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# Machine Learning Based Efficient Prediction of Human Heart Disease by Identifying the Features

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**Abstract:** *Hospitals and clinics are constrained to storing and analyzing medical data using traditional and manual methods. Many medical institutions have made significant efforts to overcome this limitation by combining considerable data resources with new technologies, there is still a lack of knowledge about diseases and how to treat them, despite the enormous number of data available. Machine learning and data-driven tactics can produce accurate diagnostic tools. The current study aims to identify and predict the heart disease at an early stage and saves the human life. In this paper, we used the machine learning based performance result evaluation and find the better prediction ratio for the heart disease.*

Keywords: **:-** Information and Communication Technology, Artificial Intelligence, Machine Learning, Health Care.

## Introduction

A typical problem in healthcare nowadays is mostly doctors approach large volume of data on patients, however little time or devices. Smart clinical decision help imagines the data at the motivation behind thought that is specific to the patient and needs of supplier. Electronic wellbeing records (EHR), are now standard in U.S. medicinal services, address both the patients and masters longitudinal experience. To predict future events these data are used with expanding frequency. Even though, forecast models are created to envision needs, most of the existing works has focused on specific expectation models that foresee a compelled set of results. In any case, ordinary clinical practice incorporates an unprepared and diverse blend of circumstances and requirements distinctive predictive models in the 100s to 1000s. To create and deploy particular models one after another is unrealistic. Prior to determination of a disease, a person's progression interceded by patho-physiologic changes recognizes the individuals who will in the long run get the disease from the individuals who won't. Discovery of temporal occasion successions that dependably use controls that recognize disease cases might be especially helpful in enhancing the performance of predictive models. For this reason, we examined whether models built using RNN could be adjusted thus, changing over clinical occasion successions and time stamped related information into trails essential to prior discovery of sickness. Electronic health record (EHR) data contains

clinically rich and related time stamped data. Patient medicinal services experiences are all around archived and time stamped (eg, findings, drugs, and techniques). Be that as it may, HER information are very unpredictable, given the structure also, broadness of data caught (spanning provider conduct, care use, pathways for treatment, and infection state of patient) and unpredictable frequency of sampling. So far, most prescient demonstrating work utilizing EHR information depends on aggregate values of features (e.g., count of event and average value of event). Utilizing these strategies, some of the features that are disaggregated in the temporal relations are most certainly not caught (e.g., at one time medication solution requested and at another time method performed).

In recent years, healthcare services have rapidly evolved to provide wireless communication media between doctor and patient via wearable devices, which is referred to as telemedicine. This allows for real-time monitoring of chronic illnesses such as heart failure, asthma, hypotension, and hypertension in areas where medical facilities are few, such as rural areas, or for people who have been off of health services for a while. Heart disease becomes the primary cause of death in all of these situations as a result of a shift in lifestyle that affects people of all ages. According to the literature, nearly 2.8 billion individuals die each year as a result of heart disease caused by being overweight or obese, which affects cholesterol levels, blood pressure fluctuations, and, most critically, the impact of stress hormones on long-term heart health. Many wearable technologies assessed common heart parameters such as blood pressure, blood glucose level, blood oxygen saturation, ECG, and so on. In this era of communication and connectivity, individuals have multiple technologies to support their day-to-day requirements. Due to this, Internet of Things (IoT) and Machine Learning (ML) are emerging technologies for practical solutions to problems facing several sectors, especially the healthcare sector. Machine learning and IoT work towards creating a better technology and environment, which will ensure efficiency and productivity for the healthcare sector. IoT is a framework that uses technologies like sensors, network communication, artificial intelligence and bigdata to provide real life solutions. These solutions and systems are designed for optimal control and performance. In IoT, a single device can generate immense amounts of data every second. All these data from IoT devices are transmitted to servers or gateways to create better machine learning models. This increased use of IoT yields huge amounts of raw data that are effectively processed by using machine learning to derive many useful insights that can become positive changers especially in healthcare delivery.

