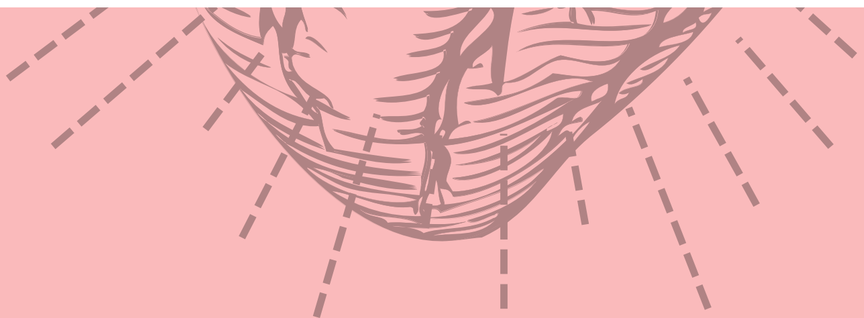
SAMSAN TECH

HEART DISEASE DIAGNOSIS

ISP688 - GROUP PROJECT



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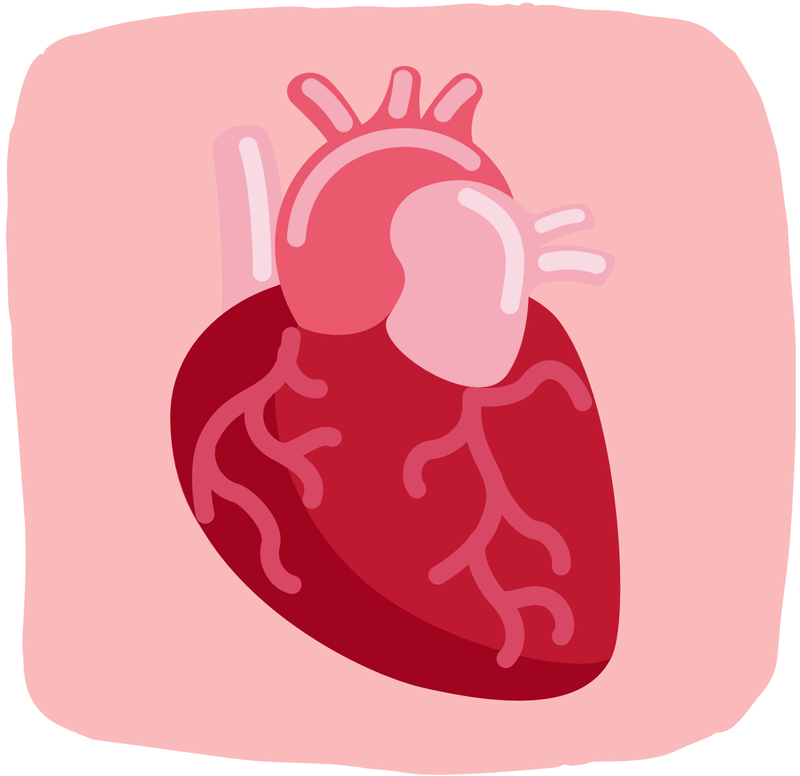
INTRODUCTION

- Heart disease is a prevalent and severe health concern globally, including coronary artery disease (CAD).
- CAD results from the buildup of cholesterol plaque in heart arteries, leading to reduced blood flow and potential complications like heart attacks and strokes.
- Early detection and intervention are crucial in managing heart disease.
- Existing heart disease prediction systems estimate risk based on various characteristics but can be costly and inefficient.
- The study aims to evaluate the effectiveness of cardiac prediction systems in diagnosing heart disease.
- The goal is to provide timely and accurate assessments to inform medical decisions.
- The study aims to address the need for improved efficiency and accessibility in heart disease prediction tools.



