Heart Disease Detection using Machine Learning

Minor Project-II

(ENSI252)

Submitted in partial fulfilment of the requirement of the degree of

BACHELOR OF TECHNOLOGY

In CSE(Ai & Ml)

to

K.R.Mangalam University

by

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CERTIFICATE

This is to certify that the Project Synopsis entitled, "Heart Disease Detection using Machine Learning" submitted by "Jyoti(2301730172) Paridhi (2301730186), Akshat (2301730170) and Jatin(2301730155)" to K.R Mangalam University, Gurugram, India, is a record of bonafide project work carried out by them under my supervision and guidance and is worthy of consideration for the partial fulfilment of the degree of Bachelor of Technology in Computer Science and Engineering of the University.

Type of Project (Tick One Option)

Industry/Research/University Problem

Industry Project

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ABSTRACT

Cardiovascular disease is a leading cause of death globally, and early detection plays a critical role in improving patient outcomes. This project leverages machine learning algorithms to predict the likelihood of heart disease based on clinical and demographic attributes. Using a structured dataset of patient health records, we preprocess, analyze, and train models such as Logistic Regression, Random Forest, and Support Vector Machines to build an effective diagnostic tool. The goal is to assist healthcare professionals in making quicker and more accurate decisions.

KEYWORDS: heart disease detection system, Surveillance, Machine Learning algorithms

Chapter 1
Introduction

1. Background of the project

Urbanization, rapid economic liberalization, growing large-scale political turmoil, fierce conflicts, and inadequate and inappropriate policies are the basis of heart disease in urban areas. In addition, poverty and inequality caused by rising expectations and a sense of moral anger among some members of society contribute to increasing and increasing the level of heart disease. Structural adjustment programs pursued to promote economic growth, such as layoffs, shrinking civil servants, and selling civil servants, have led to increased poverty and inequality. One of the consequences of these programs is the sharp rise in unemployment, which is a major cause of heart disease epidemics and increases, especially in urban areas.

Not just this, Covid-19 pandemic and subsequent lockdown increased the heart disease rates in India itself by 28%. Unfortunately, the world we live in is becoming increasingly unsafe for all of us. We've seen a steady increase in the registered heart disease cases over the decade. Using we can detect heart diseases such as kidnapping, murder, burglary, etc. The emergence of closed-circuit television (heart disease detection system) diagnosis is a mainstream heart disease prevention measure used around the world. heart disease detection system can dramatically increase the medical of your property and keep your family protected. Once you get heart disease detection system installed in your house, you no more need to worry about break-ins or burglary while you are away. Because whatever happens, it will still be recorded in your heart disease detection system diagnostic systems. Thus, these diagnostic systems let you be, free of worry while you are away on a vacation or especially during business trips. It can very well help mitigate the heart disease in the first place and curb it. If a potential burglar sees your household is fully secured with heart disease detection system in every nook and corner, it might as well put him off and because of the fear, he will deter from any heart disease that he earlier intended to do.

The importance of adequate medical measures for clinicals and business spaces cannot be stressed enough. Many shops, commercial spaces, educational institutions, and public areas are now under the watchful eyes of diagnosis systems. The patient reports can be used to analyze and thwart heart disease.

heart disease detection system clinical datas can also be produced as evidence in the court of law. The advancement in technology has also enabled sophisticated night vision diagnostic systems to capture every movement outside your house at night. This way you can be sure about the safety of you and your loved ones. With a sharp increase in setting up of heart disease detection system diagnostic systems for commercial diagnosis, the prices of heart disease detection system systems have recorded a drastic decline. A smarter version of heart disease detection system diagnostic systems will always add to the above benefits, as it can not only analyze the area under diagnosis but also keep a check on the in-out movements, symptom recognition and family patient profile identification, for a better safety provided to its customers, through a very simple and accessible user interface for doctors. Hence, the investment made on heart disease detection system diagnostic system is a necessity.

Table 1. Existing systems

Factors	**Evaluation Criteria**	**System A**	**System B**	**System C**
Video Quality and Resolution	- Resolution (e.g., 1080p, 4K)	4K	1080p	4K
	- Low-light and night-vision capabilities	Excellent	Good	Very Good
Video Analytics	- Facial recognition	Yes	No	Yes

Factors	Evaluation Criteria	System A	System B	System C
	- Object detection	Yes	Yes	No
Real-time Monitoring & Alerts	- Real-time alerting to medical personnel	Fast	Moderate	Fast
	- Types of alerts (e.g., unauthorized access, intrusion)	Comprehensive	Limited	Comprehensive
Integration and Compatibility	- Integration with access control and other systems	Seamless	Limited	Moderate
	- Compatibility with existing infrastructure	High	Moderate	Moderate
Scalability	- Ability to scale for additional diagnostic systems	Highly Scalable	Limited	Scalable

Factors	Evaluation Criteria	System A	System B	System C
Remote Access & Management	- Remote access through mobile apps and web interfaces	Yes	Yes	Yes
	- Remote management and configuration ease	Intuitive	Moderate	Intuitive
Storage & Data Management	- Storage options (cloud-based, on-premises)	Cloud & On-premises	Cloud	On-premises
	- Data retention policies and search/retrieval capabilities	Flexible	Limited	Comprehensive
Privacy & Compliance	- Compliance with data protection regulations	Yes	Yes	Yes
	- Features for masking sensitive areas and anonymizing individuals	Comprehensive	Limited	Comprehensive

