



KAVIKULGURU INSTITUTE OF TECHNOLOGY AND SCIENCE, RAMTEK – 441106

Project Preliminary Investigation Report

Name of Department:

Computer Technology

Name of Project Guide:

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Title of the Project:

Implementing the Technique of Heart Disease Prediction using Machine Learning

Area of Project Work:

Machine Learning (ML)

Problem Statement:

- To develop a machine learning model to predict the presence of heart disease in individuals based on medical and lifestyle features, enabling early detection and intervention for better patient outcomes.

Prior Art (Patent Search):

Patent Application No.	Title of patent	Existing Solutions (Abstract of Patent)
US5396886A	Method for predicting coronary heart disease	A device or system is provided for calculating and visualizing the risk for developing coronary heart disease which is in the form of a cardiovascular risk diagram which includes a series of cardiovascular risk scales projected on cardiovascular risk areas (for example, delineated by different colors) each scale representing a different cardiovascular risk factor. Data for each cardiovascular risk is recorded on its appropriate risk scale, and data points-on adjacent risk scales are connected to form enclosed area superimposed over the risk
202211010350	Heart Abnormalities Prediction Model Using Machine Learning	Information Technology has increased the efficiency of traditional systems of health monitoring, transportation, education, banking, and so on. The scope of Machine Learning is so vast and it's being used around the world. The healthcare industry is no exception. Machine Learning can play a crucial role in predicting Heart abnormalities
US20110119078A1	System and method for heart failure prediction	A method for monitoring a health status of a human subject includes the capturing of medical data concerning the health of the

		<p>subject at defined intervals using a questionnaire. The questionnaire provides a standard script for data capture. Part of the captured data is constrained to a Likert scale while other data is on a visual analog scale. The captured data further includes an assessment by a physician of health symptoms of the subject.</p>
202141000933 A	Advanced artificial intelligence based clinical decision support system for heart disease prediction	<p>AI-based heart disease prediction is an innovative approach that utilizes artificial intelligence and machine learning techniques to analyze patient data and identify patterns associated with heart disease. These AI systems can aid healthcare professionals in making more accurate and timely clinical decisions, leading to improved patient outcomes and better resource management.</p>

Literature Review:

Title of Paper	Details of Publication with Date and Year	Literature Identified for Project
A novel approach for heart disease prediction using strength scores with significant predictors	January 2021	<p>Cardiovascular disease is the leading cause of death in many countries. Physicians often diagnose cardiovascular disease based on current clinical tests and previous experience of diagnosing patients with similar symptoms. Patients who suffer from heart disease require quick diagnosis, early treatment and constant observations. To address their needs, many data mining</p>

		approaches have been used in the past in diagnosing and predicting heart diseases.
Heart disease prediction using machine learning algorithms	January 2021	<p>Day by day the cases of heart diseases are increasing at a rapid rate and it's very Important and concerning to predict any such diseases beforehand. This diagnosis is a difficult task i.e. it should be performed precisely and efficiently. The research paper mainly focuses on which patient is more likely to have a heart disease based on various medical attributes. We prepared a heart disease prediction system to predict whether the patient is likely to be diagnosed with a heart disease or not using the medical history of the patient. We used different algorithms of machine learning such as logistic regression and KNN to predict and classify the patient with heart disease.</p>
A Survey on Prediction Techniques of Heart Disease using Machine Learning	June 2020	<p>Heart is one of the most important part of the body. It helps to purify and circulate blood to all parts of the body. Most number of deaths in the world are due to Heart Diseases. Some symptoms like chest pain, faster heartbeat, discomfort in breathing are recorded. This data is analysed on regular basis. In this review, an overview of the heart disease and its current procedures is firstly introduced. Furthermore, an in-depth analysis of the most relevant machine learning techniques available on the literature for heart disease prediction is briefly elaborated.</p>

A Review on Heart Disease Prediction Using Machine Learning Techniques	April 2019	Heart disease is one of the most fatal problems in the whole world, which cannot be seen with a naked eye and comes instantly when its limitations are reached. Therefore, it needs accurate diagnosis at accurate time. Health care industry produced huge amount of data every day related to patients and diseases. However this data is not used efficiently by the researchers and practitioners.
A Literature Review on Heart Disease Prediction Based on Data Mining Algorithms	March 2018	The medical sector processed vast amounts of data on a regular basis. Handling large data in the old way can affect the results. Advanced data mining techniques are especially used in heart disease prediction to find facts about databases and medical research. Heart disease is the world's largest cause of death. The tremendous amount of data generated for the prediction of heart disease is too difficult and wasteful to process and analyse in the conventional way. Data mining provides methodologies and techniques to transform these mounds into useful information for decision making

- Imbalanced datasets, where the number of positive (heart disease) cases is significantly lower than negative cases, can lead to biased models with reduced accuracy for the minority class.