The Problem in Business

- Need for effective decision support system in predicting heart disease likelihood.
- Timely and accurate prediction aids decision-making in diagnosis, treatment, and prevention.
- Challenges in assessing heart disease risk due to complex patient data.
- Decision support system analyzes patient data using machine learning algorithms

Department Concerned

- Heart disease prediction falls under the care of the healthcare department, particularly the cardiology department.
- Cardiologists, cardiovascular nurses, and other healthcare professionals are responsible for diagnosing and treating heart disease patients.
- They require a reliable and user-friendly decision support system for predicting heart disease likelihood based on patient data.

USER REQUIREMENTS

- Accurate Prediction: Provide accurate heart disease likelihood predictions based on patient data.
- User-Friendly Interface: Ensure a user-friendly interface for easy data entry and navigation.
- Decision Support: Offer guidance on additional diagnostics and preventive actions.
- Scalability: Scale the system's processing capabilities to handle diverse datasets.
- Training and Support: Provide training programs for optimal system utilization.

SYSTEM USERS

- Cardiologists: Specialized doctors for heart disease diagnosis and treatment.
- Cardiovascular Nurses: Nurses supporting cardiologists in patient care.
- Medical Technicians: Professionals conducting and analyzing diagnostic tests.

IMPLEMENTATION STRATEGY FOR THE SYSTEM

01

Define Project Objectives

- Develop a machine learning-based system for accurate heart disease diagnosis.
- Improve early detection and reduce misdiagnosis rates.

02

Develop Action Plan

- Gather and preprocess patient data.
- Construct, train, and evaluate machine learning models.

03

Engage Stackholders

- Stakeholders' input, ideas, and support are ensured by regular communication and engagement throughout the implementation phase.

04

Allocate Resource

- Allocate skilled personnel in machine learning, data pretreatment, and software development and provide necessary technological resources and infrastructure.

05

Manage Risk

- Implement security measures and conduct model review and validation to mitigate risks.

06

Monitoring and Evaluation

- Monitor and evaluate the performance of the system.
- Track important indicators and collect user feedback for continual development.

SYSTEM FUNCTIONALITY

The system needs to support concurrent users with fast response times, handle large datasets effectively, ensure data privacy and security, and provide an intuitive interface with straightforward navigation, helpful error warnings, and attractive visuals across devices and browsers.

Functional requirements	Examples	Non-functional requirements
The website will have a homepage where the diagnosis of the heart disease.	**Homepage**	It should load within 15 seconds.
The system will display the dataset used to predict.	**Dataset**	The dataset will be not displaying confidential information such as the patient name.
The system will show the model and accuracy obtained.	**Model**	It should handle large dataset.
The system will always be available to the users.	**Availability**	The website must have a 99.7% uptime.
Users can access the system on their phone because the system is responsive.	**Accessibility**	Any device will be able to access and is compatible with every device.

SYSTEM PROCESS

DATA ACQUISITION

MODEL CONSTRUCTION AND EVALUATION

PROTOTYPE DEVELOPMENT

DATA ACQUISITION

DATA COLLECTION

- The dataset obtained from Kaggle.
- This data set dates from 1988 and consists of four databases: Cleveland, Hungary, Switzerland, and Long Beach V.
- The dataset consist of 76 attributes, but for this project it only use a subset of 13 attributes

Attributes
1. age 2. sex 3. chest pain type (4 values) 4. resting blood pressure 5. serum cholestoral in mg/dl 6. fasting blood sugar > 120 mg/dl 7. resting electrocardiographic results (values 0,1,2) 8. maximum heart rate achieved 9. exercise induced angina 10. oldpeak = ST depression induced by exercise relative to rest 11. the slope of the peak exercise ST segment 12. number of major vessels (0-3) colored by flourosopy 13. thal: 0 = normal; 1 = fixed defect; 2 = reversable defect

DATA PREPROCESSING

- The data preprocessing procedure may considerably increase the reliability, accuracy, and validity of the data, as well as assist in maintaining error-free data.
- The procedure can assist in removing incorrect misleading, or duplicate data entries from the final dataset.