## II. Heart Disease Overview

The heart is an important organ of human body in which various vessels support in blood flows to different parts of the body. Our heart is a complex structure consisting of muscles. It suffers from various types of diseases in the heart by more or less blood secretion. The cardiovascular is a heart diseases and the main cause of cardiovascular diseases is poor lifestyle, stress, coma, not exercising and irregular food intake. These life style leads to disability on heart and invites serious heart related diseases. So, healthy heart is very important for human life because it is necessary to keep the body healthy. If a person has been faced the problem of heart attack, then he should change his lifestyle to keep the heart healthy. Sometimes heart diseases show some of their symptoms then we should not avoid it easily.

Heart disease is a dangerous condition with a high prevalence; it affects roughly 5% of people under the age of 35 in industrialized nations and more than 20% of those over the age of 75. Heart collapse episodes account for around 3-5% of hospital admissions. Heart failure is the most commonly seen reason for admission by clinicians in their clinical practice. The expenditures are quite substantial, accounting for up to 20% of overall health

expenditure in affluent nations. There are several types of cardiac illness, each of which affects different internal organs of the heart. As a result, any type of heart ailment may be classified as a cardiovascular sickness, and some of the heart-related ailments are discussed below. Coronary heart disease (CHD) is the most prevalent kind of heart disease globally. It is also known as coronary artery disease (CAD). It is a disease characterized by fat buildup in the blood veins and capillaries. It also prevents blood from flowing into the heart's veins and capillaries, resulting in an inadequate supply of oxygen and blood to the heart's internal organs. To establish an effective illness management plan, a vast quantity of data must be examined. The most typical occurrences are early illness identification based on artificial intelligence, evaluation of severity, and early prediction. This will slow the course of the disease; enhance patients' quality of life, and lower related medical expenditures. Machine learning approaches have been used in this direction.

## III. Experimental Result Analysis

Artificial Neural Network (ANN) produced the highest accuracy prediction in the medical field. The back propagation multilayer perception (MLP) of ANN is used to predict heart disease. The obtained results are compared with the results of existing models within the same domain and found to be improved. The data of heart disease patients collected from the UCI laboratory is used to discover patterns with neural network, decision tree, Support Vector machines (SVM), and Naive Bayes. The results are compared for performance and accuracy with these algorithms. The proposed hybrid method returns results of 86:8% for F-measure, competing with the other existing methods. The classification without segmentation of Convolutional Neural Networks (CNN) is introduced. This method considers the heart cycles with various start positions from the Electrocardiogram (ECG) signals in the training phase. CNN is able to generate features with various positions in the testing phase of the patient. A large amount of data generated by the medical industry has not been used effectively previously. The new approaches presented here decrease the cost and improve the prediction of heart disease in an easy and effective way. The various different research techniques considered in this work for prediction and classification of heart disease using ML and deep learning (DL) techniques are highly accurate in establishing the efficacy of these methods.

Most of the ML studies performed in the area of ECG analysis aimed at disease diagnosis or risk stratification use supervised learning techniques. The goal of supervised learning is the inference of a function or a score from labeled or annotated training data. The two main supervised techniques are classification and regression, which differ on having as outputs categorical and continuous variables, respectively. Classification of different heart rhythms is one of the most developed applications of ML to the ECG using supervised approaches. Some popular algorithms include logistic regression, support vector machines, artificial neural networks, and random forests. In supervised learning, labels for the training data is provided and/or select features to feed the algorithm to learn, whereas unsupervised learning algorithm is applied on raw data and learns fully automatic. Unsupervised learning aims at discovering hidden structures in datasets with no previous knowledge about reference outcomes or labels. The most common unsupervised learning method is clustering, used for grouping data with a similar data structure. Another common task in unsupervised learning is dimensionality reduction where principal component analysis (PCA) is one of the most frequently used methods in traditional ECG analysis, projecting data onto its feature subspace.

