

PROJECT PROPOSAL

HRIDAI- (CARDIOVASCULAR DISEASES DETECTION & DIAGNOSIS PREDICTIVE MODEL)

TEAM : HRIDAM



Submission Date: JULY 24, 2024

TEAM: HRIDAM, NSTI Prayagraj

Authored By: AMBIKA AJAI SINGH



CONTENTS

- ✓ **PROJECT TITLE**
- ✓ **PROBLEM STATEMENT**
- ✓ **DESCRIPTION**
- ✓ **OBJECTIVE**
- ✓ **OPPORTUNITY**

PROJECT TITLE: HRIDAI

(CARDIOVASCULAR DISEASES DETECTION & DIAGNOSIS PREDICTIVE MODEL)

PROBLEM STATEMENT

Cardiovascular diseases are a significant cause of death worldwide. Especially in the increasingly modern and materialistic world of today, the mortality rate and the age range of the population affected by it has increased exponentially.

Traditional methods to predict cardiovascular diseases are quite unreliable and mostly ineffective and time consuming because they require manual analysis and only consider a few pieces of information. Such a cardiovascular diseases prediction model can cause delays in diagnosing and treating the disease. Also, these methods don't provide real-time monitoring or personalized risk assessment, which is a big problem.

This makes us require incessantly effective and efficacious solutions. Early cardiovascular diseases detection and prediction are crucial for effective prevention and timely intervention, which could possibly save countless lives susceptible to fatality over time. Technology and medicine can change how we predict such diseases in healthcare. With its ability to analyze large datasets and identify complex patterns, artificial intelligence, and even more so, machine learning has emerged as a promising tool for predicting cardiovascular diseases. Through this project, we aim to explore the applications and implications of using machine learning in cardiovascular diseases prediction, focusing on the best algorithms and looking for breakthroughs and various useful insights of this matter of vital importance.

DESCRIPTION

We explore the detection, diagnosis and prediction of cardiovascular disease using machine learning, uncovering the reasons behind this exciting technological advancement. We will be exploring heart disease predictions using machine learning.

Cardiovascular diseases prediction uses machine learning algorithms to analyze medical data and detect patterns that could suggest potential heart problems. This approach enables early detection and timely intervention, ultimately saving lives.

Critical factors associated with cardiovascular diseases:

There are multiple variables that potentially affect Understanding and dealing with these factors through lifestyle changes, regular check-ups, and early treatment are vital to preventing and managing heart disease. AI - ML models can use these factors to predict a person's risk and provide personalized precautions and preventive measures to combat the possibilities of having to deal with cardiovascular diseases.

Age: The risk of heart disease increases with age. Older individuals are more likely to develop cardiovascular conditions. But, given the statistical data and lifestyle changes and challenges of the modern world, the age range of cardiovascular diseases has significantly increased to combine much younger individuals.

Gender: Men tend to have a higher risk of heart disease than premenopausal women. However, after menopause, women's risk increases and approaches that of men. This is a generalized statement.

Genetics and Family History: A family history of heart disease can significantly elevate an individual's risk of getting cardiovascular diseases. Genetic factors can contribute to high blood pressure and high cholesterol.

High Blood Pressure (Hypertension): High blood pressure puts strain on the heart and blood vessels, increasing the risk of heart disease, stroke, and other cardiovascular conditions.

High Cholesterol Levels: Increased levels of low-density lipoprotein (LDL or “bad” cholesterol) and low levels of high-density lipoprotein (HDL or “good” cholesterol) can contribute to the buildup of plaques in the arteries, leading to atherosclerosis.

Diabetes: Individuals with diabetes have a higher risk of getting cardiovascular disease. Diabetes can damage blood vessels and contribute to atherosclerosis.

Physical Inactivity: A life of physical inactivity is a significant risk factor contributing much to cardiovascular diseases. Regular physical activity helps maintain a healthy weight, lower blood pressure, and improve overall cardiovascular health.

