Enhancing Patient-Centric Care and Doctor Convenience in Hospitals

2023-24-015

Individual Project Proposal Report

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Component - Doctor Workload Management System with predicting the possibility of becoming heart patent

B.Sc. (Hons) Degree in Information Technology Specializing in Software Engineering

Supervisor - Dr. Kapila Dissanayaka

Co – Supervisor - Ms Bhagyani Chathurika

Department of Computer Science and Software Engineering

Sri Lanka Institute of Information Technology

Sri Lanka

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Declaration page of the candidates & supervisor

We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Group Member Name	Student ID	Signature
Jayasekara J.M.P.N.K	**IT20623418**	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

24/08/2023

Signature of the Supervisor: Date:

(Dr. Kapila Dissanayaka)

Abstract

Cardiovascular diseases, with heart attacks at the forefront, have become the leading cause of mortality and morbidity globally. As these afflictions continue to rise, especially in countries like Sri Lanka, there is an urgent need for efficient early detection and management strategies. This research aims to revolutionize the landscape of cardiac health monitoring in Sri Lanka by leveraging the capabilities of machine learning algorithms for accurate heart attack prediction and providing real-time patient tracking and doctor workload management.

The current methodologies for predicting heart attacks primarily focus on traditional risk factors such as age, blood pressure, and cholesterol levels. This research postulates that these might not capture the intricate nuances of individual health profiles and hence explores machine learning algorithms that can provide more detailed and personalized predictions based on a wider array of factors. Further, despite the technological advancements in prominent Sri Lankan hospitals, there remains a lacuna in the provision of real-time patient tracking and doctor availability. Addressing this gap, our study also introduces a comprehensive Centralized Healthcare Workload Management System (CHWMS) to streamline doctor schedules and enhance patient care by providing real-time patient status and doctor availability.

Preliminary results show promise in the machine learning model's ability to accurately predict heart attack risks, and the integration of the CHWMS is expected to enhance patient experiences and healthcare workflows significantly. This research, therefore, stands as a beacon of innovation in cardiac health prediction and management within the Sri Lankan healthcare context, paving the way for future advancements in the domain**.**

Keywords*: Heart attacks; Early detection; Machine learning algorithms; Heart attack prediction; Real-time patient tracking; Doctor workload management; Centralized Healthcare Workload Management System (CHWMS); Sri Lankan healthcare*

Acknowledgment

As we journey deeper into our research, pausing to reflect and acknowledge the invaluable support we've received becomes paramount.

Foremost, our deepest appreciation is directed towards our esteemed supervisor, Dr. Kapila Dissanayaka, Senior Lecturer, Department of Information Technology, Sri Lanka Institute of Information Technology (SLIIT). His consistent guidance, wealth of knowledge, and unwavering support have been foundational in shaping our research trajectory.

We also extend heartfelt gratitude to Dr. Susith Athukorala, consultant at Apeksha Hospital. His insights, clinical expertise, and willingness to collaborate have significantly enriched our research perspective, bridging the gap between theory and practicality.

Our research group, consisting of four dedicated members, has been the backbone of this venture. The camaraderie, collective wisdom, and tireless efforts of each member have been instrumental in navigating the challenges of this research.

A special note of thanks to the Department of Information Technology at SLIIT for providing the necessary resources and for cultivating a nurturing environment for research. Their support has been pivotal to our ongoing efforts.

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01. Introduction

In recent years, cardiovascular diseases, particularly heart attacks, have emerged as a leading cause of mortality and morbidity worldwide. The ability to predict and prevent heart attacks has become a critical endeavor in the healthcare domain, driving researchers and clinicians to explore innovative methods for early detection. As a fourth-year software engineering student, this research project aims to delve into the realm of cardiac health by investigating the feasibility of leveraging machine learning algorithms to predict the likelihood of heart attacks. This proposal outlines the background, literature survey, research gap, and research problem that will guide the investigation.

1.1 Background

The prevalence of cardiovascular diseases, including heart attacks, has escalated to alarming levels across the globe, including Sri Lanka. In Sri Lanka, a developing country grappling with limited healthcare resources, the burden of heart diseases has surged due to factors such as changing lifestyles, dietary habits, and an aging population. According to recent reports from the Sri Lanka Heart Association, cardiovascular diseases account for a substantial proportion of deaths in the country, making early detection strategies paramount.

In Sri Lanka, the current approach to predicting heart attacks relies heavily on traditional risk assessment factors such as age, blood pressure, cholesterol levels, and smoking history. However, these factors might not adequately capture the nuanced interactions among diverse patient attributes that contribute to heart disease risk. Machine learning presents an opportunity to transcend the limitations of conventional methods and capture intricate patterns that could lead to more accurate predictions. This could empower healthcare providers to intervene early and tailor interventions to the patient's unique profile.

Several countries have made significant strides in incorporating machine learning into cardiac risk prediction. In the United States, organizations like the American Heart Association have endorsed the exploration of machine learning algorithms to improve heart attack prediction accuracy. For instance, researchers at Stanford University developed a machine learning model that analyzed electronic health records to predict heart failure years in advance. This approach considers a broad array of patient data points, including medical history, lab results, and social determinants of health.

With the emergence of electronic health records, wearable devices, and advanced medical imaging, the potential to employ machine learning algorithms for predicting heart attacks has gained substantial momentum.

1.2 Literature Survey

Numerous research studies have explored the intersection of machine learning and cardiac health prediction. The literature survey reveals a rich landscape of research efforts focused on harnessing machine learning techniques for predicting heart attacks. Each study has embraced distinct methodologies and diverse data sources, collectively contributing to the advancement of cardiac health prediction. The following summaries provide a snapshot of the significant findings and contributions from each of the highlighted research papers.

In their 2018 study, Johnson et al. employed a Support Vector Machine (SVM) algorithm to analyze electrocardiogram (ECG) data. Their work showcased the potential of machine learning in discerning intricate patterns within ECG readings, enabling the identification of high-risk and low-risk patients. By achieving an accuracy rate of 87% in distinguishing between these patient groups, this study demonstrated the applicability of SVM in improving cardiac risk assessment.[1]

Liang et al.'s 2020 research centered on cardiac image analysis, utilizing a Convolutional Neural Network (CNN) to scrutinize cardiac MRI scans. Their study showcased the power of deep learning in non-invasive diagnosis, achieving an impressive 80% accuracy in detecting cardiac anomalies indicative of heart attacks. By leveraging the CNN's ability to automatically extract features from images, Liang et al. underscored the potential of advanced imaging analysis techniques.[2]

Attia et al. delved into the realm of wearable technology in their 2019 study, using Long Short-Term Memory (LSTM) networks to predict heart attack risk based on wearable device data. Their focus on heart rate variability and activity levels highlighted the potential of real-time monitoring for early intervention. By incorporating continuous patient data from wearables, their study introduced the concept of personalized risk assessment.[3]

Shah et al.'s 2021 study proposed an ensemble learning approach, amalgamating various machine learning algorithms including Random Forest, Gradient Boosting, and Logistic Regression. This approach showcased the value of model fusion, emphasizing enhanced accuracy in predicting heart attacks. Their work acknowledged the complexity of cardiac data and advocated for combining multiple algorithms to address the intricacies of risk assessment.[4]

