

**A Comprehensive Heart Disease
Prediction System Using Machine Learning and Graphical
Interface**

A PROJECT REPORT

Submitted by

**RIYA KASHYAP (21SCSE1180039)
SAURABH KUMAR (21SCSE1011385)**

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BONAFIDE CERTIFICATE

This is to certify that Project Report entitled "HEART DISEASE PREDICTION" which is submitted by Riya Kashyap and Saurabh Kumar in partial fulfillment of the requirement for the award of degree B. Tech. in Department of B.TECH of School of Computing Science and Engineering Department of Computer Science and Engineering Galgotias University, Greater Noida, India is a record of the candidate own work carried out by him/them under my supervision. The matter embodied in this thesis is original and has not been submitted for the award of any other degree.

Signature of Examiner(s)

Signature of Supervisor(s)

External Examiner

Signature of Program Chair

Date: October, 2024

Place: Greater Noida

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ABSTRACT

This is a project report on the “**Heart Attack Prediction System**” using Python programming concepts and a Tkinter GUI to develop the application. This tool is designed for the medical sector to analyze and store data in text form, addressing the difficulties of managing data and information.

The project employs machine learning techniques to predict heart disease and uses a MySQL database for efficient data management. This project is ideal for final year projects and is available online for the first time.

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. 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.

INTRODUCTION

Heart attack prediction is the process of utilizing machine learning techniques to foresee the likelihood of a heart attack based on various health parameters. This is crucial in the medical field as it can save lives by predicting potential heart problems before they occur. The system integrates Python, Tkinter for the GUI, and MySQL for database management, providing an efficient and user-friendly tool for medical professionals.

Heart disease describes a range of conditions that affect your heart. Today, cardiovascular diseases are the leading cause of death worldwide with 17.9 million deaths annually, as per the World Health Organization reports. Various unhealthy activities are the reason for the increase in the risk of heart disease like high cholesterol, obesity, increase in triglycerides levels, hypertension, etc. All these symptoms resemble different diseases also like it occurs in the aging persons, so it becomes a difficult task to get a correct diagnosis, which results in fatality in near future. There are many open sources for accessing the patient's records and researches can be conducted so that various computer technologies could be used for doing the correct diagnosis of the patients and detect this disease to stop it from becoming fatal

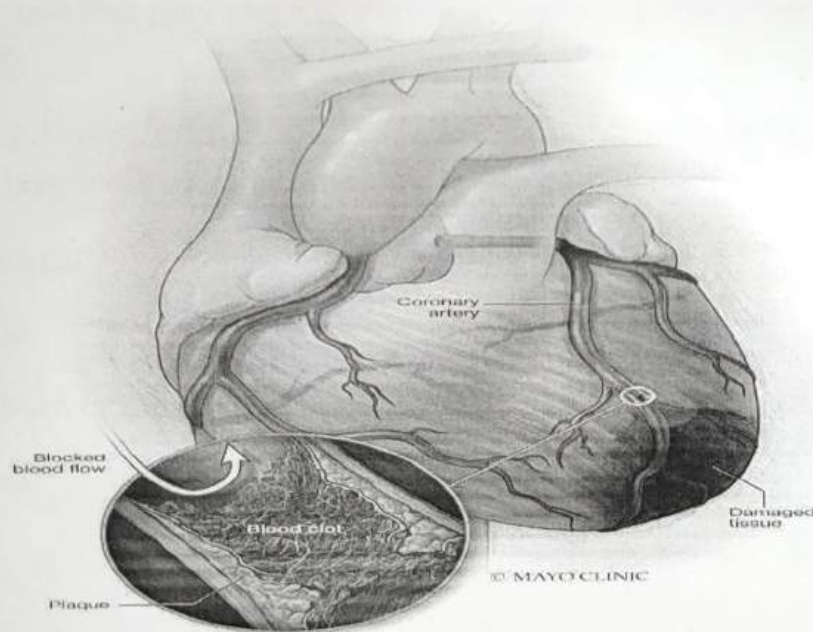
CHAPTER 1

INTRODUCTION

1.1. Introduction of tittle

A heart attack occurs when the flow of blood to the heart is severely reduced or blocked. The blockage is usually due to a buildup of fat, cholesterol and other substances in the heart (coronary) arteries. The fatty, cholesterol-containing deposits are called plaques. The process of plaque buildup is called atherosclerosis.