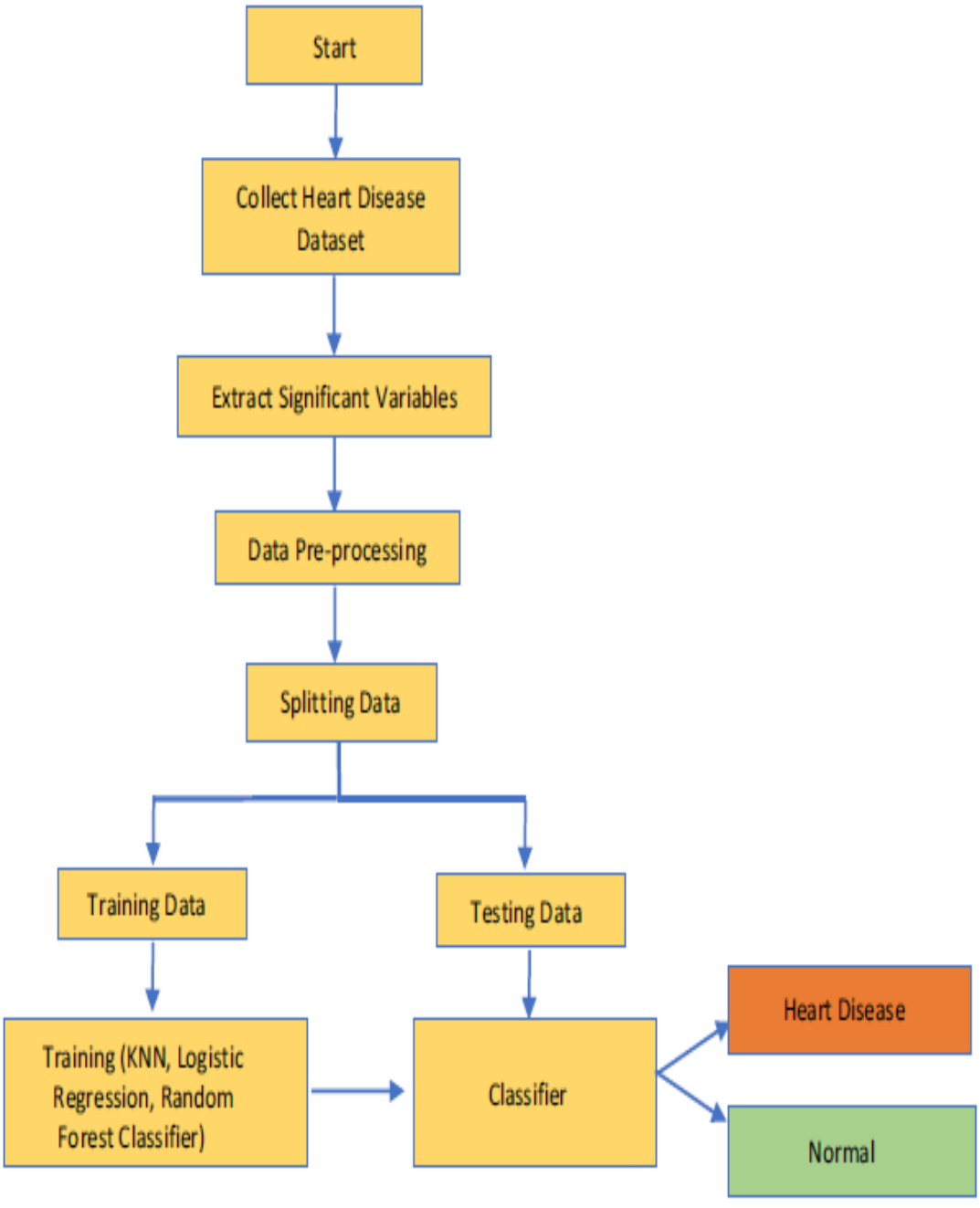


**Figure 1:** Example of heart diseases identification using machine learning techniques.

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| Index | age | sex | cp | trestbps | chol | fbs | restecg | thalach | exang | oldpeak |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 63 | 1 | 3 | 145 | 233 | 1 | 0 | 150 | 0 | 2.3 |
| 1 | 37 | 1 | 2 | 130 | 250 | 0 | 1 | 187 | 0 | 3.5 |
| 2 | 41 | 0 | 1 | 130 | 204 | 0 | 0 | 172 | 0 | 1.4 |
| 3 | 56 | 1 | 1 | 120 | 236 | 0 | 1 | 178 | 0 | 0.8 |
| 4 | 57 | 0 | 0 | 120 | 354 | 0 | 1 | 163 | 1 | 0.6 |
| 5 | 57 | 1 | 0 | 140 | 192 | 0 | 1 | 148 | 0 | 0.4 |
| 6 | 56 | 0 | 1 | 140 | 294 | 0 | 0 | 153 | 0 | 1.3 |
| 7 | 44 | 1 | 1 | 120 | 263 | 0 | 1 | 173 | 0 | 0 |
| 8 | 52 | 1 | 2 | 172 | 199 | 1 | 1 | 162 | 0 | 0.5 |
| 9 | 57 | 1 | 2 | 150 | 168 | 0 | 1 | 174 | 0 | 1.6 |

