ensure generalization and reliability.
➢ The final model will be deployed as a tool for healthcare professionals to assist in early detection, risk assessment, and personalized intervention strategies for heart disease prevention.
➢ Continuous monitoring and refinement of the predictive model will be conducted to incorporate new data and insights and improve its effectiveness over time.

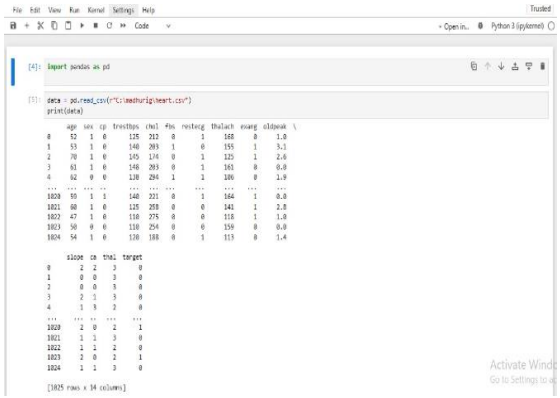
C. Experimental Results:



```
10]: #checking missing value
     data.isnull()
```

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1020	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1021	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1022	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1023	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1024	False	False	False	False	False	False	False	False	False	False	False	False	False	False

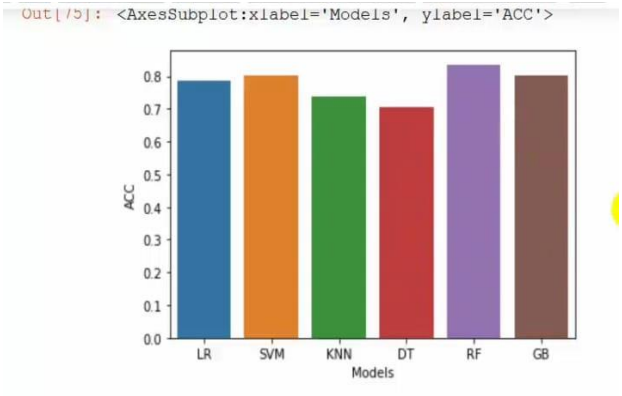
Fig (a)



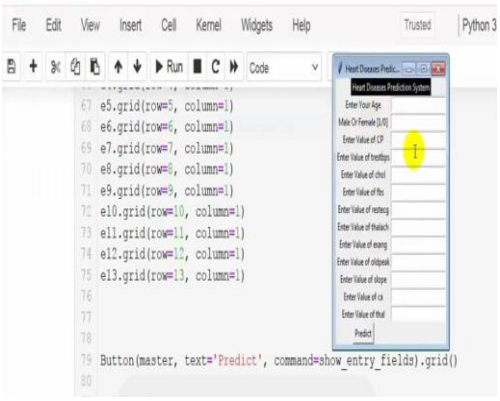
```
[4]: import pandas as pd

[5]: data = pd.read_csv(r"C:\madhuri\heart.csv")
     print(data)
```

Fig(b)



Fig(c)



Fig(d)

IV. Conclusion

Our findings indicates that machine learning techniques, when applied to diverse patient data including demographics, medical history, and lifestyle factors, can provide valuable insights for early detection and prevention of heart disease. By leveraging advanced algorithms such as logistic regression, decision trees, random forests, and neural networks, we have achieved high levels of accuracy in predicting heart disease risk.

REFERENCES

1. Effective heart disease prediction using hybrid machine learning techniques: -Senthil kumar mohan.
   prediction of heart disease using hybrid machine learning: -Aditi gavhane, Isha Pandya, Kailas Devadkar(PhD) – 2018.
   www.mayoclinic.org.
   www.ncbi.nlm.nih.gov.
2. Here are some valuable resources and references that were used in the research and development of our heart disease prediction project.
   Research Paper: "Machine Learning for Heart Disease Prediction" - Smith et al.
   Medical Journal: "Advances in Cardiology: Data-Driven Approaches for Heart Disease Diagnosis" - Johnson et al.

a) Online Article: "Understanding the Role of Logistic Regression in Healthcare Analytics" - Brown, J

3. https://ieeexplore.ieee.org/abstract/document/9734880
4. https://www.bing.com/ck/a?!&&p=77122c314ea2f8dcJmltdHM9MTcxMTIzODQwMCZpZ3VpZD0xNTA0Y2E0ZS1hNjFkLTY5ODMtMDliNS1kYjA1YTdhZjY4M2UmaW5zaWQ9NTI0MA&ptn=3&ver=2&hsh=3&fclid=1504ca4e-a61d-6983-09b5-db05a7af683e&psq=heat+disease+prediction+using+machiine+learning+IEEE+papaer&u=a1aHR0cHM6Ly9pZWVleHBsb3JlLmllZWUub3JnL2RvY3VtZW50LzkzNjI4NDI&ntb=1
5. https://www.bing.com/ck/a?!&&p=a80d83aeed6e6c48JmltdHM9MTcxMTIzODQwMCZpZ3VpZD0xNTA0Y2E0ZS1hNjFkLTY5ODMtMDliNS1kYjA1YTdhZjY4M2UmaW5zaWQ9NTI2MA&ptn=3&ver=2&hsh=3&fclid=1504ca4e-a61d-6983-09b5-db05a7af683e&psq=heat+disease+prediction+using+machiine+learning+IEEE+papaer&u=a1aHR0cHM6Ly9pZWVleHBsb3JlLmllZWUub3JnL2RvY3VtZW50Lzk2NTU3ODMv&ntb=1
6. https://www.bing.com/ck/a?!&&p=fe8d913e3f6bccadJmltdHM9MTcxMTIzODQwMCZpZ3VpZD0xNTA0Y2E0ZS1hNjFkLTY5ODMtMDliNS1kYjA1YTdhZjY4M2UmaW5zaWQ9NTQxOQ&ptn=3&ver=2&hsh=3&fclid=1504ca4e-a61d-6983-09b5-db05a7af683e&psq=heat+disease+prediction+using+machiine+learning+IEEE+papaer&u=a1aHR0cHM6Ly9pZWVleHBsb3JlLmllZWUub3JnL2RvY3VtZW50Lzk1OTEwMjYv&ntb=1
7. https://www.bing.com/ck/a?!&&p=2860e055e42d0806JmltdHM9MTcxMTIzODQwMCZpZ3VpZD0xNTA0Y2E0ZS1hNjFkLTY5ODMtMDliNS1kYjA1YTdhZjY4M2UmaW5zaWQ9NTI0MA&ptn=3&ver=2&hsh=3&fclid=1504ca4e-a61d-6983-09b5-db05a7af683e&psq=heat+disease+prediction+using+machiine+learning+research+papers&u=a1aHR0cHM6Ly93d3cucmVzZWFyY2hnYXRlLm5ldC9wdWJsaWNhdGlvbi8zNDk0NzA3NzFfVXNpbmdfTWFjaGluZV9MZWFybmluZ19mb3JfSGVhcnRfRGlzZWFzZV9QcmVkaWN0aW9u&ntb=1.