An Android Application for Healthcare Management System

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**December 2023**

**Acknowledgements**

I express my heartfelt gratitude to Md. Motaleb Hossen Manik, Lecturer of the Department of Computer Science and Engineering and the esteemed supervisor of this project. His unwavering expertise and guidance have been the cornerstone of my journey in developing the "An Android Application for Healthcare Management System." His profound knowledge, tireless support, continuous encouragement, and invaluable suggestions have propelled this project to its current stage. His constant supervision and constructive criticism have been instrumental in shaping the project's direction.

I am indebted to the enduring support and scholarly mentorship provided by Md. Motaleb Hossen Manik. Without his enthusiastic motivation and unwavering encouragement, this endeavor would not have reached fruition.

Additionally, I am thankful to Allah for granting me the talents and abilities that enabled me to undertake and complete this project.

**Asif & Atik**

**Authors**

**Abstract**

The "Android Application for Healthcare Management System" is a telemedicine-focused mobile application designed to enhance healthcare accessibility and streamline medical processes. This application facilitates patient-doctor interactions by integrating various functionalities. Upon login, patients can effortlessly browse and select doctors based on their respective specialties and expertise, utilizing filtering options for precise matching. Detailed doctor profiles assist users in making informed decisions before scheduling appointments. The platform allows for seamless communication between patients and doctors. Patients can receive prescriptions and medications directly through the app, while doctors have access to patient medical history and past prescriptions for better treatment planning. Moreover, an integrated machine learning (ML) model enables the prediction of heart diseases based on user-input data, providing AI-driven solutions for early detection and intervention. The administrative component of the application grants control to authorized personnel. The admin app empowers administrators to manage the system effectively by adding verified doctors, editing doctor information, and overseeing patient records comprehensively. This healthcare management system, through its user-friendly interface and diverse features, aims to bridge the gap between healthcare providers and patients, fostering efficient telemedicine practices and contributing to improved healthcare delivery.

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1. Introduction
   1. Background

Efficient healthcare management is integral to providing optimal medical services to the patients. In this digital age, the need for streamlined doctor-patient interaction is crucial. In our country healthcare-based application faces many problems like limited accessibility, fragmented information, lack of predictive solutions hence lack of desire to seek professional help etc. Our goal is to provide a comprehensive app that connects patients with doctors, integrates predictive models, ensures data security, and provides an intuitive interface for efficient healthcare management.

* 1. Objectives

The objective of creating a mobile app for healthcare can encompass various goals tailored to the needs of healthcare providers and patients. Here are several key objectives associated with such an app:

* Simplify the process of contacting and booking appointments for both healthcare providers and patients.
* Reach a broader patient base beyond geographical limitations, providing convenience and flexibility in appointment scheduling.
* Increase the visibility of doctor, allowing patients to easily find and connect with suitable professionals.
* Furnish detailed information about doctors, their specialties, availability, and services offered, helping patients in making informed decisions.
* Establish a responsive emergency and ambulance hotline to swiftly deliver life-saving assistance and immediate medical aid during critical situations.

The primary goal of developing this mobile app is to bridge the gap between doctors and patients, enhancing healthcare accessibility, and fostering a positive and convenient patient experience.

* 1. Scope

This project aims to introduce a healthcare management application, drawing inspiration from on successful apps and websites. The focus is on developing a user-friendly platform that allows patients to easily find doctors based on their specialties, facilitates appointment scheduling and provides doctors with accurate prescriptions. Also, integration of an advanced Machine Learning model to predict heart diseases based on user-input data is one of the core goals.

* 1. Unfamiliarity of the problem

The healthcare management app is a unique solution that combines telemedicine services with advanced functionalities. It offers a comprehensive platform for patients to navigate through various services, facilitating information passing between doctor & patient, appointment scheduling, and prescription management. The app also incorporates an AI-driven predictive model for real-time health assessments. The user-friendly interface caters to both patients and doctors, while an administrative control panel allows admin to manage doctor information & patient data.

* 1. Project planning

The healthcare management app project plan involves several stages, including research, design, prototyping, development, testing, and quality assurance. In fig 1.1 a Gantt chart representation is included, which shows the timeline from research and requirements gathering to deployment and completion. The schedule is a rough estimate that shows the time & efforts spend on each stage.

1. Related Works
   1. Related works

Physarum polycephalum, accurately the 'many-headed' slime mold, is a gigantic multi-nucleated but single-celled protest [1]. Recently, Physarum polycephalum (true slime mold) has arisen …………….

* 1. Discussion on Existing models

Some relevant work details and contribution are added in given table.