**Figure 2:** Dataset features heatmap.

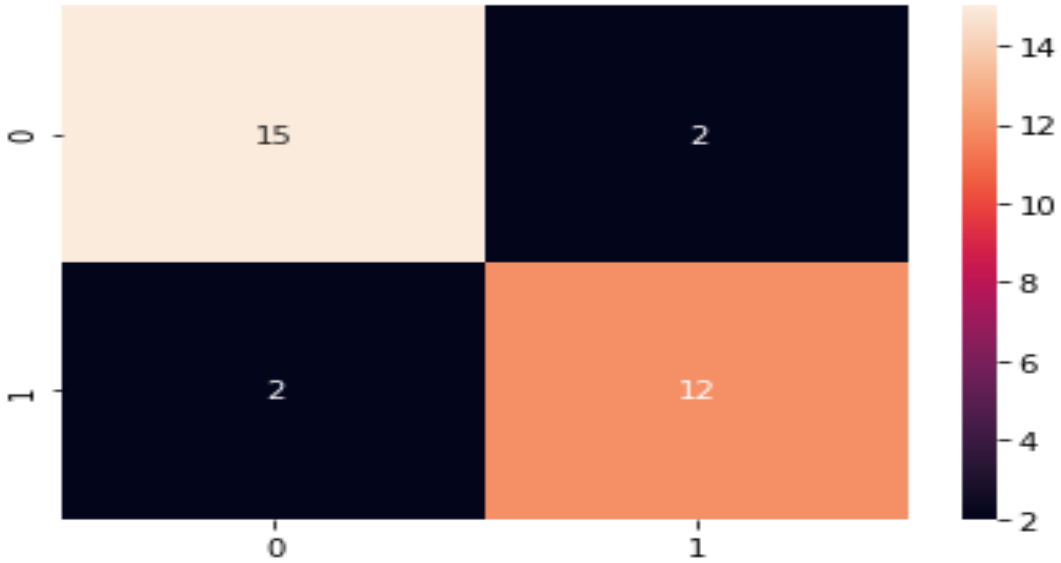


**Figure 3:** The above picture shows that the confusion matrix representation for the experimental work using logistic regression model.

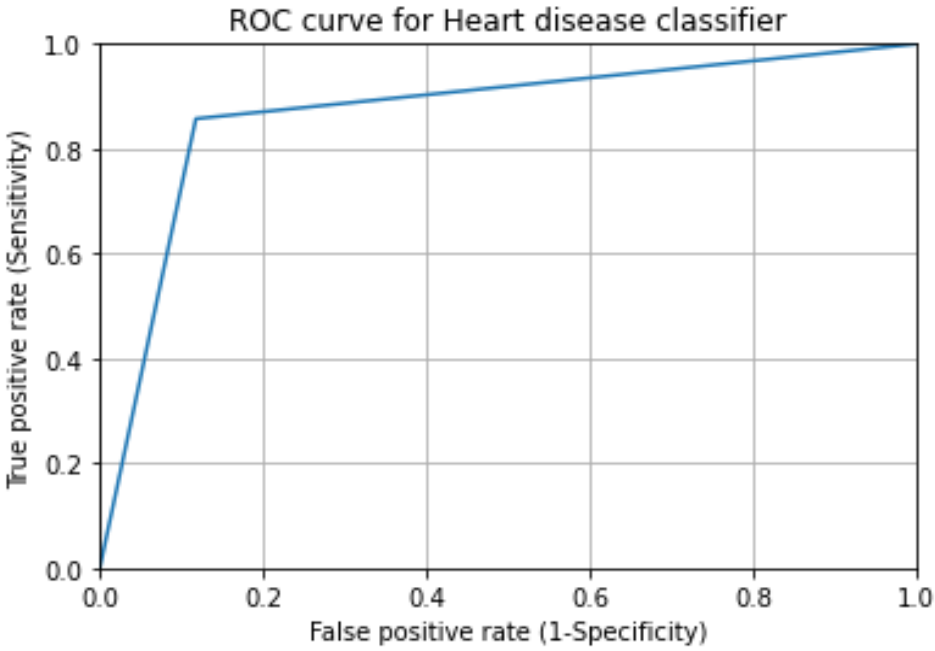


**Figure 4:** The above picture shows that the ROC curve representation for the experimental work using logistic regression model, which is based on true positive rate and false positive rate.