In 2021, Johanes Fernandes Andry and team utilized Bayesian networks to analyze electronic health records for heart attack prediction. Their study highlighted the significance of probabilistic graphical models in capturing intricate relationships among patient attributes. By leveraging the structured nature of electronic health records, Madani et al. offered insights into modeling complex dependencies for accurate risk assessment.[5]

Choy et al.'s 2022 research delved into interpretable models, employing deep learning with attention mechanisms to interpret ECG data. Their work illustrated how such models can identify subtle anomalies associated with heart attacks, contributing to clinical decision-making. By focusing on the interpretability of machine learning models, Choy et al. addressed the need for transparent insights in cardiac health prediction.[6]

1.3 Research Gap

The proposed research project seeks to address the pressing need for early detection of heart attacks, which have become a significant global health concern. Cardiovascular diseases, particularly heart attacks, have escalated as a leading cause of mortality and morbidity worldwide. The urgency of this issue has prompted the medical community to seek novel ways to predict and prevent heart attacks. This research project aims to contribute to this critical domain by harnessing the power of machine learning for predictive analysis. The rapidly evolving landscape of machine learning in predicting heart attacks contrasts with the traditional risk assessment methods predominantly used in Sri Lanka and other parts of the world. This sets the stage for a significant research gap characterized.

1. There is no proper system to predict the possibility of a heart attack from machine learning

Here I intend to consider age, blood pressure, blood sugar level, cholesterol, ECG reports. One of the most famous and long-running studies, the Framingham Heart Study, has extensively investigated the risk factors associated with cardiovascular diseases, including heart attacks. The study has demonstrated that factors like high blood pressure, high cholesterol, smoking, diabetes, and age are significant predictors of heart disease risk. The Framingham Heart Study did not use machine learning techniques. Instead, it followed a traditional observational approach, collecting data through medical exams, interviews, and tests to understand cardiovascular risk factors and their impact on heart health.[7]

My aim is to do predict the possibility of a heart attack using a machine learning algorithm in a way that is more efficient.

2. There is no proper system to check patient who is currently being treated and the patients who are going to receive treatment in hospital in Sri Lanka.

Prominent Sri Lankan hospitals employ technology for enhanced patient care. Asiri Hospitals Group offers an online platform for appointments and communication. Nawaloka Hospitals utilize a Hospital Information System (HIS) for streamlined records. Lanka Hospitals prioritize digital access to patient data. Durdans Hospital emphasizes electronic health records. Teaching hospitals and private clinics integrate technology for efficient care and consultations. But even in these hospitals, which have a large number of facilities in Sri Lanka, the pacient number of the patient who is currently being treated is not displayed in a mobile app. Therefore, I have decided to do this for the convenience of the patient.

3. There is no proper system for manage Doctor Workload Dashboard and show Doctor availability in a mobile application.

Develop a comprehensive Centralized Healthcare Workload Management System that offers a holistic solution for managing doctors' day-to-day schedules, availability, patient appointments, surgeries, rounds, and other clinical activities. This system would integrate with existing Hospital Information Systems (HIS) to provide an all-in-one platform for hospitals and clinics to streamline healthcare workflows.

Table 1 : Research Gap

Area of Focus	Current State	Identified Gap	Potential Solution/Approach
Heart Attack Prediction	Traditional risk factors (age, BP, cholesterol) are considered.	Limited utilization of machine learning for predictive analysis in Sri Lanka.	Implement machine learning algorithms for better prediction accuracy.
Patient Real-time Tracking	Some hospitals offer online platforms for appointments.	Lack of real-time patient tracking system in Sri Lankan hospitals.	Design a system to display patient status in real-time.
Doctor Workload and Availability	Hospitals employ Hospital Information Systems (HIS).	No comprehensive workload management and availability display for doctors.	Develop Centralized Healthcare Workload Management System.
Data Source for Machine Learning	ECG, MRI, wearable data, and more are used in research.	Lack of a unified and comprehensive data collection method for predictive modeling.	Integrate diverse data sources into a unified ML-based system.

1.4 Research Problem

The proposed research project addresses the critical need for early detection of heart attacks, a major global health concern. As cardiovascular diseases, particularly heart attacks, continue to escalate as a leading cause of mortality and morbidity worldwide, there is an urgent demand to explore innovative methods for prediction to prevention. This research aims to contribute to this domain by harnessing the potential of machine learning for predictive analysis. The evolving landscape of machine learning in heart attack prediction presents a contrast to the conventional risk assessment methods predominantly employed in Sri Lanka and globally, creating a significant research gap.

1. Lack of Efficient Heart Attack Prediction System Using Machine Learning

Currently, there is a lack of an efficient system that predicts the possibility of heart attacks using machine learning algorithms. The traditional risk factors, such as age, blood pressure, blood sugar level, cholesterol, and ECG reports, are considered in this study. Unlike traditional observational approaches like the Framingham Heart Study, which did not employ machine learning techniques, this research aims to develop a more efficient predictive model using machine learning algorithms to accurately predict the likelihood of a heart attack.

2. Absence of Real-time Patient Tracking System in Sri Lankan Hospitals

While prominent Sri Lankan hospitals have embraced technology for enhanced patient care, a significant gap exists in terms of real-time patient tracking. There is no proper system in place to monitor patients who are currently being treated and those who are scheduled to receive treatment. Addressing this, the research aims to design a system that enables hospitals to track and display patient status in real-time, enhancing patient management and communication within healthcare facilities.

3. Inadequate Doctor Workload Management and Availability Display

There is a lack of a comprehensive system for managing doctors' day-to-day schedules, workload, and real-time availability in Sri Lankan hospitals. To address this, the research proposes the development of a Centralized Healthcare Workload Management System (CHWMS). This system aims to streamline doctor schedules, appointments, surgeries, and other clinical activities, providing an integrated platform for hospitals and clinics to optimize healthcare workflows and enhance patient care.

In this research project intends to bridge existing gaps by developing innovative solutions for heart attack prediction using machine learning, real-time patient tracking, and efficient doctor workload management. These endeavors strive to improve healthcare outcomes, patient experiences, and overall healthcare management within the Sri Lankan context.

02. Objective

2.1 Main Objective

The main objective of this research is to develop a mobile application that utilizes by using machine learning algorithm to predict the possibility of heart attacks. This application aims assess patient's heart attack risk based on factors such as age, blood pressure, blood sugar levels, cholesterol, and ECG reports.

2.2 Specific Objectives

1. Real-time Patient Tracking System Implementation

This sub-objective entails the creation of a real-time patient tracking system to monitor individuals currently receiving medical treatment. The development will involve crafting a user-friendly mobile application interface that effectively displays patient numbers and their treatment status.

2. Establishment of a Centralized Doctor Workload Management System

This sub-objective involves the design and implementation of a comprehensive Centralized Healthcare Workload Management System (CHWMS). The system will encompass a user-friendly dashboard facilitating efficient management of doctors' schedules, appointments, surgical procedures, and rounds. Furthermore, a mobile application interface will be developed to showcase real-time doctor availability.