Sometimes, a plaque can rupture and form a clot that blocks blood flow. A lack of blood flow can damage or destroy part of the heart muscle.



1.2. Identification of system

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1.3. Identification of problem

Symptoms of a heart attack vary. Some people have no symptoms.

Common heart attack symptoms include:

- Chest pain that may feel like pressure, tightness, pain, squeezing or aching
- Pain or discomfort that spreads to the shoulder, arm, back, neck, jaw, teeth or sometimes the upper belly
- Cold sweat
- Fatigue
- Heartburn or indigestion
- Nausea

- **Shortness of breath**

Women may have atypical symptoms such as brief or sharp pain felt in the neck, arm or back. Sometimes, the first symptom sign of a heart attack is sudden cardiac arrest.

Some heart attacks strike suddenly. But many people have warning signs and symptoms hours, days or weeks in advance. Chest pain or pressure (angina) that keeps happening and doesn't go away with rest may be an early warning sign. Angina is caused by a temporary decrease in blood flow to the heart.

Heart attack risk factors include:

- Age
- Tobacco use
- High blood pressure
- High cholesterol.
- Obesity
- Diabetes
- Unhealthy diet
- Stress

CHAPTER 2

BACKGROUND STUDY

2.1 Background Study

Heart disease predictor is an offline platform designed and developed to explore the path of machine learning. The goal is to predict the health of the patient from collective data to be able to detect configurations at risk for the patient, and therefore, in cases requiring emergency medical assistance, alert the appropriate medical staff of the situation of the latter. We initially have a dataset collecting information of many patients with which we can conclude the results into a complete form and can predict data precisely. The results of the predictions, derived from the predictive models generated by machine learning, will be presented through several distinct graphical interfaces according to the datasets considered.

2.2 Methodology

The “target” field refers to the presence of heart disease in the patient. It is integer-valued 0 = no disease and 1 = disease.

Age- age of patient in years, sex- (1 = male; 0 = female).

- **Cp**—chest pain type.
- **Trest bps**—resting blood pressure (in mm Hg on admission to the hospital). The normal range is 120/80 (if you have a normal blood pressure reading, it is fine, but if it is a little higher than it should be, you should try to lower it. Make healthy changes to your lifestyle).
- **Chol**—serum cholesterol shows the amount of triglycerides present. Triglycerides are another lipid that can be measured in the blood. It should be less than 170 mg/dL (may differ in different Labs).
- **Fbs**—fasting blood sugar larger than 120 mg/dl (1 true). Less than 100 mg/dL (5.6 mmol/L) is normal, and 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is considered prediabetes.
- **Restecg**—resting electrocardiographic results.
- **Thalach**—maximum heart rate achieved. The maximum heart rate is 220 minus your age.
- **Exang**—exercise-induced angina (1 yes). Angina is a type of chest pain caused by reduced blood flow to the heart. Angina is a symptom of coronary artery disease.

2.3 Existing solutions

Python offers multiple options for developing GUI (Graphical User Interface). Out of all the GUI methods, tkinter is the most commonly used methods. It is a standard python interface to the Tk GUI toolkit shipped with Python. Python with tkinter outputs the fastest and easiest way to create the GUI applications.

To create a tkinter:

- Importing the module - tkinter
- Create the main window (container)
- Add any number of widgets to the main window.
- Apply the event Tigger on the main window.

2.4 Problem Definition

The problem of heart disease prediction is to accurately predict a patient's risk of heart disease so that they can receive early intervention and treatment.

Heart disease prediction systems use machine learning algorithms and data mining techniques to analyze a patient's medical history and attributes to predict their risk of heart disease.

Some of the medical parameters that can be used to predict heart disease include:

age, sex, blood pressure, cholesterol, obesity, and fasting sugar level.