SYSTEM PROCESS

DATA ACQUISITION

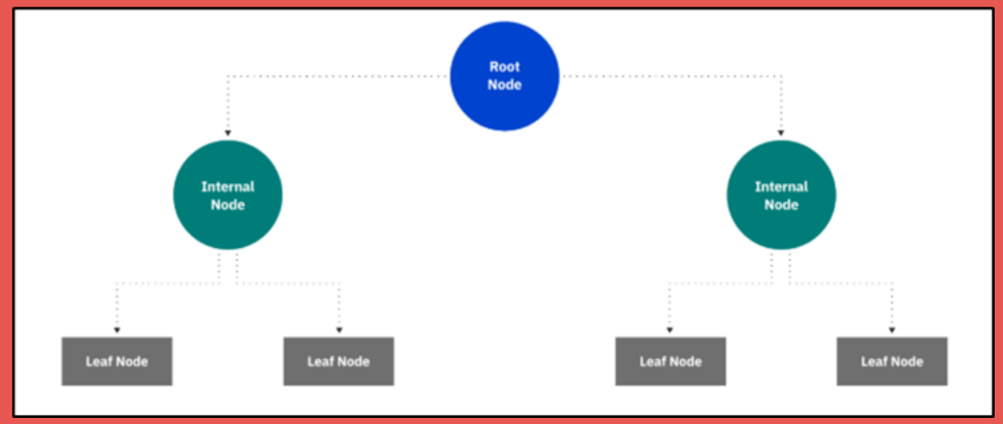
MODEL CONSTRUCTION AND EVALUATION

PROTOTYPE DEVELOPMENT

MODEL CONSTRUCTION AND EVALUATION

MODEL CONSTRUCTION

- The machine learning technique that will be implemented is the decision tree.
- It is organised hierarchically and has a root node, branches, internal nodes, and leaf nodes.



EVALUATION

- It is evaluated by the accuracy of the model.
- The parameters are tuned to achieve the best accuracy.
- From the purposed method the result have achieved an accuracy of 99.03%.