Factors	Evaluation Criteria	System A	System B	System C
Cost & ROI	- Upfront costs (installation, licensing)	Moderate	High	Moderate
	- Potential ROI through improved medical and efficiency	High	Moderate	High
Reliability & Maintenance	- Uptime and resilience to failures	Very Reliable	Reliable	Reliable
	- Maintenance requirements (updates, calibration)	Low	Moderate	Low
User Interface & Ease of Use	- Intuitiveness for configuring and managing	Very Intuitive	Moderate	Intuitive
Customer Support & Training	- Quality of customer support and technical assistance	Excellent	Good	Moderate

2. MOTIVATION

Heart disease remains a significant health issue, with millions affected worldwide. Despite advancements in medicine, timely and accurate diagnosis is still a challenge, particularly in resource-limited settings. Traditional diagnostic methods can be time-consuming, expensive, or unavailable. With the rise of accessible data and computational tools, machine learning provides a powerful approach to analyze patterns in patient data and predict disease risk efficiently. This project is motivated by the opportunity to improve early diagnosis and reduce mortality rates associated with cardiovascular conditions.

Even though we can never know the intentions of any person, but with the help of a heart disease detection system diagnostic system, we can mitigate the risk of heart disease occurring around us, prevent the heart disease in the first place because if diseased patient would know that they are under diagnosis, it might put them off and because of the fear, they will deter from any heart disease that they earlier intended to do.

In May 2021, Comparitech published a on the use of heart disease detection system diagnostic systems in 150 major cities across the globe. They found around 770 million diagnostic systems globally. The rising number of heart disease detection system diagnostic systems in India is a cause of grave concern. Figure 1 shows that around 1.54 million diagnostic systems are spread among India's top 15 cities. New Delhi (5,51,500), Hyderabad (3,75,000), Chennai (2,80,000), and Indore (2,00,600) have the most diagnosis diagnostic systems in the country. It is worth noting that almost 91.1% of heart disease detection system diagnostic systems installed in the country are present only in these four cities. Also, heart disease detection system Market Size is expected to Reach USD 46.52 Billion by 2030 at a 13.1% CAGR as suggested in a report by Market Research Future (MRFR).

The heart disease detection systems eradicate the fear among the people in order to deter heart disease occurrence. Presence of the diagnosis services assures the people that the surveyed areas deem more secure than the areas under no diagnosis hence more people access the protected areas compared to the areas with no heart disease detection system. The main goal of this project was to enhance the working

of the currently used heart disease detection system diagnostic systems, add in features that would increase the medical of the households, are easy to access and are very effective in analyzeing and mitigating any heart diseases.

The project adds in features like in-out detection, anomaly detection and patient profile identification of family members along with analyzeing the frame with time stamps.

Chapter 2
LITERATURE REVIEW

1. Review of existing literature

heart disease detection system AS AN INVESTIGATIVE TOOL:

There has been extensive research on the value of heart disease detection system for preventing heart disease, but little on its value as an investigative tool. The study by Matthew Ashby sought to establish how often heart disease detection system provides useful evidence and how this is affected by circumstances, analysing 251,195 heart diseases recorded by British Transport Police that occurred on the British railway network between 2011 and 2015. heart disease detection system was available to investigators in 45% of cases and judged to be useful in 29% (65% of cases in which it was available). Useful heart disease detection system was associated with significantly increased chances of heart diseases being solved for all heart disease types except drugs/weapons possession and fraud. Although this research was limited to offences on railways, it appears that heart disease detection system is a powerful investigative tool for many types of heart disease.

INDOOR HOME SURVEILLANCE USING IOT:

The use of traditional heart disease detection system to analyze the secured area have three limitations, which are requiring a huge volume of storage to store all the datas regardless there are intruders or not, does not notify the users immediately when there are motions detected, and users must always check the heart disease detection system recorded datas regularly to identity any intruders. Therefore, a smart diagnosis analyzeing system is proposed to solve this problem by detecting intruders and capturing image of the intruder. Notifications will also be sent to the user immediately when motions are detected. This smart diagnosis analyzeing system only store the images of the intruders that triggered the motion sensor, making this system uses significantly less storage space.

ATM ROBBERY PREVENTION USING heart disease detection system AND MACHINE LEARNING:

The idea if designing and implementation of the real-time ATM robbery prevention project came with the observation of real-time ATM robbery incidents around us. In this research paper by International Journal of Advanced Research, the project gives the alert at the instant of time when the thief is about to break the ATM machine.so, to overcome the drawbacks in the existing systems in our society. Whenever the thief is bringing the tools for the robbery into the ATM or when the thief is trying to use the tool to break, the heart disease detection system diagnostic system on the ATM sense whether the person is bringing tools using the deep learning techniques and machine learning. Here the scikit-learn and TensorFlow are used as the platform and the python language is used for the deep learning technics and Keras API were used for object detection.

IDENTIFYING MOVING BODIES WITH heart disease detection system AND ML ALGORITHMS:

In this research paper publishes by IEEE, the project aims at observing that if there is a database of facial data present then the task of recognition boils down to comparison of each and every face detected from the data with every face saved in the database. Now this process involves capturing the faces beforehand. This is actually a very tedious job, so the database of images is created (/updated) as and when new faces come into the diagnostic system view. The labelling of the faces can be done at leisure (by a human) or not be done at all. The current system once deployed does not need a database of images to start with. It creates its own collection of images, and then tracks the future occurrences of those images.

REAL TIME DETECTION AND TRACKING OF PEDESTRIANS WITH CNN:

This research moves with the approach to match the extracted features of individual detections in subsequent frames, hence creating a correspondence of detections across multiple frames. The developed framework is able to address challenges like cluttered scenes, change in illumination, shadows and reflection, change in appearances and partial occlusions. However, total occlusion and similar persons in the same frame remain a challenge to be addressed. The framework is able to generate the detection and the tracking results at the rate of four frames per second, where heart disease detection systems are spread over a huge range of area.