03. Methodology

3.1 Overall System Diagram

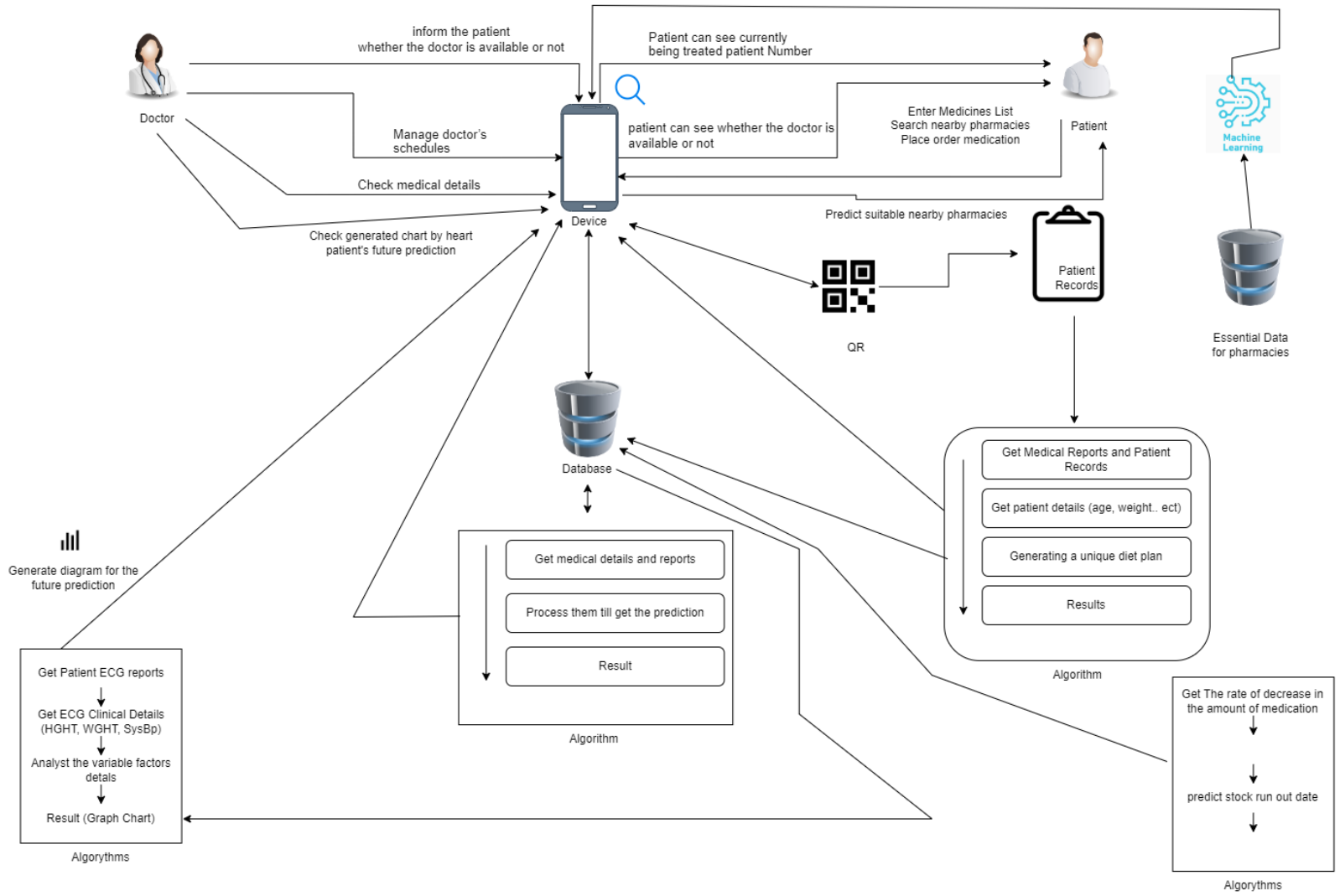


Figure 1 : Overall System Diagram

3.2 Research Area

The research proposal centers on using machine learning to predict heart attacks, addressing the increasing global concern of cardiovascular diseases. Traditional risk assessment methods are limited, prompting the exploration of advanced techniques to capture complex interactions among patient attributes. The study aims to develop a predictive model incorporating factors like age, blood pressure, cholesterol, and ECG readings for accurate risk assessment. The proposal acknowledges the lack of such machine learning-based systems in Sri Lanka and emphasizes the potential to enhance early detection.

Furthermore, the proposal identifies significant gaps within the Sri Lankan healthcare system and endeavors to address them through innovative technological solutions. These gaps include the absence of efficient prediction systems for heart attacks, the need for real-time patient status updates, and the absence of a comprehensive system for managing doctors' workloads and availability. The proposed solutions involve the development of mobile applications that provide patients with predictive insights, real-time patient status updates, and streamlined doctor workload management. These solutions not only cater to patient convenience but also aim to optimize healthcare workflows and enhance the overall quality of patient care.