SYSTEM PROCESS

DATA ACQUISITION

MODEL CONSTRUCTION AND EVALUATION

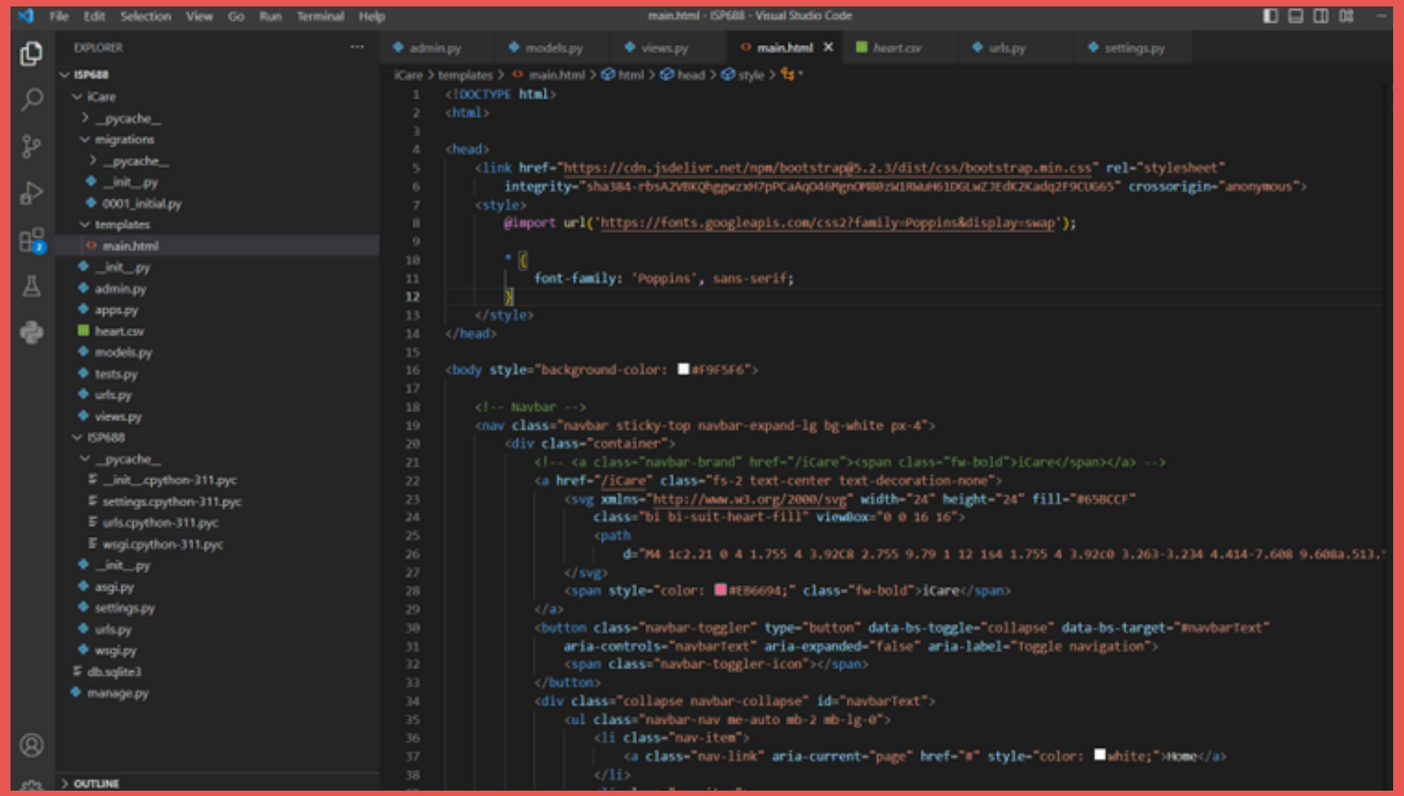
PROTOTYPE DEVELOPMENT

PROTOTYPE DEVELOPMENT

DEVELOPMENT

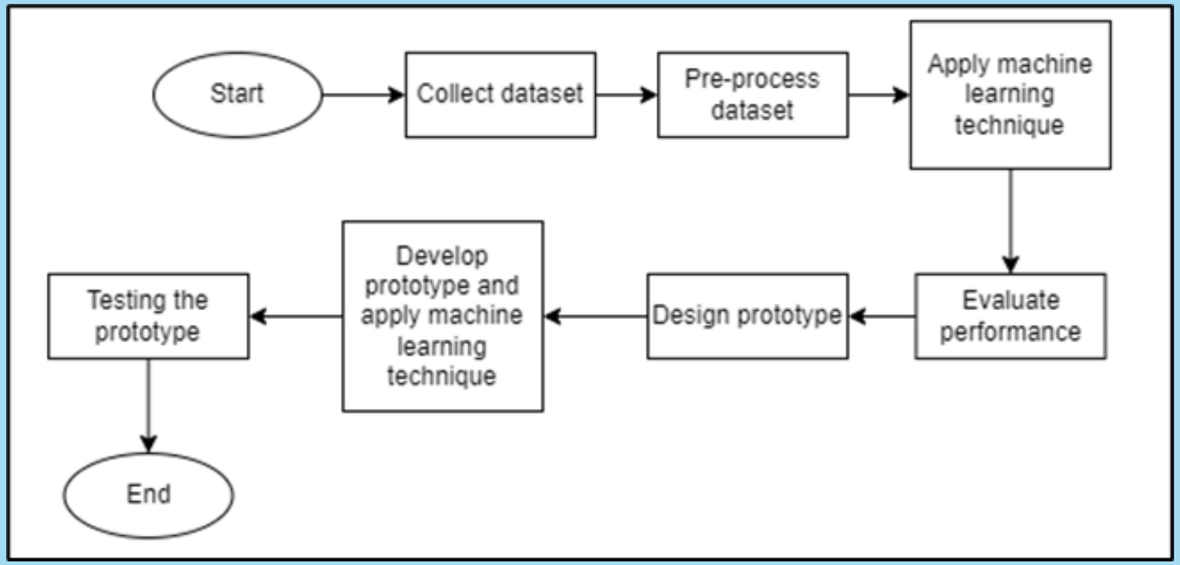
- The prototype is then developed using Django which is a python framework.
- The platform use is visual basic tools.
- The model will be implemented in the prototype.