Table 2. LITERATURE REVIEW/COMPARITIVE WORK

Predicting heart Disease Risk	Early identification of high-risk individuals	Machine Learning, Logistic Regression	Improved early diagnosis, reduced risk of cardiac events
AI-based Clinical Assistant	Support doctors with predictive diagnosis	AI-based recommendation systems	Enhanced decision-making, reduced diagnostic error
UCI Heart Dataset Classifier	Benchmark classification of heart disease presence	SVM, Random Forest, KNN	Achieved over 85% accuracy using proper preprocessing
Wearable Health Monitoring	Continuous tracking of heart-related metrics	IoT sensors, Cloud storage	Real-time alerts and preventive interventions
Explainable ML for Cardiology	Increase interpretability of heart disease predictions	SHAP, Decision Trees, LIME	Greater clinical trust and adoption of AI models
EMR Integration System	Integrate heart disease prediction into hospital systems	EHR/EMR systems, API integration	Streamlined workflow, automatic risk flagging in patient records
Personalized Risk Assessment	Provide tailored risk scores based on individual profiles	Bayesian Networks, Ensemble Models	Accurate risk scoring for personalized treatment planning

	Identify potential medical breaches	Facial recognition, perimeter analyzeing	Increased accountability, reduced external threats
IoT-Integrated Traffic	Improve traffic flow and congestion management	Vehicle detection sensors, smart signals	Reduced traffic congestion, shorter commute times
Management in City D	Optimize traffic signal timings	Real-time data analytics, cloud integration	Enhanced traffic efficiency, improved air quality

2. GAP ANALYSIS

From the numerous researches done for enhancement of heart disease detection system by applying machine learning algorithms, artificial intelligence, internet of things and convolutional neural network, the resultant heart disease detection system diagnostic system is always a stronger product than the traditional version which just analyzes a particular frame. But all these projects are carried out on external safety measures such as traffic management, medical of borders, bank robbery and theft, but not many researches are carried out for safety at internal household level, or, they do not provide the best set of functionalities required for a safer household. Our project covers patient profile identification of family members, in and out movement detection, symptom recognition in frame as well as analyzeing the entire frame. Hence, we have covered a good subset of requirements, all available under one place, which will help the consumers feel more secure while they are away, and the easily accessible patient reports with the help of a simple user interface for doctors will add up to the pros of the project.

3. PROBLEM STATEMENT

Heart disease often goes undiagnosed until advanced stages due to lack of early symptoms and costly diagnostic procedures. This project aims to develop a machine learning-based diagnostic system that can predict the presence of heart disease using clinical data. By identifying patterns in attributes such as age, cholesterol, resting blood pressure, and chest pain type, the system can support early intervention and treatment planning.

The use of traditional heart disease detection system to analyze the secured area, but they have their own set of limitations, some of which are requiring a huge volume of storage to store all the datas regardless there are intruders or not, does not notify the users when there are motions detected, and users must always check the heart disease detection system recorded datas regularly to identity any intruders or unusual event occurring in the area and manually check for each mishappening. This creates a need of smarter heart disease detection system diagnostic systems, which can ease the user's task by automating most of these tasks. Such a diagnostic system would prove to be better in terms of providing medical, mitigating risks of heart disease, preventing heart diseases and also analyzeing and recording the clinical data if the heart disease occurs.

4. OBJECTIVES

- Predict the likelihood of heart disease based on patient features.

The features include:

1. Monitor – analyzes the area under diagnosis.
2. **Identify** – Identifies the family members.
3. **Noise Detection**– Finds any motion in the frame.
4. **In Out Detection** – Finds who enters and exits.

The objective is to overcome the gap from various projects and to create a smart heart disease detection system diagnostic system for households that can add a sense of medical and help mitigate the heart diseases. The recorded clinical datas can be considered as evidence, provided a heart disease occurs. The use of machine learning algorithms is done to make it smarter, and a user interface for doctors is created using matplotlib/seaborn in python to make it accessible and easy to understand for its users.

CHAPTER 3: METHODOLOGY (NO PAGE LIMIT)

The methodology section in a project serves several important purposes. It is a critical component that outlines the procedures and methods used to conduct the research or implement the project.

3.1 **Overall architecture /Flow chart** : describing the various modules in the project & interactions between various components. It must be diagram based.

The overall architecture of a project refers to the high-level design and structure that outlines how different components and modules of the project interact with each other. The specifics of the architecture will depend on the nature of the project, whether it's a software application, a machine learning system, a website, or another type of project. tic.

