Final Year Project (FYP) Proposal

Project Title	
	REMOTE HEALTH MONITORING SYSTEM AND DISEASE PREDICTION.

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Abstract

The issues regarding restricted access to healthcare and the rising frequency of chronic illnesses have brought attention to the need for creative solutions to facilitate effective and proactive healthcare management, especially for home patients. This project that we have chosen presents a remote health monitoring system (RHMS) for home patients that collects real-time data of the patient and displays it on a mobile app indicating whether the patient is ok and if the patient's condition is critical then there is an alert message on the app that he/she needs to see a particular doctor, moreover this system analyzes the patient's data and makes future predictions that if the patient can have a disease in future. The RHMS facilitates real-time monitoring of vital health parameters, such as heart rate, blood pressure, glucose levels, and other relevant physiological indicators, through wearable devices and Internet of Things (IoT) sensors. The collected data are securely transmitted to a centralized database, ensuring privacy and data integrity. The disease prediction model (GUI) is obtained by applying machine learning algorithms and identifying the risk factors or potential healthcare complications of some diseases. The RHMS aims to promote a proactive healthcare culture, ultimately leading to enhanced patient outcomes and an overall improvement in public health and well-being.

1. Introduction

1.1. *Overview:*

This project makes a specialty in the improvement and implementation of a remote health monitoring system (RHMS) with a powerful disease prediction. With a growing emphasis on preventive healthcare, the RHMS aims to permit real-time monitoring of various health parameters using wearable devices and IoT sensors. The received statistics are transmitted to a centralized database, facilitating the evaluation of developments and styles through superior systems getting to know algorithms [1]. Via leveraging predictive analytics and deep learning, the device picks out capability health risks and predicts the onset of diseases e.g., heart attack, diabetes, etc. making an allowance for early intercession and personalized healthcare treatment plans. Through easy-to-use interfaces and nonstop correspondence channels among patients and medical care suppliers, the project aspires to encourage patient commitment, reduce healthcare expenses, and improve average public health results, at last reforming the scene of medical services.

1.2 Motivation:

The motivation for this project originates from the challenges witnessed during the COVID-19 pandemic, where many people faced significant health complications and lacked timely assistance [2]. The prevailing situation highlighted the critical need for a remote system that could monitor patients' health and provide timely guidance and support. The vision is to overcome any barrier to healthcare access by leveraging technology to empower individuals with proactive healthcare management tools, guaranteeing that nobody is left without vital help during a health crisis. This project thus aims to provide a comprehensive solution that can not only monitor health parameters but also offer personalized guidance and interventions, ultimately contributing to a more resilient and responsive medical infrastructure.

1.3 Objectives:

Software (Simulation) Based Objectives:

- Develop a user-friendly RHMS software interface that allows for real-time tracking and analysis of key health factors such as heart rate, blood pressure, and glucose levels, among others.

- Develop a disease prediction model using advanced machine learning and deep learning, to identify potential health risks and predict the onset of specific diseases based on historical health data and demographic information [3].

Hardware Based Objectives:

- Integrate efficient wearable gadget and Internet of Things (IoT) sensors that can effectively record and transmit real-time health data to ensure seamless connectivity and information transfer between the hardware and the RHMS software.

- Ensure the hardware components are durable and reliable to enable long-term and reliable patient monitoring. This will allow for prolonged periods of continuous health monitoring without sacrificing accuracy or performance.

- Enable patients to easily integrate the hardware devices into their daily routines without experiencing significant disruptions or discomfort by making them easily accessible and user-friendly.

1.4 Deliverables:

- ***Software for a complete remote health monitoring system (RHMS):***
  A fully functional mobile application interface that is simple to use for both patients and medical professionals, tools for real-time data visualization and

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individualized health advice, data integrity, and privacy is ensured by secure data storage techniques.

- *Prototypes of functional hardware:*
  IoT and wearable sensors for tracking health data in real-time, Effortless data transmission to the software platform will be demonstrated by a hardware prototype.

- *Integrated Disease Prediction Model:*

  Robust disease prediction algorithm integrated into the RHMS software. Predictive analytics features for early detection of potential health risks, Continuous model refinement based on the latest medical research and patient feedback.

- *Training and Demonstration Materials:*

  Presentation tools for showcasing the RHMS's features and advantages, resources, and training materials for instructing end users and healthcare professionals on how to use the system effectively, for maintaining and troubleshooting the hardware and software components, there are instructional videos and manuals available.