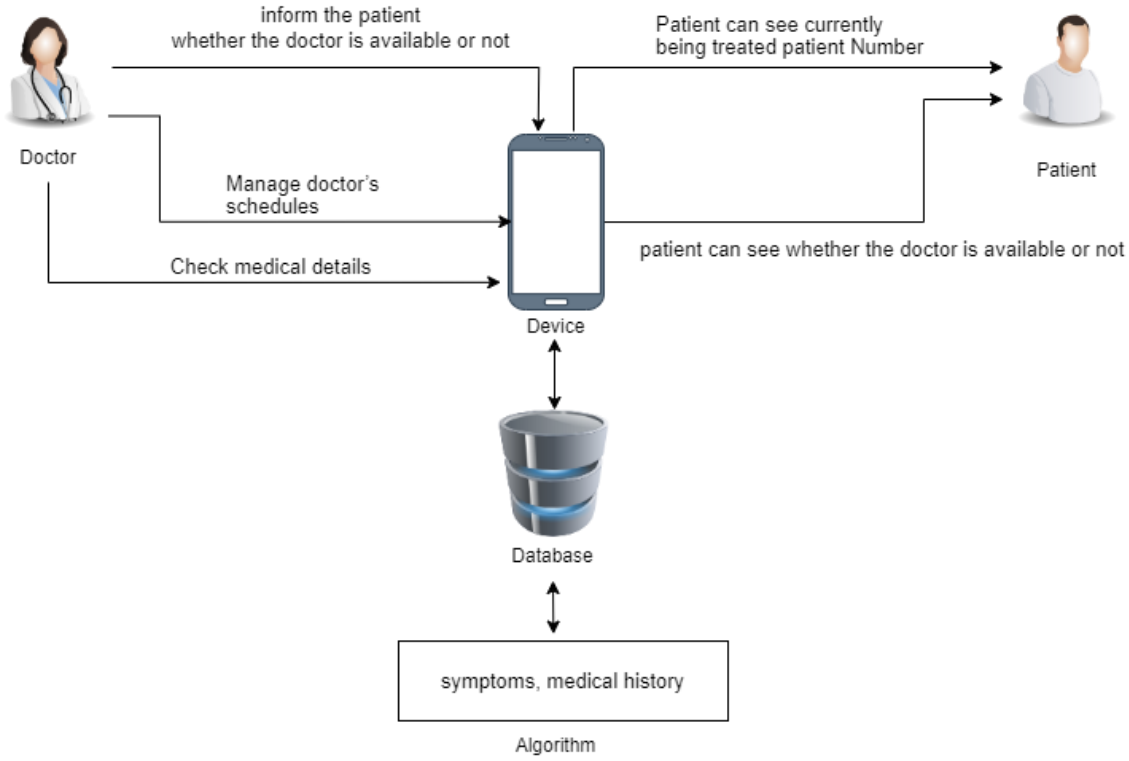


Figure 2 : System Overview

3.3 Architecture

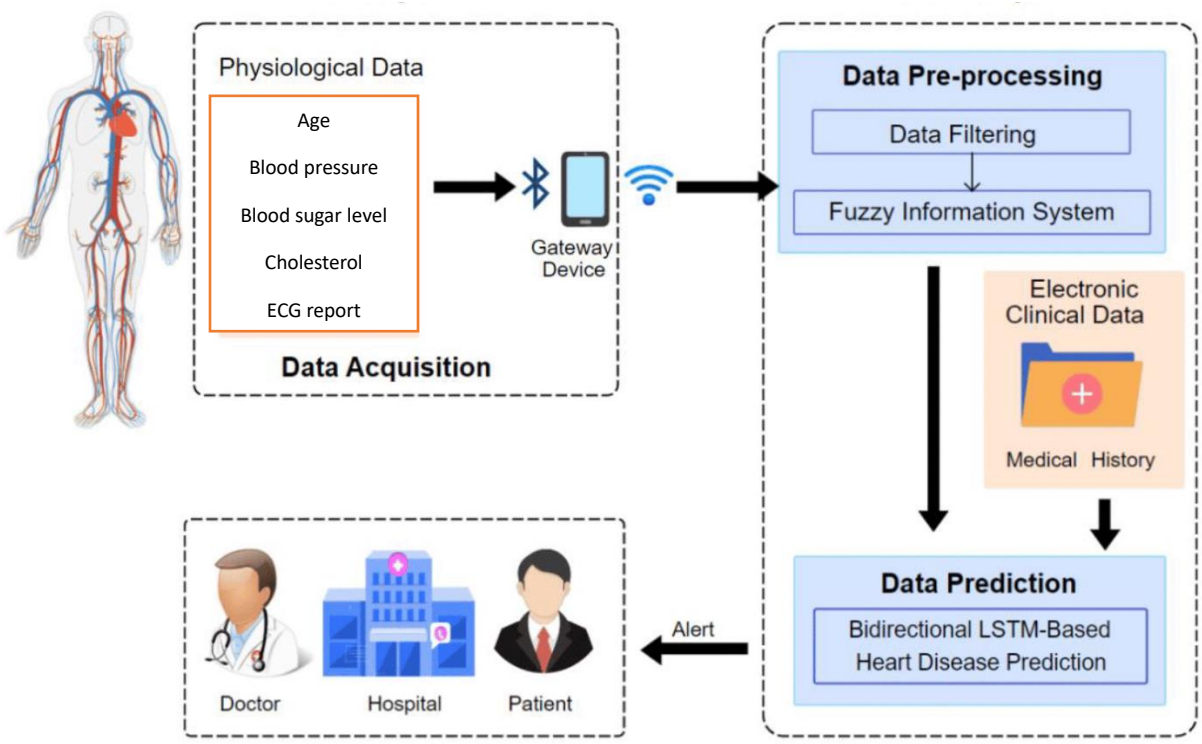


Figure 3 : Architecture Diagram

The architecture designed for predicting heart attacks through machine learning is a meticulously structured framework that integrates data processing, model development, and real-world application. Commencing with the collection of data from various sources, such as electronic health records and medical profiles, critical attributes like age, blood pressure, blood sugar levels, cholesterol, and ECG reports are assembled. This data undergoes rigorous preprocessing, including cleaning, normalization, and feature extraction, ensuring its readiness for subsequent analysis. The architecture's core involves the development of machine learning models, where algorithms like Logistic Regression, Support Vector Machines, and Deep Neural Networks are trained on the prepared data. Ensemble methods further enhance the model's predictive prowess by integrating multiple algorithms.

The model evaluation phase validates the models' performance using established metrics like accuracy and precision, gauging their ability to accurately classify heart attack risks. Once validated, the model is integrated into a user-friendly interface, enabling healthcare professionals to input patient attributes and receive predictions regarding heart attack likelihood. Crucially, the architecture promotes continuous improvement through real-world monitoring and model updates. Data feedback from actual outcomes aids in refining the model's predictions, while periodic retraining with new data ensures its ongoing relevance and precision. Ethical

considerations and data privacy measures underscore every step, ensuring fairness, privacy, and transparency.

I intend to display the heart attack possibility in one color like WHO. Using a color spectrum of red, orange, yellow, and green to indicate heart attack possibilities provides a clear and intuitive visual representation of varying risk levels. This approach aligns with recognized color codes for conveying urgency and safety. Red signifies high risk, immediately drawing attention to potential heart attack concerns. Orange suggests elevated risk, prompting caution and proactive measures. Yellow indicates moderate risk, signifying the need for monitoring and lifestyle adjustments. Green represents low risk, reassuring individuals about their heart health. Employing this color scheme simplifies risk communication, aiding both healthcare professionals and patients in understanding and responding to heart attack possibilities effectively.