## IV. Conclusion

In recent years, there has been a growing trend towards the application of Information Communication Technologies (ICT) in various topics in the health area. Health Informatics (HI) has occupied a strategic role in society, generating relevant impacts on economic and human aspects. The aim of this work to detect heart diseases symptoms at early stage and reduce the risk of heart attack or heart diseases on the basis of their features, and improve the performance parameters values using different number of techniques.

## References

[1] Abdul wahab Ali Almazroi, “Survival prediction among heart patients using machine learning techniques”, Mathematical bioscience engineering, 2021, pp. 134-145.

[2] Abid Ishaq, “Improving the Prediction of Heart Failure Patients' Survival Using SMOTE and Effective Data Mining Techniques”, IEEE Access, 2021, pp. 39707-39716.

[3] Alaa Khaleel Faieq, “Prediction of heart diseases utilising support vector machine and artificial neural network”, Indonesian Journal of Electrical Engineering and Computer Science, 2022, pp. 374-380.

[4] Amin Ul Haq, “A Hybrid Intelligent System Framework for the Prediction of Heart Disease Using Machine Learning Algorithms”, Hindawi Mobile Information Systems, 2018, pp. 1-22.

[5] Amir Tabatabaei Hosseini, Fariborz Rahimi, “Phase Angle determinants in patients with cardiovascular disease using machine learning methods”, Health and Technology , Springer, 2021, pp. 1-7.

[6] Amirata Ghorbani, David Ouyang, “Deep learning interpretation of echocardiograms”, Digital Medicine, 2021, pp. 1-10.

[7] Amitava Banerjee, Suliang Chen, “Machine learning for subtype definition and risk prediction in heart failure, acute coronary syndromes and atrial fibrillation: systematic review of validity and clinical utility”, Springer, 2021, pp. 1-14.

[8] Amzad Hossen , Tahia Tazin, “Supervised Machine Learning-Based Cardiovascular Disease Analysis and Prediction”, Hindawi, Mathematical Problems in Engineering, 2021, pp. 1-11.

[9] Andre Esteva, Alexandre Robicquet, “A guide to deep learning in healthcare”, Nat ure Medicine, 2019, pp. 24–29.

[10] Aniruddha Dutta, “An Efficient Convolutional Neural Network for Coronary Heart Disease Prediction”, 2021, pp. 1-37.

[11] Aqsa Rahim, Yawar Rasheed, “An Integrated Machine Learning Framework for Effective Prediction of Cardiovascular Diseases”, IEEE Access, 20201, pp. 106575-106588.

[12] Armin Yazdani, Kasturi Dewi Varathan, “A novel approach for heart disease prediction using strength scores with significant predictors”, BMC Med Inform Decis Mak , 2021, pp. 1-21.

[13] Aravind Akella, Sudheer Akella, “Machine learning algorithms for predicting coronary artery disease: efforts toward an open source solution”, Future Science, 2021, pp. 1-9.

[14] Arman Kilic, “Artificial Intelligence and Machine Learning in Cardiovascular Healthcare”, The Annals of Thoracic Surgery, 2019, pp. 1-29.

[15] Asfi-Ar-Raihan Asif, Mirza Muntasir Nishat, “Performance Evaluation and Comparative Analysis of Different Machine Learning Algorithms in Predicting Cardiovascular Disease”, Engineering Letters, 2021, pp. 1-12.

[16] Ayushe Gangal, Peeyush Kumar, “Prediction Models for Healthcare using Machine Learning: A Review”, 2020, pp. 1-23.

[17] B Padmaja, Chintala Srinidhi, “ Early and Accurate Prediction of Heart Disease Using Machine Learning Model”, Turkish Journal of Computer and Mathematics Education, 2021, pp. 4516-4528.

[18] Baban.U. Rindhe, Nikita Ahire, “Heart Disease Prediction Using Machine Learning”, International Journal of Advanced Research in Science, Communication and Technology, 2021, pp. 267-273.