**Table 2.1:** Heat Disease Dataset classifier

|  |  |  |
| --- | --- | --- |
| Authors & Year | Project Title | Contribution |
| Gupta et al., 2019 [1] | MIFH: A Machine Intelligence Framework for Heart Disease Diagnosis | Achieved 93.44 % accuracy |
| Miao et al., 2018 [2] | Coronary Heart Disease Diagnosis using Deep Neural Networks | Used DNN model and reduced error of 16.33%, sensitivity of 93.51% |
| Pouriyeh et al., 2017 [3] | A comprehensive investigation and comparison of Machine Learning Techniques in the domain of heart disease | Analysis among Naive Bayes, KNN, RBF, MLP, SVM and find SVM performs best considering on accuracy, precision, F1 score, ROC curve. |

The table presents studies on machine learning techniques for heart disease diagnosis, revealing their effectiveness in achieving high accuracy rates, reduced error rates, and superior performance metrics, with SVM outperforming other models.

Our Android app for telemedicine incorporates an advanced model designed to predict heart disease based on patient-input parameters. If the prediction indicates a high possibility of a heart condition, we strongly recommend scheduling a doctor's appointment through our app for immediate attention and further evaluation.

1. System Design

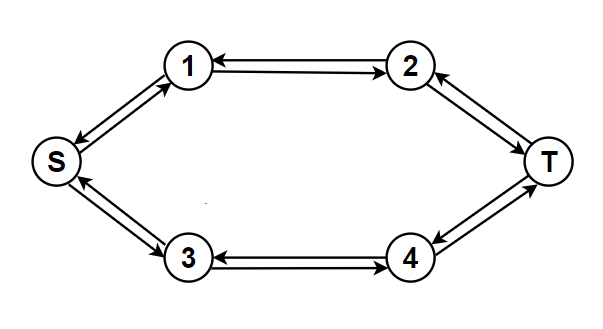
There exist lots of challenges in some of mega cities like Dhaka such as road conditions are not good enough, cycling lanes ………………………

* 1. Analysis of the system

This research aims at extending a construction pattern for our network to Dhaka, Bangladesh's capital city. The main challenges with Dhaka city are described in followings……………………….

* 1. System architecture

Green City also named as Eco-city or Sustainable city is a city designed with consideration for the social, economic, environmental impact which consists of several elements such as Green Transports. A simple network in shown in Fig. 3.1. It shows that ……………



**Figure 3.1:** Real traffic network.

* 1. Tools used

In our project, we used Android Studio as our primary development environment and Firebase as database. we also used Kaggle dataset, google colab for heart disease predictor model. Java is used as primary language and we also used figma for UI design.

* + 1. Android Studio

Android Studio is a popular IDE for Android app development, offering a user-friendly interface, robust functionalities, and a built-in emulator. It streamlines the process of creating Android applications, offering features like drag-and-drop UI design, real-time code analysis, and compatibility with Android devices and OS versions. Android Studio supports multiple languages, simplifies library and API integration, and provides robust testing tools for testing applications across various devices and Android versions. Its comprehensive toolset and support for various programming languages make it a preferred choice for developers in creating high-quality, user-friendly Android applications.

* + 1. Java

Java Programming Language is chosen for developing the Android application for healthcare management system in this project. Reason for choosing this language:

1. Extensive Community Support: Java benefits from a large and active developer community, providing ample resources, libraries, and support forums for Android app development.
2. Comprehensive Toolset: Android Studio, the official IDE for Android, supports Java, offering a robust ecosystem of tools and frameworks that streamline the development process.
3. Security and Performance: Java's stringent security measures and performance optimizations contribute to secure and efficient execution of code on Android devices.
4. Officially Supported for Android: Java has long been the primary language for Android development, enjoying continuous support and enhancements from Google and the Android development community.
5. Ease of Learning and Readability: Java's straightforward syntax, object-oriented nature, and code structure make it easily understandable, promoting readability and maintainability, crucial for collaborative app development projects.

In essence, Java's strong community backing, comprehensive tooling, security features, official support for Android, and its ease of learning and readability collectively make it a preferred language for developing the Android-based healthcare management system in this project.

* + 1. Google Colab

Google Colab is a popular choice for deep learning models due to its free access to GPUs and TPUs, which significantly speed up training times. The cloud-based platform allows seamless collaboration and resource sharing, while its integration with Google Drive streamlines workflow. Colab comes pre-installed with popular deep learning libraries like TensorFlow, Keras, and PyTorch, saving time and effort in setting up the environment. It supports Jupyter notebooks, providing an interactive environment for code writing, experimentation, and documentation. Colab offers scalable resources, allowing users to switch between GPU/TPU options based on model complexity or dataset size. It also offers educational resources for beginners.

* + 1. Firebase (Database)

Firebase, a Google-provided cloud-based platform, is integrated in our project for secure login, registration, and storage of patient and doctor information, ensuring efficient management and retrieval of vital healthcare data.