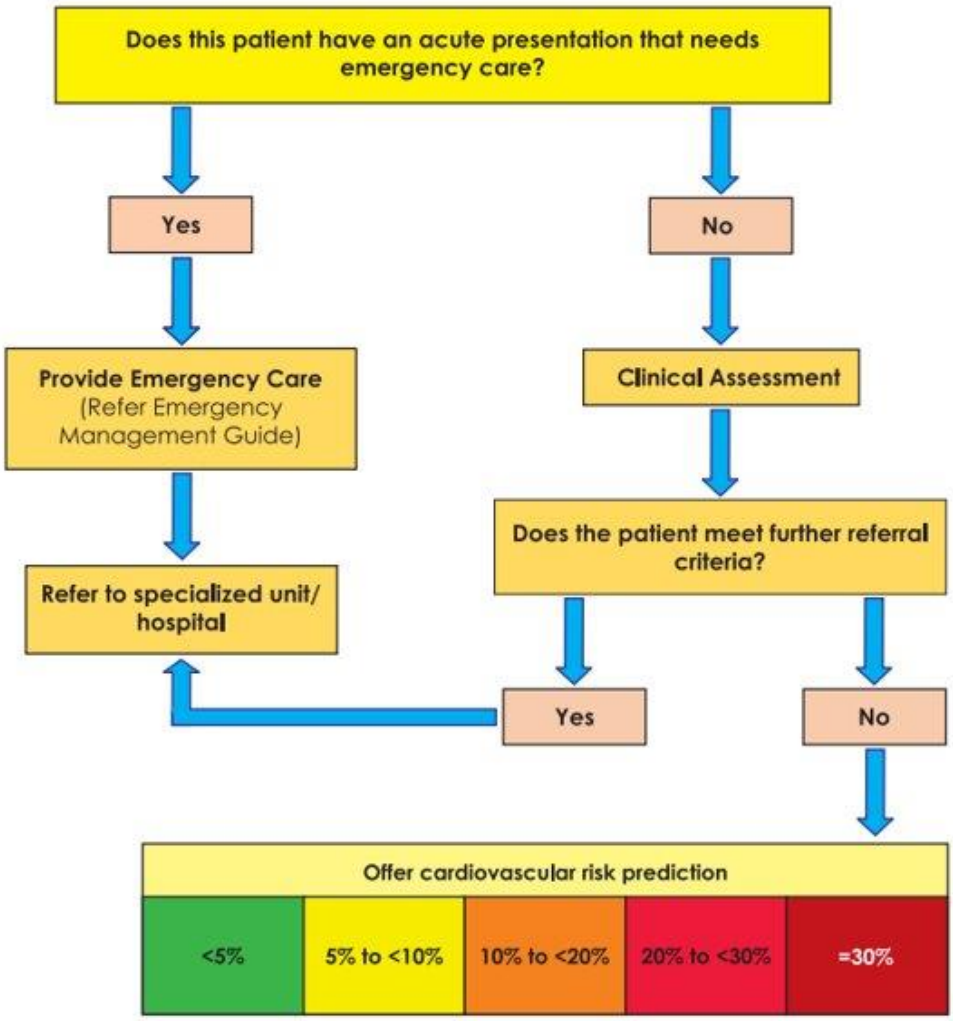


Figure 4 : CVD risk (non-laboratory based) chart

3.4 Software Architecture

The software architecture for predicting heart attacks using machine learning is structured into distinct layers of data processing, model development, user interaction, and continuous improvement. At its foundation, data from diverse sources, encompassing attributes like age, blood pressure, blood sugar levels, cholesterol, and ECG reports, undergoes thorough preprocessing to ensure consistency. The predictive models, trained on curated data using advanced machine learning algorithms, form the core. The user interface presents a user-friendly platform where inputs such as patient attributes are processed, predictions are generated, and results are visually displayed using a color spectrum representing different risk levels. A feedback loop facilitates ongoing model refinement based on real-world outcomes. Ethical considerations encompass data security, privacy, and regulatory compliance. This architecture synergizes data-driven insights, machine learning techniques, and user engagement to contribute to early heart attack prediction and tailored healthcare strategies. Here are the steps involved in the software architecture for predicting heart attacks using machine learning according to research idea.

1. Data Collection and Preprocessing
2. Feature Engineering and Selection
3. Machine Learning Model Development
4. Prediction Engine
5. Model Prediction and Output
6. User Interface Design
7. Continuous Monitoring and Model Improvement
8. Security and Ethical Considerations

3.5 Requirement Gathering

The most important component of the research process is the phase that entails acquiring and analyzing requirements. I aim to collaborate with healthcare organizations to align all-purpose requirements, accurate medical data collection and app features with national guidelines. And we hope to get the necessary information and ideas from the research papers to ensure that the mobile application will benefit from the collective knowledge and advancements in the field of cardiac health prediction through research papers in the requirements gathering process.

- Collaborate with hospitals to obtain patient data including age, blood pressure, blood sugar levels, cholesterol, and ECG reports.
- Extract relevant risk assessment criteria from National Cardiovascular Risk Management Guidelines to ensure accurate risk prediction.
- Collaborate with hospitals to access doctor schedules, availability, patient appointments, and clinical activities.
- Analyze research papers to identify the most relevant medical data features for accurate heart attack risk prediction.

3.6 Proposed Technology Stack

Table 2 : Proposed Technology Stack

Component	Technology/Platform
Mobile Front-end	React Native
Web Front-end	React.js
Back-end Development	Node.js with Express.js
Machine Learning Development	Python (Google Colab as platform)
Python Libraries	TensorFlow, PyTorch, pandas, numpy, scikit-learn
Version Control	Git with GitHub

04. Project Requirements

4.1 User Requirements

Heart Attack Prediction System

- Users should be able to input patient data like age, blood pressure, blood sugar level, cholesterol, and ECG reports.
- System should provide a prediction indicating the likelihood of a heart attack based on input data.
- The prediction results should be displayed in an easy-to-understand format.

Real-time Patient Tracking

- Hospital staff should be able to update the status of patients (e.g., waiting, undergoing treatment, discharged).
- Patients should have access to real-time updates on treatment status via a mobile application.

Doctor Workload Management

- Doctors should be able to view and update their schedules.
- The system should display doctor availability for appointments.
- Hospital administrators should have an overview dashboard of all doctor workloads.

4.2 Software Requirements

Heart Attack Prediction System

- Implement an interface for data entry including fields for age, blood pressure, blood sugar level, cholesterol, and ECG reports.
- Use a machine learning model trained on appropriate cardiac datasets to predict heart attack likelihood.
- Display the prediction output, ensuring that results are translated into percentages or risk categories (e.g., low, medium, high risk).
- Store the entered data and prediction results in a secure database with timestamps.

Real-time Patient Tracking

- Ensure synchronization of patient status updates in real-time across the mobile application and main system.
- Store real-time patient tracking data in a secure database, ensuring data privacy and compliance.

Doctor Workload Management

- Design a calendar interface where doctors can view and modify their schedules.
- Implement a dashboard view for hospital administrators, displaying doctors' schedules, patient counts, and workload metrics.
- Include a feature to update doctor availability based on the schedule and appointments data.
- Store doctor schedules and appointment data in a secure, searchable database.

4.3 Functional Requirements

Heart Attack Prediction System

- The system shall process the data using the integrated machine learning model to predict the possibility of a heart attack.
- The system shall display the prediction result in a comprehensible manner, such as percentages or risk categories.
- The system shall save all input data and corresponding prediction results in a secured database with time stamps.

Real-time Patient Tracking

- The system shall offer an interface for hospital staff to update the current status of a patient.
- The mobile application shall include an authentication process (like login credentials) for patients and their families to ensure data privacy.
- The system shall retrieve and display patient status based on queries by authorized users.

Doctor Workload Management

- The system shall provide a calendar interface, enabling doctors to view, add, or modify their schedules.
- The system shall adjust and display doctor availability based on the data from their schedules and patient appointments.

4.4 Non-functional Requirements

Performance - The system should respond to user input within 5 seconds under normal load conditions.

Security - All patient-related data must be encrypted both in transit and at rest.

Usability - The user interface should be intuitive, requiring minimal training for hospital staff and users.

Portability - The mobile application should be available on both iOS and Android platforms.

Availability - There should be a disaster recovery plan in place to restore the system in case of major incidents.

Compliance - The heart attack prediction model should adhere to medical standards and guidelines for health predictions.