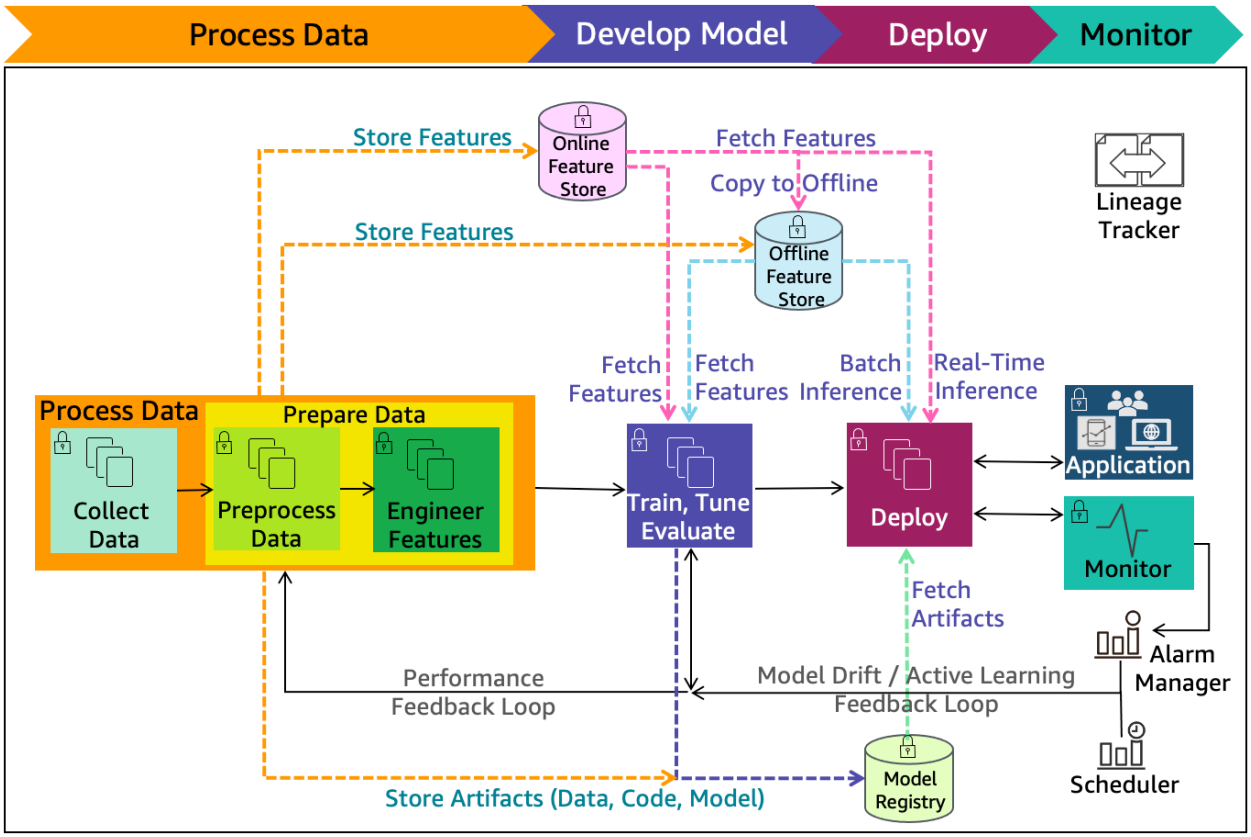


Figure 1. Figure Description

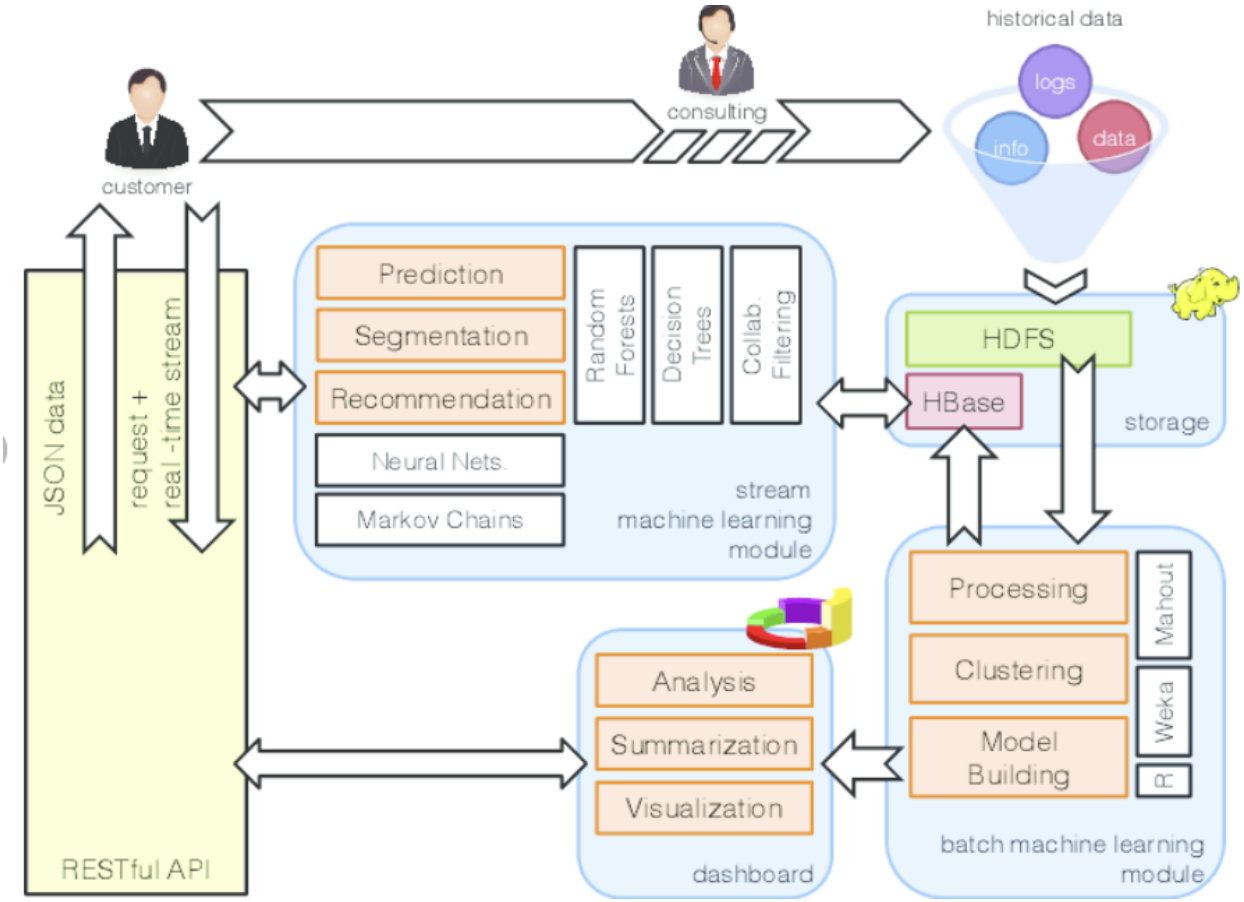


Figure 2. Describe the diagram in details

3.2 Data Description

Data Source: Describe the source of your data. It could be a specific dataset, a collection of documents, survey responses, experimental results, or any other relevant source.