2.5 Goals / Objective

- **Detect heart disease early**

Help clinicians detect cardiac problems early so that patients can receive appropriate treatment

- **Reduce misdiagnosis**

Help diagnosticians reduce misdiagnosis by correctly classifying cardiovascular disease

- **Improve accuracy**

Use machine learning to produce an accurate algorithm for early heart disease prediction

Machine learning (ML) is an artificial intelligence technology that can recognize patterns from data. It can be used to diagnose, detect, and forecast many disorders in the medical industry

CHAPTER 3

DESIGN/FLOW OR PROCESS

3.1 Design/ Flow or Process

It is a quite easy work with python, in this method we have used few advance libraries like tkinter, os, numpy, pandas, sklearn, datetime etc

- How to start in few simple steps

Open Terminal, and install all required modules

- `pip install numpy == 1.26.4`
- `pip install pandas == 2.2.2`
- `pip install scikit-learn`
- `pip install matplotlib == 3.5.32.`




It is the first interface of Heart Attack Application, which is completely design with the help of python tkinter.

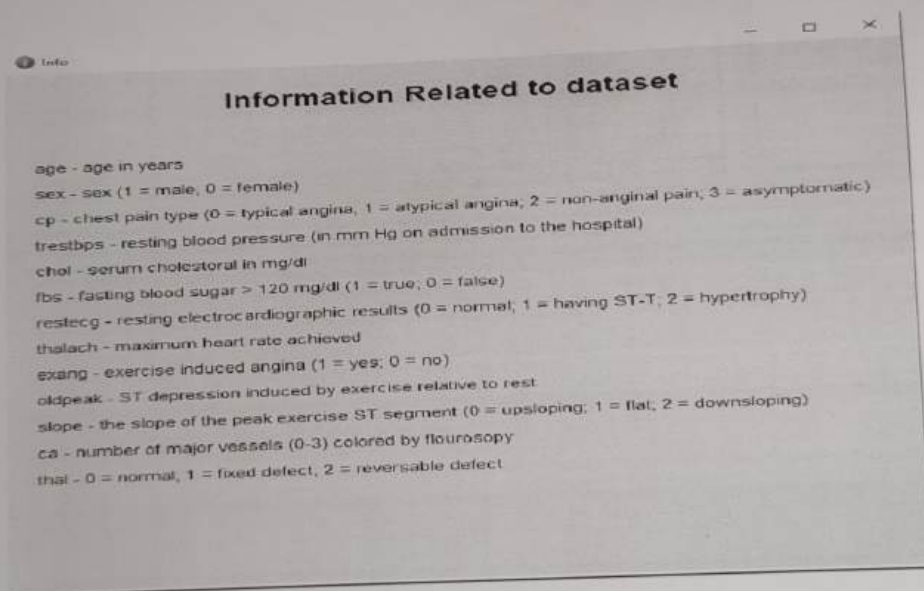
It contain all the features with advance modules and working.

There is list of work we can perform, in this

project:

1. Prediction
2. Database
3. Generate Report
4. Information of test

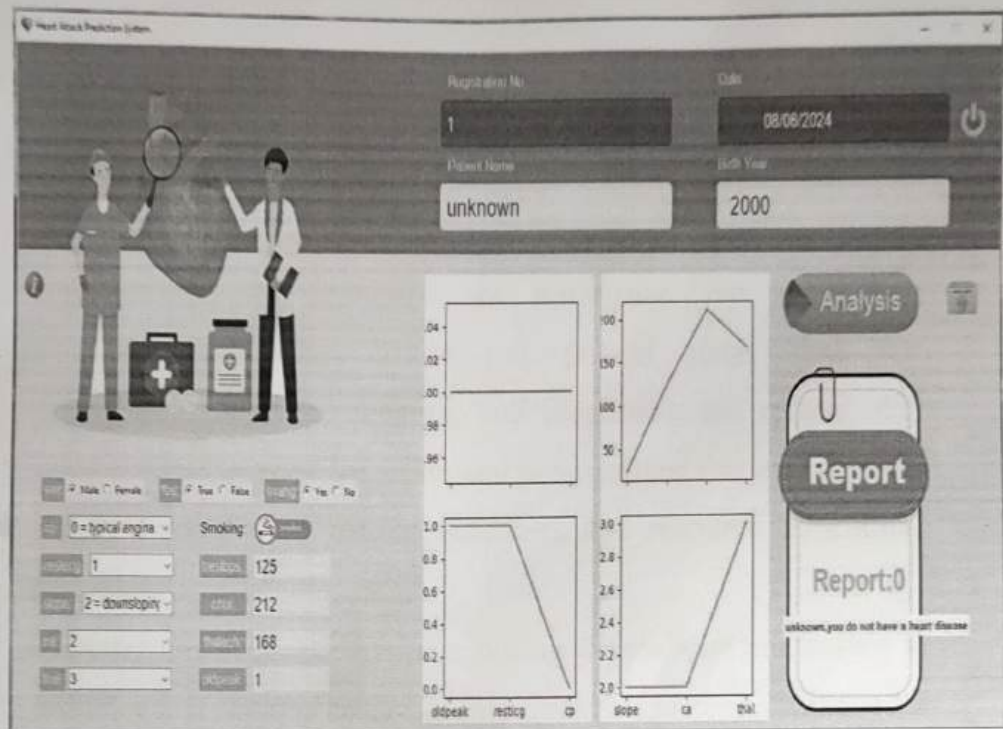
3. Click on info  button, to get more information about all entries