4.5 Test Cases

Test Case 01 - Login to the system

1. Launch the application.
2. Enter a valid username.
3. Enter a valid password.
4. Click on the "Login" button.
5. Expected Result: The user is successfully logged into the system and is redirected to the dashboard.
6. Actual Result: [To be filled after testing]
7. Status: [Pass/Fail]

Test Case 02 - Predict heart attack risk

3. Navigate to the 'Predict Heart Attack' section.
4. Check all the required patient details like age, blood pressure, blood sugar level, cholesterol, ECG reports.
5. Click on the "Predict" button.
6. Expected Result: The system analyzes the data and provides a prediction regarding heart attack risk.
7. Actual Result: [To be filled after testing]
8. Status: [Pass/Fail]

Test Case 03 - Real-time patient tracking

1. Navigate to the 'Patient Tracking' section.
2. Search for a specific patient using their unique ID.
3. Expected Result: The system displays the real-time status of the patient.
4. Actual Result: [To be filled after testing]
5. Status: [Pass/Fail]

Test Case 04 - Check doctor availability

1. Navigate to the 'Doctors' section.
2. Choose a specific doctor from the list.
3. Expected Result: The system displays the doctor's availability, schedule, and current workload.
4. Actual Result: [To be filled after testing]
5. Status: [Pass/Fail]