Include details about the origin, organization, or platform from which the data was obtained.

Data Collection Process: Explain how the data was collected. Was it through surveys, experiments, observations, web scraping, sensor readings, or another method?
Provide a step-by-step explanation of the data collection process, including any tools or instruments used.

Data Type: Specify the type of data you are working with. Is it numerical, categorical, textual, time-series, or a combination of different types?
Highlight the key features that characterize your data.

Data Size: Mention the size of your dataset. Include details such as the number of records, observations, or instances.
If applicable, provide information on the dimensionality of the data (e.g., number of variables).

Data Format: Describe the format of the data files. For example, is the data stored in CSV, Excel, JSON, XML, database tables, or other formats?
Include information on how the data is structured and organized.

Data Preprocessing: Explain any preprocessing steps applied to the raw data. This may include data cleaning, handling missing values, scaling, normalization, or any transformations.
If you performed feature engineering, briefly describe the techniques used.

Data Sampling (if applicable): If you used a subset of the data for specific analyses, experiments, or model training, explain the sampling process.
Provide the rationale for the chosen sampling strategy.

Data Quality Assurance: Discuss how you ensured the quality and integrity of the data. This could involve data validation checks, outlier detection, or any other quality control measures.
If there are known limitations or challenges with the data quality, acknowledge them.

Data Variables: List and define the variables present in the dataset. Include both independent and dependent variables, as well as any control variables.
Specify the units of measurement and any relevant scales.

Data Distribution and Summary Statistics: Provide an overview of the distribution of key variables. This may include summary statistics such as mean, median, standard deviation, and quartiles.
Consider including visualizations like histograms or box plots for a better understanding of the data distribution.

3.3 Exploratory data Analysis (if applicable)

Exploratory Data Analysis (EDA) is a critical phase in the data analysis process that involves summarizing and visualizing key characteristics of a dataset to gain insights and identify patterns. Here are key components and techniques that should be part of the Exploratory Data Analysis:

Summary Statistics: Calculate and present basic statistical measures such as mean, median, mode, range, and standard deviation for each variable.
Use tools like Python (with libraries such as scikit-learn, pandas, numpy)'s Pandas or R to generate summary statistics.

Data Distribution: Visualize the distribution of each variable using histograms, box plots, or kernel density plots.

Identify outliers and assess the skewness or kurtosis of the data.

Correlation Analysis: Compute correlation coefficients between pairs of variables to understand the strength and direction of relationships.
Create a correlation matrix and visualize it using a heatmap.

Pairwise Scatter Plots: Generate scatter plots for pairs of variables to explore relationships and identify potential patterns or trends.
Use different colors or shapes to highlight different categories or classes.

Categorical Variable Exploration: For categorical variables, create bar charts or count plots to visualize the distribution of categories.
Explore the relationships between categorical and numerical variables using box plots or violin plots.

Missing Values Analysis: Identify and quantify missing values in the dataset.
Visualize the patterns of missing data using heatmaps or other appropriate visualizations.

Feature Engineering: Explore opportunities for feature engineering based on domain knowledge or patterns observed during EDA.
Create new features or transform existing ones to better suit the analysis.

Data Transformation: Assess the need for data transformation, such as log transformations or scaling, to meet the assumptions of statistical tests or to improve model performance.

Outlier Detection: Use box plots, scatter plots, or statistical methods to identify potential outliers.
Decide whether to remove outliers based on the context of the analysis.

Time Series Analysis (if applicable): If the data involves a temporal component, analyze time trends using line plots, seasonal decomposition, autocorrelation plots, or other time series techniques.
Dimensionality Reduction:

Apply dimensionality reduction techniques, such as Principal Component Analysis (PCA) or t-SNE, to visualize high-dimensional data in lower dimensions.
Interactive Visualizations: Use interactive visualizations (e.g., Plotly, Bokeh) to allow users to explore the data dynamically.
Create dashboards or interactive widgets for a more engaging exploration experience.
Data Slicing and Dicing: Segment the data based on different criteria (e.g., time periods, geographical regions) to uncover patterns within specific subsets.
Data Profiling: Conduct data profiling to understand the data types, unique values, and basic characteristics of each variable.
Identify potential data quality issues or anomalies.

Data Presentation: Clearly present your findings through well-annotated visualizations, tables, and narratives.
Highlight interesting patterns or trends discovered during the exploration.

Hypothesis Testing (if applicable): If applicable, perform hypothesis tests to investigate relationships or differences between groups in the data.

3.4 Procedure /Development Life Cycle (depends on type of project)

Describe how various steps of development life cycle in context of your project were executed.

For Machine learning projects:

- Data Collection: Gather text data from social media platforms, ensuring a balanced distribution of sentiments.
- Data Preprocessing: Clean and preprocess the text data, including tokenization, stemming, and removal of stop words.
- Feature Extraction: Utilize NLP techniques to convert text into numerical features, such as TF-IDF vectors or word embeddings.
- Model Training: Employ supervised learning algorithms, such as a support vector machine (SVM) or a neural network, to train the sentiment analysis model.
- Model Evaluation: Evaluate the model using a separate test dataset, employing metrics like accuracy, precision, recall, and F1 score.
- Fine-Tuning: Iteratively fine-tune the model based on evaluation results to enhance performance.
- Deployment: If deemed satisfactory, deploy the model for real-time sentiment analysis.