These features enhance the application's performance, security, scalability, and user experience, making it a valuable tool for managing healthcare-related data.

* + 1. Tensor Flow Lite

TensorFlow Lite is a lightweight version of TensorFlow, an open-source machine learning framework developed by Google, designed specifically for mobile and edge devices. It aims to deploy machine learning models on devices with limited computational resources, such as smartphones, IoT devices, and embedded systems. TensorFlow Lite offers several key features:

TensorFlow Lite supports various platforms including Android, iOS, Raspberry Pi, microcontrollers, and edge devices, making it versatile for deploying machine learning models across a wide range of hardware.

* + 1. Figma (UI Design)

Figma is a cloud-based design tool for UI and UX, offering collaborative design, cross-platform accessibility, vector editing, prototyping, reusable components, version history tracking, developer handoff features, and plugin ecosystem. It facilitates efficient design processes from initial concepts to final product development, allowing multiple designers to work simultaneously and share feedback.

1. Project Implementation

This chapter implements the……………….

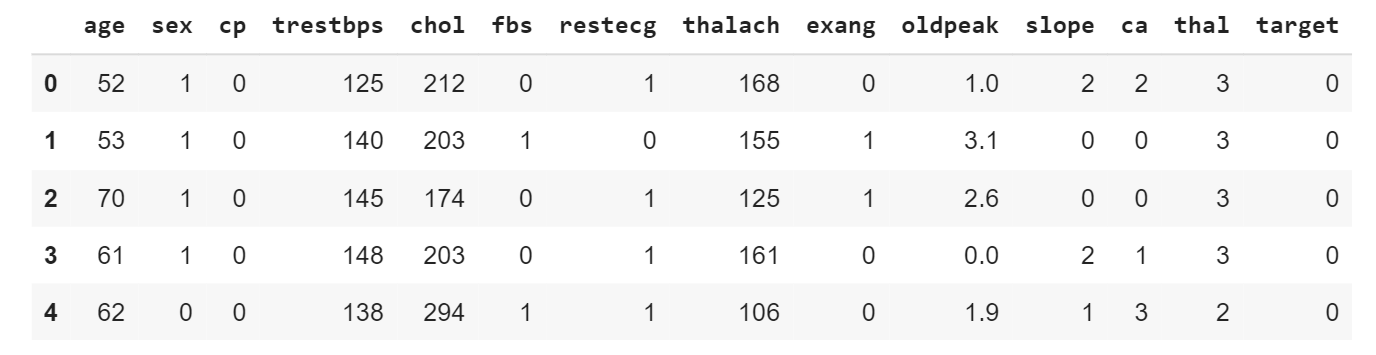
* 1. System implementation

Heart Disease Dataset

This data set dates from 1988 and consists of four databases: Cleveland, Hungary, Switzerland, and Long Beach V. It contains 76 attributes, including the predicted attribute, but all published experiments refer to using a subset of 14 of them. The "target" field refers to the presence of heart disease in the patient. It is integer valued 0 = no disease and 1 = disease.

Number of rows: 1025

Number of columns: 14



Data used in our project to train and predict heart disease based on user input

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Age | Sex | Cp | BP | Cholesterol | Blood sugar | Max HR | Exercised Angina |
| 1 | 53 | 1 | 0 | 140 | 212 | 1 | 155 | 1 |
| 0 | 52 | 1 | 0 | 125 | 212 | 0 | 168 | 0 |

**Project Feature:**

User

* User’s log in & sing up
* User can read health related advices
* Find Doctor and filter using expertise, price & so on
* User can set appointment with doctor
* User can predict heart disease giving some question’s answer to our ML model
* User can keep track health info calculating BMI and other feature
* User can see his all prescription
* User can call emergency ambulance service sending google map’s location
* Emergency SOS service

Doctor

* Only valid doctor can log in as a doctor
* Doctor can see medicine details, disease details and health related articles if need
* Doctor can monitor a patient & check previous all prescription
* Doctor can set proper prescription for patient

Admin

* Add new doctor
* Edit doctor’s info
* Monitor all info of patient
* Add Ambulance services
  1. Morality or ethical issues

Telemedicine integration raises ethical concerns, including patient privacy, data security, informed consent, equitable access, quality of care, digital divide, doctor-patient relationship, algorithmic bias, and professional boundaries. Ensuring data confidentiality, informed consent, and equitable access to telemedicine services is crucial. Addressing technology access, language barriers, and disabilities is also essential. Quality of care and accuracy in diagnosis and treatment recommendations are crucial. The digital divide and the doctor-patient relationship must be preserved. Algorithmic bias and transparency must be avoided, and professional boundaries must be adhered to. Collaboration between policymakers, healthcare professionals, technologists, and ethicists is essential for responsible telemedicine deployment.