05. Evaluation Criteria

5.1 Gantt Chart

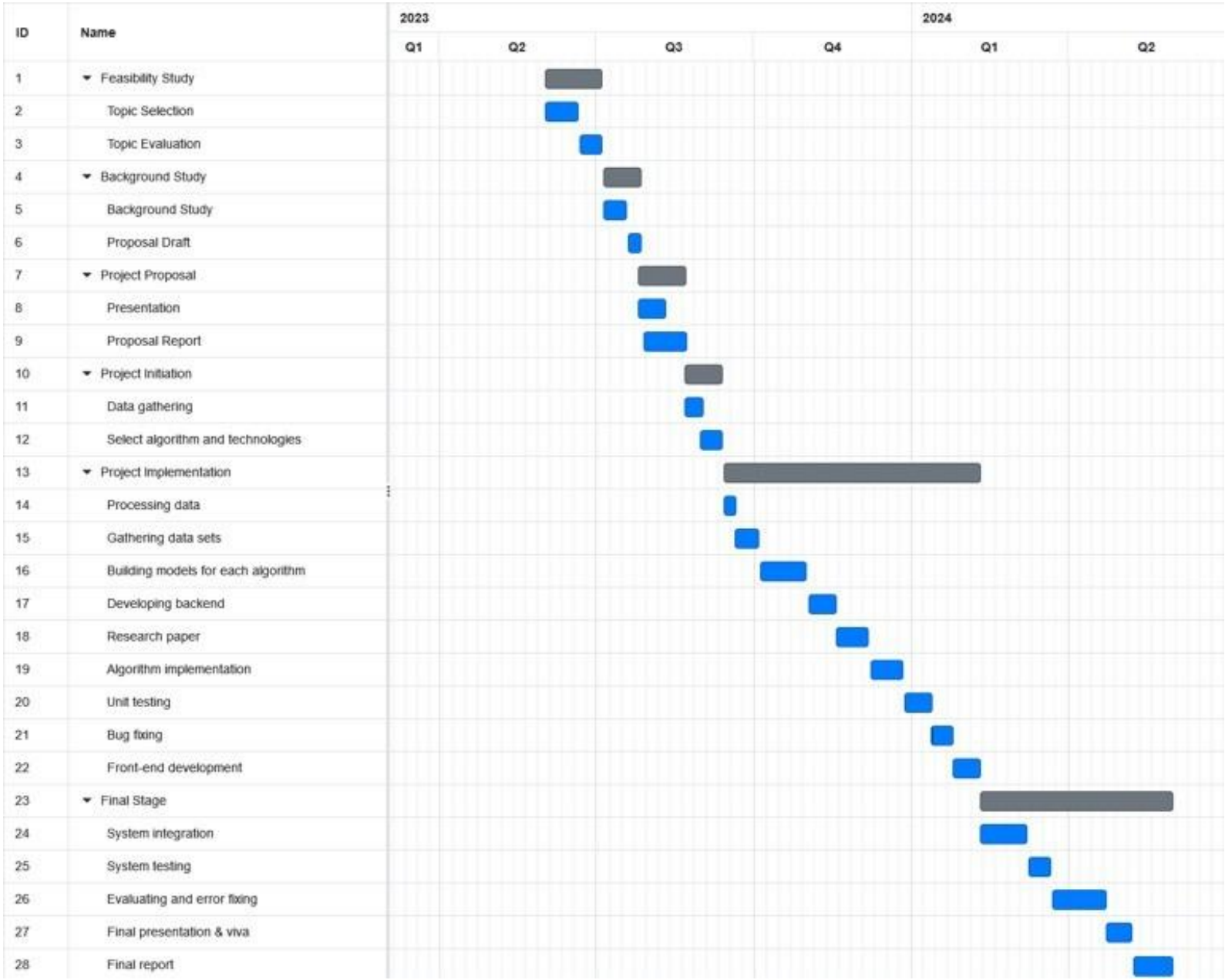


Figure 5 : Gantt Chart

5.2 Work Breakdown Structure

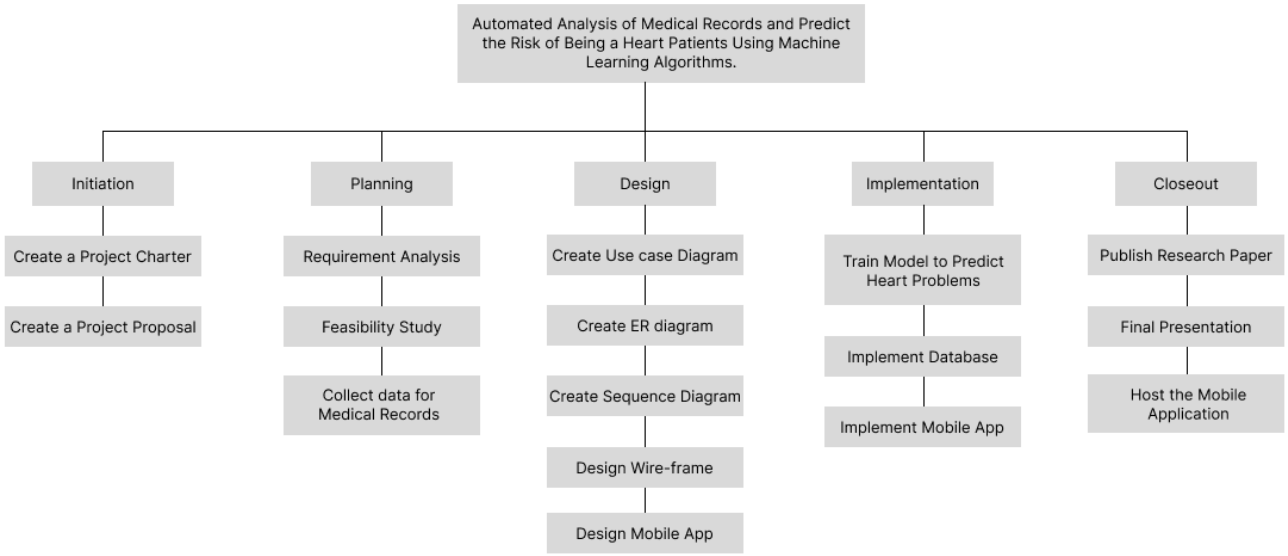


Figure 6 : Work Breakdown Structure

06. Budget

Table 3 : Budget

Description	Amount (LKR)	Notes
1. Cloud Computing Resources (Google Colab Pro)	5,000	Assuming a monthly subscription. This will allow for more RAM and longer runtimes.
2. Python Libraries	0	Most Python libraries are open-source and free.
3. Data Acquisition	5,000	Costs for accessing or procuring specific datasets, if they aren't publicly available.
4. Domain Expert Consultation	5,000	Fees for consulting with a cardiologist or data scientist expert.
5. Data Storage & Backup (Cloud Storage)	3,000	This would be for any necessary storage solutions beyond what Google Colab provides.
6. Miscellaneous Software Tools	1,500	Tools for data visualization, analysis, etc.
7. Training Material	3,000	Books, online courses, or other materials to assist in research.
8. Miscellaneous	5,000	Unforeseen expenses, additional resources, or contingency.
9. Research Documentation & Reporting	2,500	Costs associated with documenting research, printing, stationery, and any potential presentation tools.
Total	30,000	

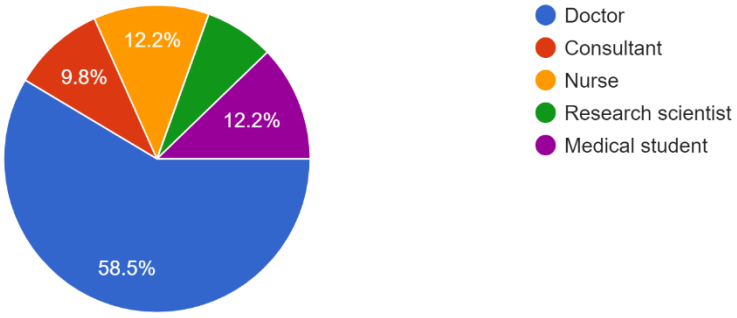
07. Appendices

Google form link : Machine Learning in Predicting Heart Attack Risks & Optimizing Doctor Workloads

https://docs.google.com/forms/d/e/1FAIpQLSe5f3dY14AQli49MnGOMH1HofcOI4Syy_rYtlSe5139tdTChQ/viewform?usp=sf_link

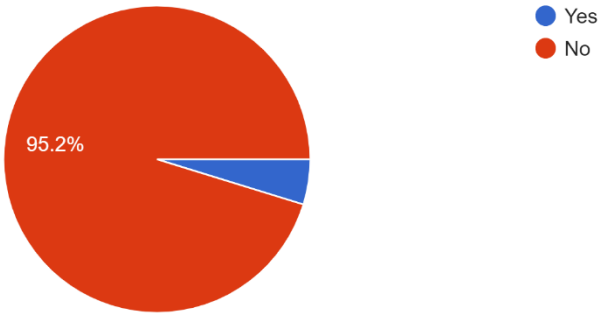
What is your current role in the healthcare sector?

41 responses



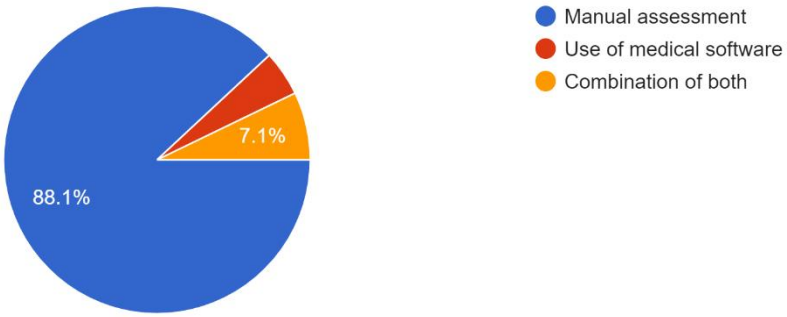
Have you previously used any machine learning tools in patient care or diagnosis?

42 responses



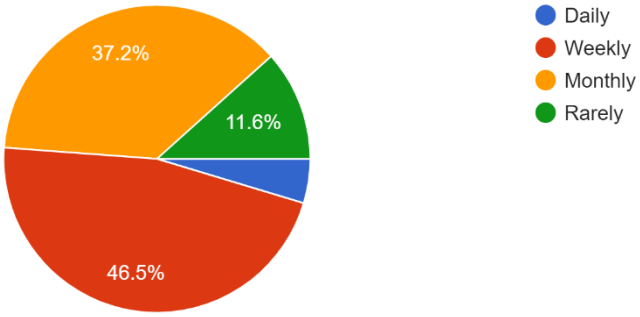
How do you currently identify patients at risk of a heart attack?

42 responses



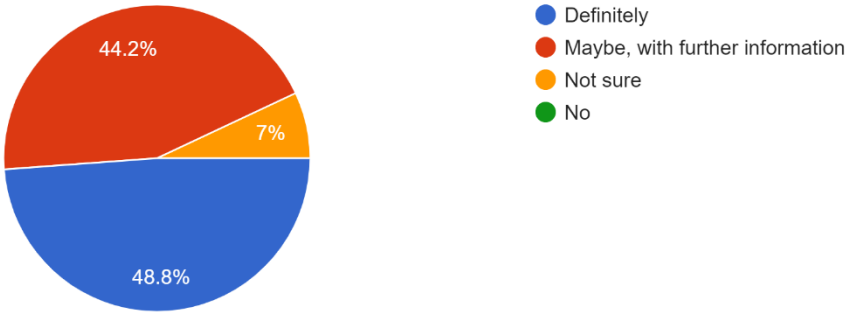
How often do you encounter patients with heart disease or at risk of a heart attack in your practice?

43 responses



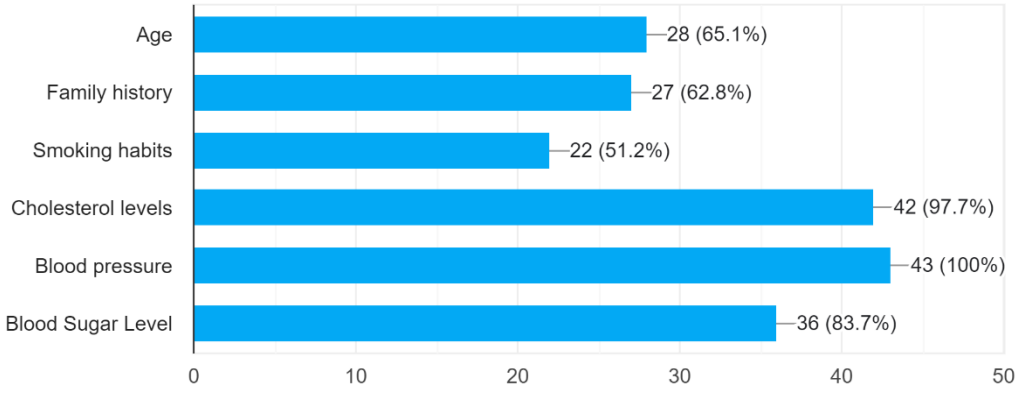
Would you trust a machine learning model to help predict heart attack risks if it had a proven accuracy?