Example of prototype develop using Django in python framework:



SYSTEM WORKFLOW

The project consists of 7 activities, including collecting and preprocessing data, constructing a Decision Tree model, evaluating its performance, designing and developing a prototype using Django, and testing for errors.



USABILITY OF THE SYSTEM

User-Friendly Interface	The system's user interface needs to be simple and easy to use with clearly labelled buttons, menus, and input areas.
Efficient Workflow	Users should be guided efficiently through the process of entering data and getting predictions by the system.
Contextual Help and Documentation	To help users comprehend certain features or concepts, the system should offer tooltips or contextual guidance.
Error Prevention and Handling	To reduce user errors, the system should have error avoidance techniques.
Responsiveness and Performance	A seamless and responsive user experience should be provided by the system, which should also have short reaction times.

SYSTEM BENEFITS

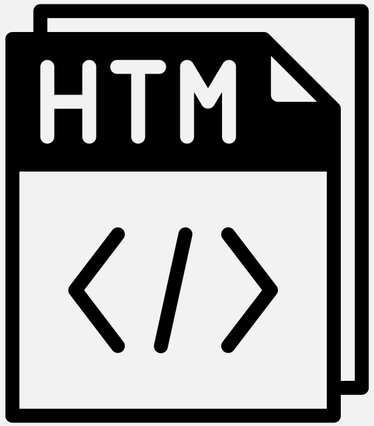
- ML models in the DSS efficiently identify heart attack symptoms (Nandal et al., 2022).
- DSS provides better predictions than conventional techniques by considering risk factors, symptoms, and medical history.
- Aids medical practitioners make informed decisions and improve cardiac disease diagnosis accuracy.
- Provides general recommendations and preventive measures for heart disease.
- Automates the analysis of patient data and generation of forecasts.
- Saves time for healthcare providers to focus on providing treatment.
- Assists in decision-making by providing relevant data and suggestions.
- Providing information on risk factors, diagnostic procedures, and available treatments for heart disease.

MEASUREMENT SCHEME

- We will predict whether the patient has heart disease or not using patient details.
- It is represented using values 0 and 1 where 0 is negative heart disease and 1 is positive heart disease.
- The result is based on the Decision tree algorithm where the accuracy of the model is calculated.

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

Attributes	Value
age	Integer (21 – 100)
sex	1 = male, 0 = female
chest pain type (4 values)	0, 1, 2, 3
resting blood pressure	80 – 180
serum cholestoral in mg/dl	Less than 170 – More than 240
fasting blood sugar > 120 mg/dl	1 = true, 0 = false
resting electrocardiographic results	0, 1, 2
maximum heart rate achieved	150 – 200
exercise induced angina	1 = yes, 0 = no
oldpeak = ST depression induced by exercise relative to rest	0 – 7.0
the slope of the peak exercise ST segment	0 – 2
number of major vessels colored by flourosopy	0 – 3
thal: 0 = normal; 1 = fixed defect; 2 = reversable defect	1 - 3



SOFTWARE FOR SYSTEM IMPLEMENTATION

- The system will be developed using Django, a high-level Python web framework.
- Django is an open-source framework and freely available for use.
- Django offers libraries and a proper folder structure suitable for large and complex machine learning models.
- Python will be used as the programming language for the backend.
- HTML will be used as the preferred markup language for the frontend.

SYSTEM DEMONSTRATION

THANK YOU!

Thank you so much for watching our presentation! Do you have any questions, comments, or suggestions?