Proposed Solution:

To address class imbalance and prioritize accurate predictions for the minority class, we propose modifying the learning algorithm with varying misclassification costs. After identifying class imbalance, distinct costs will be assigned, placing higher emphasis on the minority class misclassifications. This adapted algorithm will then train to minimize the cumulative cost of misclassifications, specifically focusing on correctly predicting the minority class instances. Model evaluation will rely on class-imbalanced metrics like precision, recall, F1-score, and AUC-ROC. Cross-validation will fine-tune parameters, ensuring consistent performance across data subsets. Regular monitoring, iteration, and validation will maintain model effectiveness and alignment. Comprehensive documentation will record cost rationale, algorithm changes, and metric usage. This approach aims to yield an equitable, robust model that excels in predicting the minority class while ensuring fairness and reliability across both classes.

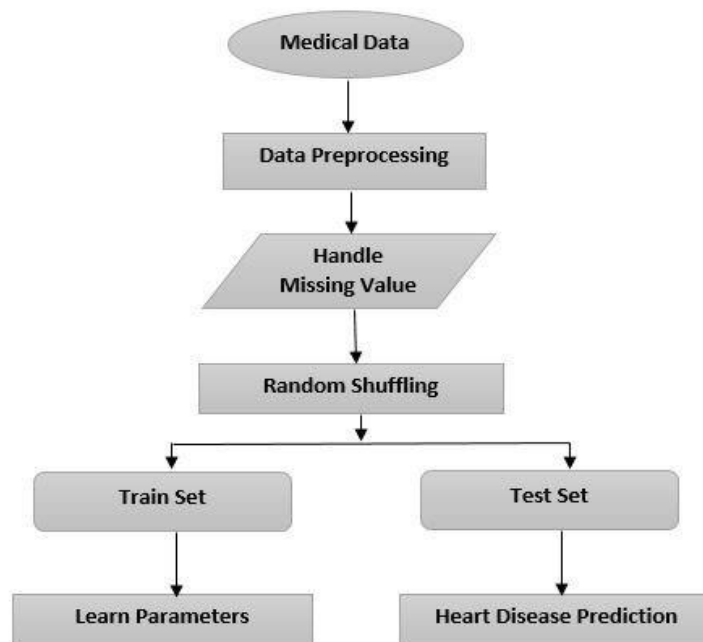


Fig: Flow Graph

Objectives and Scope of Work:

Objectives:

- To develop a heart prediction system, the system can discover and extract hidden

knowledge associated with diseases from heart data set.

- This system aims to exploit machine learning techniques on medical data set to assist in the prediction of the heart disease.
- Reduce the cost of medical tests.

Scope of work:

The scope of heart disease prediction is to develop a reliable and accurate machine learning model that can predict the likelihood of individuals having heart disease based on their medical and lifestyle features

Feasibility Assessment:

I. Excepted Outcomes of the project

1. The expected outcomes of the heart disease prediction project are accurate early detection of heart disease.
2. improved patient outcomes through timely interventions and personalized care.

II. Innovation Potential

The innovative approach to "Heart Disease Prediction" involves integrating diverse data sources through advanced multimodal fusion techniques. By combining medical imaging, wearable sensor data, and patient-reported information, we aim to uncover comprehensive insights using cutting-edge machine learning and deep neural networks. Our model fuses ECG scans, wearables, medical histories, and patient symptoms for a holistic health profile understanding. We prioritize temporal and spatial data analysis to detect subtle heart disease risk patterns. With a focus on explainable AI, our system provides transparent insights into predictions for medical professionals and patients. Real-time wearable data and continuous monitoring allow for early warnings and timely interventions. Personalized risk assessments cater to individual variations in genetics, lifestyle, and health history, encouraging proactive health management. Ultimately, our innovative approach redefines heart disease prediction as a personalized, continuous health companion, enhancing early detection, prevention, and overall well-being.

III. Task Involved

Tasks involved in the heart disease prediction project include data collection, preprocessing, feature selection, model training, evaluation, and deployment with a focus on accuracy, interpretability, and ethical considerations.

IV. Expertise Required

1. Inhouse Expertise

Python, Pandas, Machine Learning

2. External Expertise

PyCharm

V. Facilities Required

1. Inhouse Expertise

1.1 System configuration

- Processor AMD Ryzen 7
- No. of Cores-8.
- RAM-16 GB Hard Disk-128 GB

2. External Expertise

Internet, storage

Milestones and time Plan

[illegible]

Name and Signature of Project Guide

Ms. Vaishali Malekar

Signature of HOD

Dr. Vilas P. Mahatme