* 1. Socio-economic impact and sustainability

The socio-economic impact and sustainability of a telemedicine application for healthcare management can be substantial. Here are some potential aspects to consider regarding its impact:

1. Improved Access to Healthcare: Telemedicine can bridge the gap between patients and doctors, especially in remote or underserved areas. This can lead to increased access to healthcare services, reducing travel time and costs for patients.
2. Enhanced Efficiency: By enabling patients to find suitable doctors based on their disease and set appointments digitally, the system can improve the efficiency of healthcare delivery, reducing wait times and optimizing doctor-patient interactions.
3. Cost Savings: Telemedicine can potentially reduce healthcare costs for both patients and healthcare providers. Patients may save on travel expenses, and healthcare providers can optimize resources by offering remote consultations.
4. Healthcare Quality: ML-driven solutions for predicting heart disease can provide early detection and preventive care, improving health outcomes and reducing the severity of illnesses.
5. Data-Driven Insights: The system can generate valuable data on patient health, doctor interactions, and disease patterns. Analyzing this data can lead to insights for better healthcare delivery, research, and policy-making.
6. Challenges: Challenges may include ensuring data privacy and security, addressing technological barriers for certain populations, and maintaining regulatory compliance in different regions.

To ensure sustainability, collaboration with healthcare professionals, policymakers, and stakeholders is crucial for long-term success and impact assessment of healthcare technologies, focusing on scalability, continuous improvement, and socio-economic impact.

* 1. Financial analyses and budget

At first, a selected portion of Dhaka city is considered to construct the network using Physarum inspired technique……………………….

1. Conclusion

A modified Physarum-inspired model is presented in this project to address the design of the bicycle lane network…………………………………….

* 1. Conclusion and challenges faced

Telemedicine applications can revolutionize healthcare by improving accessibility, efficiency, and quality. ML-driven solutions for predictive analysis, appointment scheduling, and remote consultations empower patients and doctors, leading to cost savings and early disease detection.

Challenges Faced:

1. Technological Barriers: Accessibility and availability of high-speed internet and compatible devices in remote or underprivileged areas may hinder widespread adoption.
2. ML Dataset Quality: Ensuring the dataset's quality, completeness, and relevance is crucial for accurate model predictions. Challenges may include missing values, inaccuracies, or insufficient data, especially in healthcare where data collection can be complex.
   1. Future Study

The future study of a telemedicine application for healthcare management could encompass several avenues for further exploration and development:

1. Enhanced ML Models: Machine learning algorithms are continuously refined and improved for improved disease diagnosis accuracy, ensemble models, and new data sources for robust predictions.
2. Remote Monitoring and IoT Integration: Expanding the capabilities by integrating Internet of Things (IoT) devices for remote patient monitoring. This could include wearable sensors, smart devices, or home health monitoring systems to collect real-time patient data.
3. Telemedicine Platform Expansion: Scaling the telemedicine platform to include a broader spectrum of medical specialties or healthcare services beyond consultations, such as mental health counseling, rehabilitation programs, or chronic disease management.
4. User Experience and Interface Enhancement: Conducting user-centric studies to improve the user interface, making it more intuitive, accessible, and accommodating to diverse user demographics.
5. AI-driven Decision Support Systems: Developing AI-driven clinical decision support systems that aid healthcare providers in diagnosis, treatment recommendations, and personalized medicine.
6. Blockchain for Data Security: Exploring blockchain technology to enhance data security, transparency, and integrity, ensuring tamper-proof patient records and maintaining privacy.

These future studies could contribute to advancing telemedicine technology, improving healthcare accessibility, and enhancing patient outcomes while addressing challenges and ethical considerations for a more comprehensive and effective healthcare ecosystem.

# References

[1] Gupta, A., Kumar, R., Arora, H.S. and Raman, B., 2019. MIFH: A machine intelligence framework for heart disease diagnosis. *IEEE access*, *8*, pp.14659-14674.

[2] Miao, K.H. and Miao, J.H., 2018. Coronary heart disease diagnosis using deep neural networks. *international journal of advanced computer science and applications*, *9*(10).

[3] Pouriyeh, S., Vahid, S., Sannino, G., De Pietro, G., Arabnia, H. and Gutierrez, J., 2017, July. A comprehensive investigation and comparison of machine learning techniques in the domain of heart disease. In *2017 IEEE symposium on computers and communications (ISCC)* (pp. 204-207). IEEE.

**N.B.** This is the preferable format for Report writing. The subsections written in italic forms (i.e., 1.4, 1.5, 4.2, 4.3, 4.4) are fixed. However, the Supervisor can extend the sections/points of the report (if necessary).