Unhealthy Diet: Diets high in saturated and trans fats, cholesterol, sodium, and added sugars contribute to elevated blood cholesterol levels, hypertension, and obesity, increasing the risk of heart disease. Also, processed and ultra-processed foods, like the popular junk food choices of today are a major concern for increasing the risk of various health diseases and disorders, including cardiovascular diseases.

Smoking: Tobacco smoke contains chemicals that can damage blood vessels and heart tissue, leading to the development of atherosclerosis and other cardiovascular issues.

Obesity and Overweight: Excess body weight, especially around the abdomen, is associated with an increased risk of heart disease. Obesity contributes notably to conditions such as diabetes and hypertension.

Excessive Alcohol Consumption: Heavy and chronic alcohol consumption can lead to high blood pressure, cardiomyopathy, and other heart-related issues.

Stress: Chronic stress may contribute to heart disease through various mechanisms, including elevated blood pressure and unhealthy coping mechanisms. Stress may be the biggest challenge putting substantially younger individuals at the risk of cardiovascular diseases.

OBJECTIVE

Various objectives are outlined below for using AI-ML for the sake of prediction and detection of cardiovascular diseases:

Early Detection: AI – ML algorithms can find patterns in health data to detect potential heart issues even before symptoms appear.

Personalized Risk Assessment: Customizing predictions based on a person's health profile improves accuracy, enabling personalized preventive measures and timely intervention.

Real-Time Monitoring: Continuous monitoring of health parameters in real time enables quick action in case of abnormalities, reducing response time and improving patient outcomes.

Data Analysis Perspectives: Analyzing large data sets to discover patterns, relationships and trends between various risk factors and the likelihood of developing cardiovascular diseases helping healthcare professionals make improved and informed decisions.

Aid Researches: To enable researchers and data analysts to use this information to develop and test predictive models to identify individuals at risk of heart disease. Aid in the development of effective prevention and treatment strategies for heart disease.

Laying Groundwork For Future Prospects: To identify potential areas for further research, such as investigating the relationship between lifestyle factors and cardiovascular diseases risk.

Providing Data That Includes Various Variables: To provide a collection of data related to patients who have undergone cardiac diagnostic tests and include a variety of clinical and demographic features of patients, such as -

- age

-
- gender
 - chest pain type
 - resting blood pressure
 - serum cholesterol levels
 - maximum heart rate achieved
 - presence or absence of coronary artery disease

Practices and Processes to be followed:

Data Preprocessing: Clean and preprocess the dataset to handle missing values, normalize features, and convert categorical variables into a suitable format for machine learning models.

Feature Selection: Identify and select the most relevant features for the prediction model to improve accuracy and reduce computational complexity.

Model Evaluation: Employ appropriate evaluation metrics such as accuracy, precision, recall, and F1-score to assess the ML model's performance.

Hyperparameter Tuning: Fine-tune the parameters of the chosen algorithm to optimize the model's performance.

Validation and Testing: Split the dataset into training, validation, and testing sets to ensure the model generalizes well to new, unseen data.

OPPORTUNITY

We will be exploring and venturing into a lot of algorithms and tools of AI - ML available for making our project as detailed and as precisely accurate as possible. We sincerely wish to make the best of this opportunity and make noteworthy contributions in the noble field of healthcare, which we are deeply passionate about, as it's the most fruitful way to make a meaningful impact in the lives of people.

“We would like to express our gratitude towards NSTI, IBM, DGT and Edunet for providing us this opportunity to delve into AI and explore limitless possibilities.”

We have also thought over the future prospects we wish to incorporate and implement farther in the scope of this project. We wish to take it to a higher level where our project is made available and accessible in medical institutes, research laboratories, hospitals and the general public for the benefit of people from all walks of life. We are immensely excited to work towards contributing positively in the advancement of science and technology for the sake of deeper understanding and mutual improvement.

TEAM MEMBERS

TEAM HRIDAM (NSTI PRAYAGRAJ):
• AMBIKA AJAI SINGH
• ASHISH GUPTA
• ATUL SRIVASTAV
• SAKSHI CHAURASIA