On putting all the required details given in the software interface , click on the
button.

Analysis

Final Result:



CHAPTER 4

CONCLUSION AND FUTURE WORK

Conclusions

In conclusion, the development of a heart attack prediction system using machine learning presents both significant opportunities and challenges in healthcare. By leveraging advanced algorithms to analyze patient data, such as demographics, medical history, and diagnostic test results, the system can offer early detection and personalized risk assessment, leading to improved patient outcomes and resource allocation efficiency.

However, the success of such a system depends on addressing key challenges, including ensuring data quality and representativeness, enhancing model interpretability and transparency, mitigating the risk of overfitting, and addressing ethical and privacy concerns. Despite these challenges, the potential benefits of a heart attack prediction system are substantial, offering healthcare providers valuable decision support tools to better prioritize patient care and interventions. Moving forward, collaboration between data scientists, healthcare professionals, policymakers, and regulatory bodies will be essential to develop robust, ethical, and clinically relevant predictive models that ultimately improve patient care and outcomes in the management of cardiovascular health.

FUTURE SCOPE

- **Integration with Wearable Devices:**

As wearable health monitoring devices become more prevalent, integrating data from these devices into heart attack prediction systems could enhance the accuracy and timeliness of risk assessments.

- **Advanced Machine Learning Techniques:**

Exploring advanced machine learning techniques, such as ensemble methods, deep learning, and reinforcement learning, may further improve the predictive performance of heart attack prediction systems.

These techniques can capture complex relationships within the data and adapt to evolving patterns over time.

- **Remote Patient Monitoring:**

With the increasing adoption of telemedicine and remote patient monitoring, there is an opportunity to develop heart attack

prediction models that can be deployed in virtual healthcare settings. Remote monitoring platforms can enable continuous assessment of patient risk factors and early detection of warning signs, facilitating timely interventions and follow-up care.

- **Predictive Analytics for Precision Medicine:**

Integrating genetic and genomic data into heart attack prediction models can enable personalized risk stratification and treatment recommendations based on an individual's genetic predisposition to cardiovascular diseases. Incorporating biomarkers and omics data can enhance the precision and individualization of predictive analytics in cardiovascular medicine.

- **Population Health Management:**

Heart attack prediction systems can contribute to population health management initiatives by identifying high-risk cohorts within communities or patient populations. Targeted interventions, preventive strategies, and public health campaigns can be tailored to address the specific needs of at-risk groups, reducing the overall burden of cardiovascular disease on healthcare systems.

- **Clinical Decision Support Systems:**

Embedding heart attack prediction algorithms into clinical decision support systems (CDSS) can assist healthcare providers in

making evidence-based decisions at the point of care. Integrating predictive analytics seamlessly into electronic health record (EHR) systems can streamline clinical workflows and improve the delivery of personalized care.

- **Longitudinal Data Analysis:**

Longitudinal analysis of patient data over extended periods can provide insights into the trajectory of cardiovascular health and disease progression. Monitoring changes in risk factors, treatment responses, and outcomes over time can inform personalized risk management strategies and optimize long-term patient outcomes.

REFERENCES

- <https://pmc.ncbi.nlm.nih.gov/articles/PMC10378171/>
- <https://github.com/g-shreekant/Heart-Disease-Prediction-using-Machine-Learning>
- <https://iopscience.iop.org/article/10.1088/1757-899X/1022/1/012072/pdf>