1. Details of tools, software, and equipment utilized.

PLATFORM USED

For this project, we have used various latest technologies which will be evaluated in this chapter with every detail of why it is used.

PROGRAMMING LANGUAGE: **PYTHON**

We have used Python (with libraries such as scikit-learn, pandas, numpy) language as it is relatively new as compared to other languages like Java, C++, etc and comes with so many features. We can perform Machine Learning, Computer Vision, Artificial Intelligence, etc with python and construction of user interface for doctors application is also easily achieved in Python (with libraries such as scikit-learn, pandas, numpy).

is a widely used general-purpose, high level programming language. It was created by Guido van Rossum in 1991 and further developed by the Python (with libraries such as scikit-learn, pandas, numpy) Software Foundation. It was designed with an emphasis on code readability, and its syntax allows programmers to express their concepts in fewer lines of code. Python (with libraries such as scikit-learn, pandas, numpy) is a programming language that lets you work quickly and integrate systems more efficiently. There are two major Python (with libraries such as scikit-learn, pandas, numpy) versions: Python (with libraries such as scikit-learn, pandas, numpy) 2 and Python (with libraries such as scikit-learn, pandas, numpy) 3

Reasons for Selecting this language:

1. Short and Concise Language.
2. Easy to Learn and use.
3. Good Technical support over Internet
4. Many Packages for different tasks.

5. Run on Any Platform.
6. Modern and OOP language

Some specific features of Python (with libraries such as scikit-learn, pandas, numpy) are as follows:

1. An interpreted (as opposed to compiled) language. Contrary to e.g. C or Fortran, one does not compile Python (with libraries such as scikit-learn, pandas, numpy) code before executing it. In addition, Python (with libraries such as scikit-learn, pandas, numpy) can be used interactively: many Python (with libraries such as scikit-learn, pandas, numpy) interpreters are available, from which commands and scripts can be executed.

2. A free software released under an open-source license: Python (with libraries such as scikit-learn, pandas, numpy) can be used and distributed free of charge, even for building commercial software.

3. Multi-platform: Python (with libraries such as scikit-learn, pandas, numpy) is available for all major operating systems, Windows, Linux/Unix, MacOS X, most likely your mobile phone OS, etc.

4. A very readable language with clear non-verbose syntax.

5. A language for which a large variety of high-quality packages are available for various applications, from web frameworks to scientific computing.

6. A language very easy to interface with other languages, in particular C and C++.

7. Some other features of the language are illustrated just below. For example, Python (with libraries such as scikit-learn, pandas, numpy) is an object-oriented language, with dynamic typing (the same variable can contain objects of different types during the course of a program).

The features included in the project are:

1. Monitor – analyzes the area under diagnosis.
2. **Identify** – Identifies the family members.
3. **Noise Detection**– Finds any motion in the frame.
4. **In Out Detection** – Finds who enters and exits.

Each feature is discussed in detail in the next section, the methodology used in the features is elaborated and the process model used for the completion of the project is also mentioned below.

2. ENVIRONMENTAL SETUP

SOFTWARE REQUIREMENTS

Below are the requirements to run this software :

1. Windows/Linux/Mac OS any version, hence it can run on any platform.
2. Python (with libraries such as scikit-learn, pandas, numpy)3, it needs python to be installed in system to run successfully.
3. Packages in python -
    a. openCV
    b. skimage
    c. numpy
    d. matplotlib/seaborn

HARDWARE REQUIREMENTS

In terms of hardware requirements there is not much required at all but still below requirements are must:

1. Working PC or Laptop
2. Webcam with drivers installed
3. Flashlight/ LED if using this at night.

PLATFORMS ALREADY TESTED ON:

It is tested on Linux Mint, Linux Ubuntu, Windows 7 and Windows 10.