43 responses



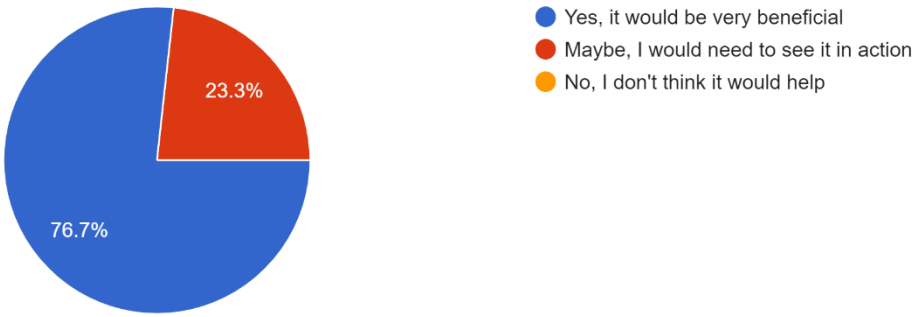
What factors do you think are the most crucial in predicting heart attack risks? (Multiple selections allowed)

43 responses



Would a tool that predicts patient needs based on their health metrics be beneficial for managing your workload?

43 responses

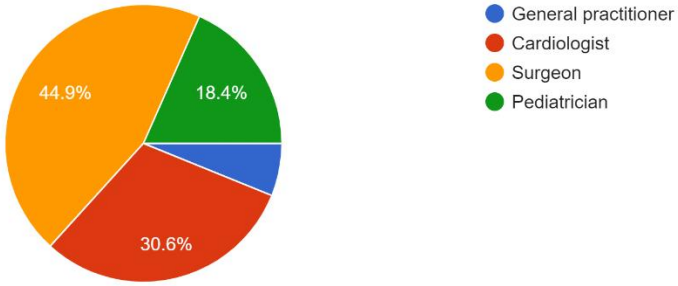


Google form link : Managing Doctor Workload & Availability in Modern Healthcare

https://docs.google.com/forms/d/e/1FAIpQLSc1S9KI9oeDSZRGG4PejEDJ6UQJ-g6ehjZJFMFinDVfe1urYg/viewform?usp=sf_link

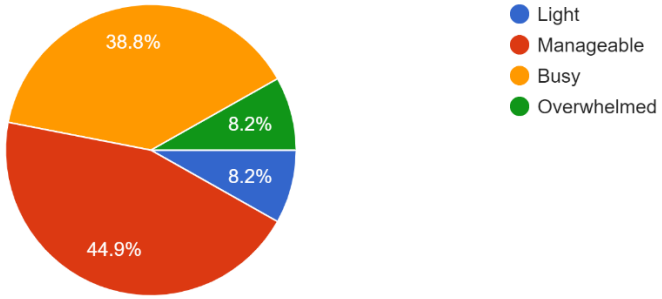
What is your primary medical specialty?

49 responses



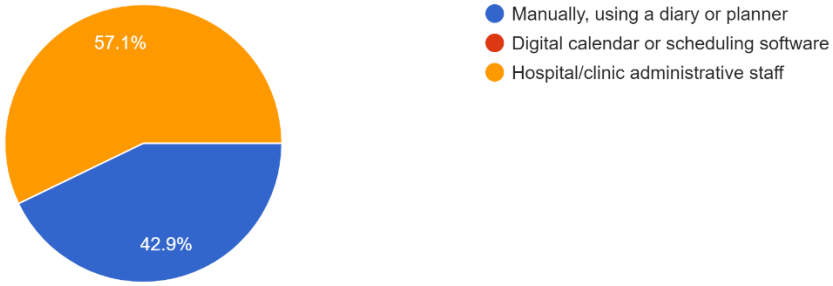
How would you describe your current workload?

49 responses



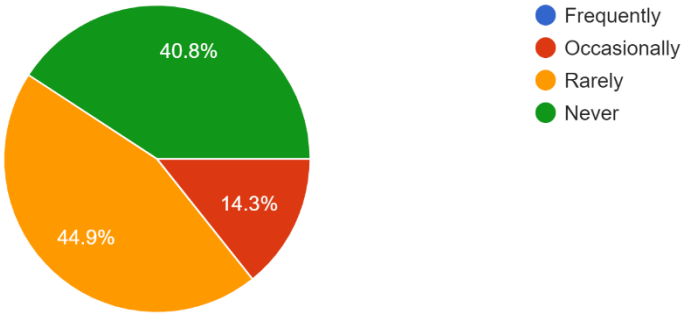
How do you currently manage your daily appointments and schedules?

49 responses



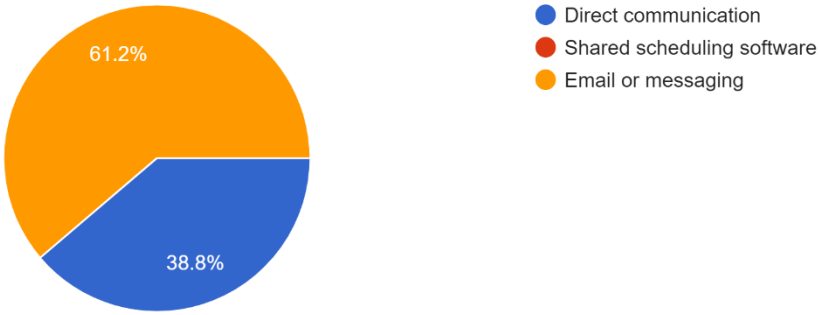
Have you ever postponed or rescheduled patient appointments due to unexpected workload increases?

49 responses



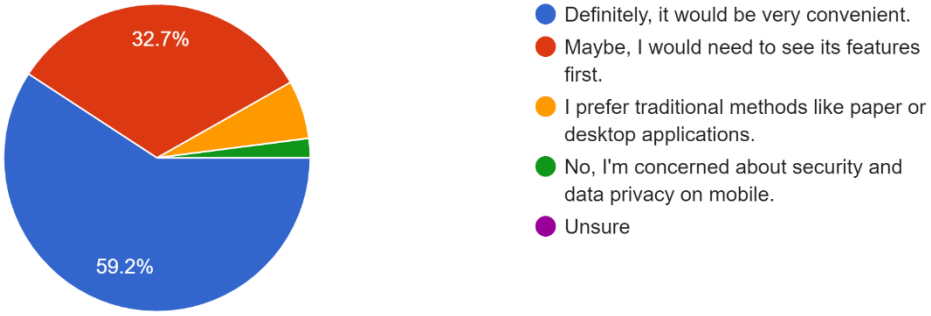
How do you communicate your availability with your colleagues and the administrative staff?

49 responses



Would you prefer a workload management schedule on mobile applications?

49 responses



08. Reference List

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