2. Methodology:

In our Remote health monitoring system, the vitals of the patients who have permanent medical conditions will be monitored by various sensors. A wearable device for the patient will be made which will consist of all the sensors necessary for monitoring the vitals of the patient. On the basis of data obtained by the sensors, the condition of the patient will be characterized as either normal or abnormal. The acquired data will be sent to the database for accumulation of individual patient records. The healthcare professionals will be able to easily access the data and analyze the condition of the patient depending upon his/her health. The trends of the patient's vitals will be observed and if an abnormality is detected, the system will generate a warning to the consultant professional and the attendant of the patient   and depending upon the collected data, the application will deduce what kind of health issues a patient can be facing in the future. For example, if the patient's vitals which concern their cardiovascular health show abnormal behavior over a particular period of time, the data will be processed according to the machine learning algorithms used in the application. The data will be analyzed and a prediction regarding the illness will be provided to the users. This will enable early detection of underlying health conditions which would've been overlooked in the conventional healthcare procedure because the patients who require remote healthcare monitoring don't have feasible access to healthcare facilities.
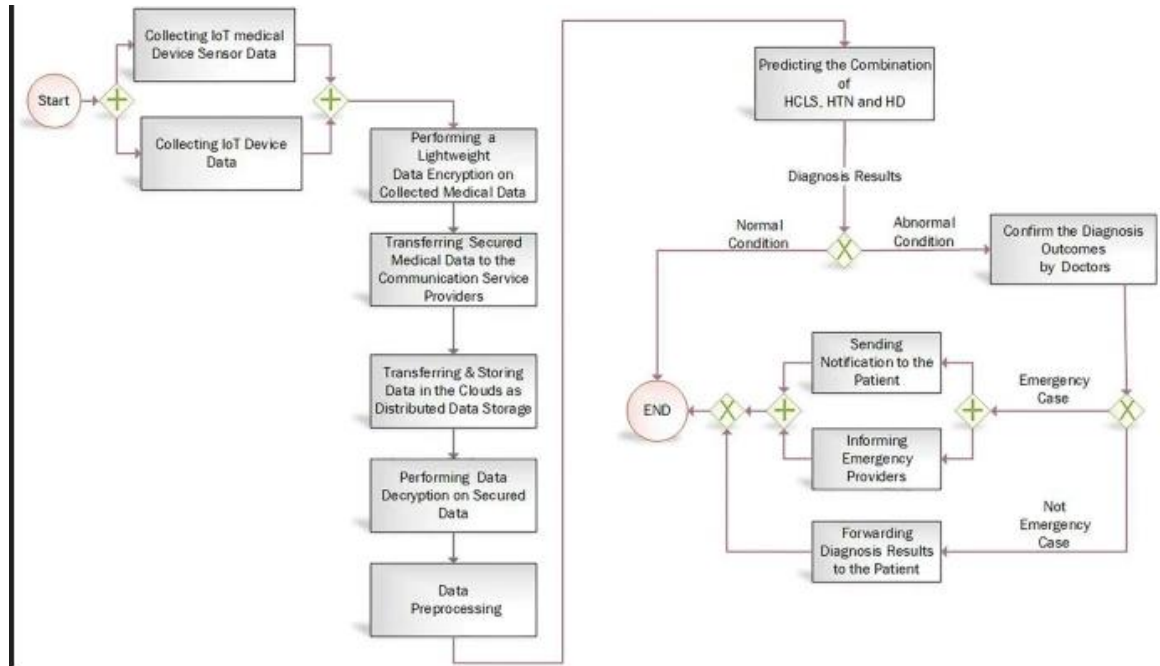
2.1. Flowchart:

Figure 1 [4]

References

1. M. Alshamrani, "IoT and artificial intelligence implementations for remote healthcare monitoring systems: A survey," *Journal of King Saud University - Computer and Information Sciences*, Jun. 2021, doi: https://doi.org/10.1016/j.jksuci.2021.06.005.

2. K. G. Fan, J. Mandel, P. Agnihotri, and M. Tai-Seale, "Remote Patient Monitoring Technologies for Predicting Chronic Obstructive Pulmonary Disease Exacerbations: Review and Comparison," *JMIR mHealth and uHealth*, vol. 8, no. 5, p. e16147, May 2020, doi: https://doi.org/10.2196/16147.

3. V. L. N. Sujith, G. S. Sajja, V. Mahalakshmi, S. Nuhmani, and B. Prasanalakshmi, "Systematic review of smart health monitoring using deep learning and Artificial intelligence," *Neuroscience Informatics*, vol. 2, no. 3, p. 100028, Sep. 2022, doi: https://doi.org/10.1016/j.neuri.2021.100028.

4. S. Akhbarifar, H. H. S. Javadi, A. M. Rahmani, and M. Hosseinzadeh, "A secure remote health monitoring model for early disease diagnosis in cloud-based IoT environment," *Personal and Ubiquitous Computing*, Nov. 2020, doi: https://doi.org/10.1007/s00779-020-01475-3.