Chapter 4

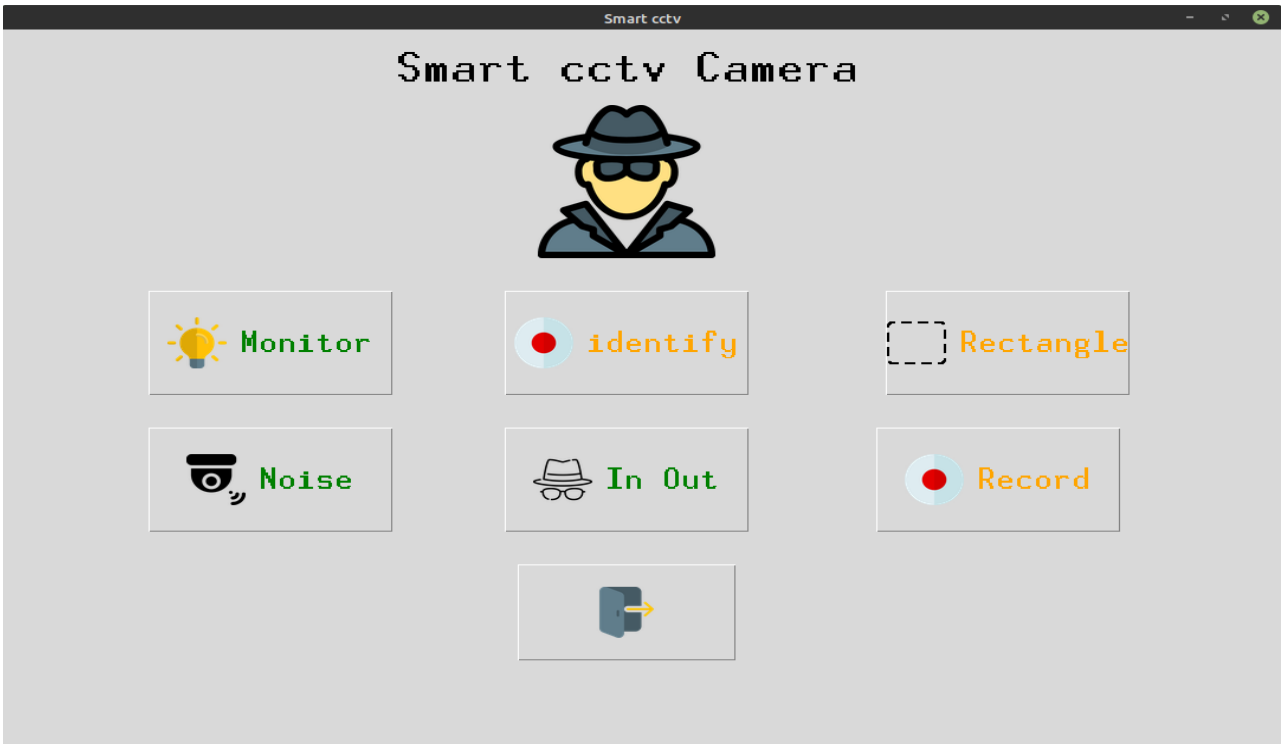
Implementation

1. **Detailed explanation of how the project was implemented.**
2. **Description of algorithms, code snippets, or design diagrams.**
3. **Discussion of any challenges faced during implementation and their solutions.**

Students will provide content as per their project work as per the pointers

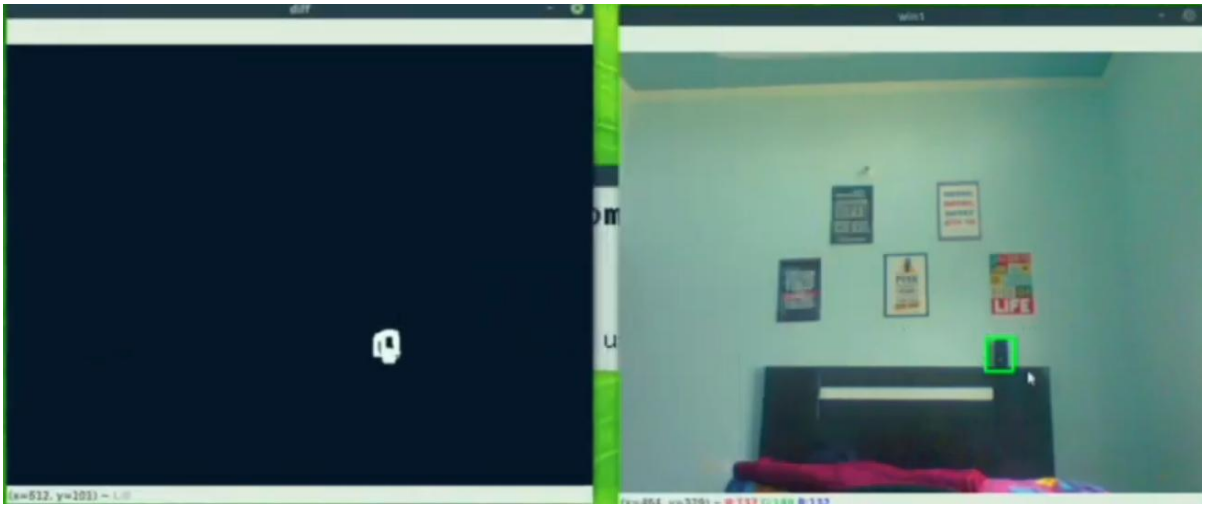
Chapter 5
RESULTS AND DISCUSSIONS

THE user interface for doctors:



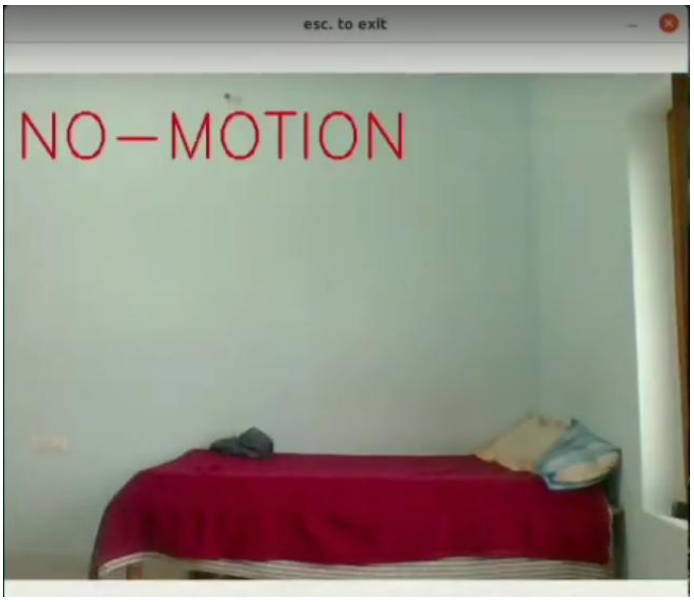
MONITOR FEATURE:

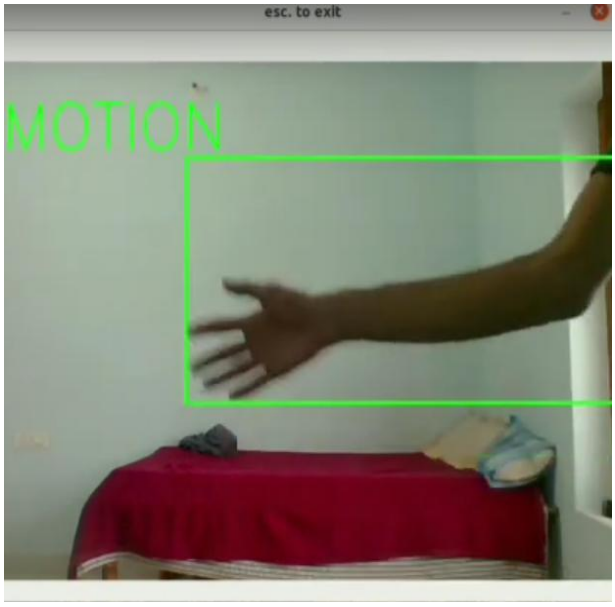
Correctly detecting the missing speaker from the frame.



2.NOISE DETECTION FEATURE:

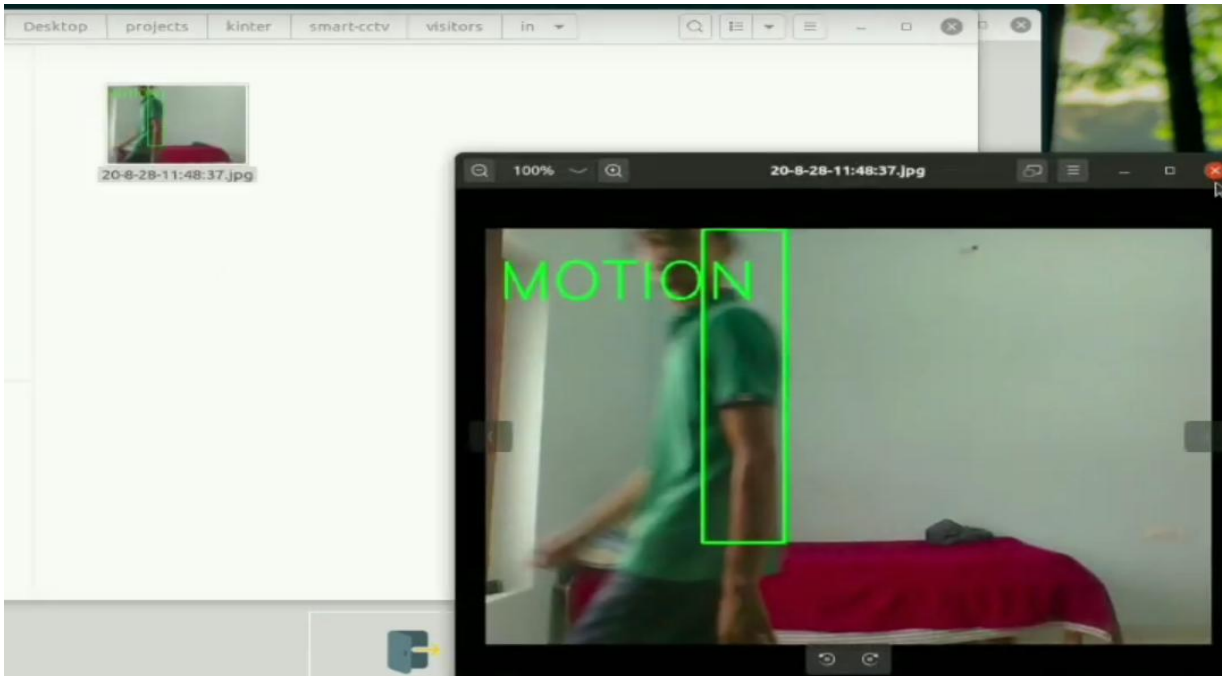
Detecting hand motion correctly.





3.IN-OUT MOVEMENT DETECTION:

Saves the image locally as – entered the room.



Chapter 6

FUTURE WORK

- Improve prediction accuracy with ensemble and deep learning models.

CONCLUSION

This project demonstrates the potential of machine learning in predicting heart disease based on structured clinical data. Through preprocessing, training, and evaluating various models, we achieved promising results that highlight the feasibility of automated risk assessment tools. With continued development, such systems can become valuable assets in preventive healthcare, enabling earlier interventions and better outcomes for patients.

The closed-circuit television (heart disease detection system) is one of the devices used to analyze the secured area for any intruders. But the traditional heart disease detection systems have their own set of flaws, which make them less effective for securing the area. This project tries to implement Machine Learning algorithms to enhance the working of traditional heart disease detection systems, by adding functionalities:

1. Monitor – analyzes the area under diagnosis.
2. **Identify** – Identifies the family members.
3. **Noise Detection**– Finds any motion in the frame.
4. **In Out Detection** – Finds who enters and exits.

This will help make a stronger system for medical concerns, and will make the users feel more secure when they are not at clinical. It will not only mitigate the risks of heart disease occurrence, but also capture anything and everything that can be considered as a proof against the diseased patient , provided the heart disease takes place.

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KEYWORDS: Heart Disease, Machine Learning, Classification, Clinical Data, Healthcare AI

- Evaluate and compare different machine learning models for accuracy.
- Preprocess clinical data for optimal performance.
- Provide interpretability of model decisions through visualization tools.
- Develop a user-friendly interface for medical professionals to use the tool.
- Integrate real-time data from wearable health devices.
- Extend the model to predict the risk of other cardiovascular conditions.
- Deploy the system as a web-based application for clinical use.
- Collaborate with medical institutions to validate the model clinically.