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UMOYO Cloud-Cloud and IOT Based Health Monitoring System (CHMS)

[1*] Gabriel Nkhonde, [2]Mr J. Mulepa

[1*] DMI-St John the Baptist University, Malawi, gabrielnkhonde@gmail.com
[2] DMI-St John the Baptist University Malawi, mulepadmi@gmail.com
[3] Deputy Vice Chancellor DMI-St John the Baptist University, Malawi,

ABSTRACT

This project aims to develop a IoT Based health monitoring system for health services. This Cloud and IoT Based Health Monitoring System Umoyo IoT Cloud monitoring system (UCMS) is an innovative solution that combines the power of cloud computing and the Internet of Things (IoT) to change the way healthcare is managed. The system will provide a real-time monitoring, analysis, and storage of important health data, allowing for remote health tracking, early intervention, and data-driven decision-making. The system will be designed to be used in hospitals and homes also for measuring and monitoring various parameters like temperature, heart rate, blood pressure and also environment conditions. The results will be recorded using Arduino sensors. The main goal of Umoyo IoT Cloud is to provide a smooth and efficient approach to health monitoring and management, allowing people to take care of their health while healthcare providers gain valuable insights into patient health. The system will be developed using IoT sensors, Arduino, HTML, CSS, JavaScript, PHP and MySQL.

Keywords— Cascading Style Sheets, Digital Humidity Temperature Sensor, Hyper Text Markup Language, Internet of Things, Hypertext Pre-processor, Software Development Life Cycle, Random Access Memory, Solid State Disk, Health Monitoring System, Liquid Crystal Display Gigahertz

INTRODUCTION

The healthcare sector has witnessed a remarkable transformation due to the innovative applications of IoT technologies. These IoT devices, often referred to as "smart devices," play a crucial role in real-time data collection, diagnosis, and treatment. They provide healthcare professionals with valuable insights into patient health, enabling them to make informed decisions and improve patient outcomes. This documentation explores into the Umoyo IoT Cloud, a revolutionary Cloud and IoT Based Health Monitoring System (HMS). Designed specifically for patients with high blood pressure (hypertension), diabetes, respiratory issues, and other chronic conditions, Umoyo IoT Cloud extends its reach to rural and urban areas, bridging the gap in healthcare accessibility. Despite the widespread adoption of IoT in various industries, its utilization in the medical sector remains relatively untapped. This documentation focuses on leveraging IoT devices to establish an effective health monitoring system. Umoyo IoT Cloud employs a network of sensors to gather critical patient health information. These sensors, characterized by their compact size, speed, and affordability, make healthcare accessible to even the most remote and underserved communities. Umoyo IoT Cloud extends beyond traditional patient monitoring by encompassing the patient's surroundings, including temperature and humidity. This comprehensive approach provides healthcare providers with a holistic understanding of a patient's health status. Malawi's rapidly expanding population has led to a surge in healthcare demands. Umoyo IoT Cloud addresses this challenge by providing a well-equipped, organized system for patient data management. It enables healthcare professionals to maintain accurate records, facilitating informed decision-making and personalized patient care. Umoyo IoT Cloud extends its reach beyond hospital walls, enabling healthcare personnel to remotely monitor patients and maintain their vital records. This facilitates proactive interventions and ensures continuity of care. Umoyo Cloud stands as a testament to the transformative power of IoT in the healthcare sector. By providing real-time patient monitoring, remote assistance capabilities, and comprehensive data management, Umoyo IoT Cloud paves the way for a more efficient, personalized, and accessible healthcare experience for all.

LITERATURE REVIEW

Mohammad Monirujjaman KhanTurki M. AlanaziA. AlbraikanFaris. A. Almalki [1] Conducted a study on simplifying the utilization of an otherwise complicated medical device at a minimum cost while sitting at home is presented, to increase affordability for regular people.

R. Alekya, Neelima Devi Boddeti, K. Salomi Monica, Dr.R. Prabha, Dr.V. Venkatesh [2] This is a review on how IoT can be incorporated into complex health care procedures.

Sahar Ebadinezhad and Temitope Emmanuel Mobolad [3] Provided a comprehensive review of dependable, cloud-based remote system patient monitoring framework for IoT health detection.

Tej Prakash SahuDR. Vinay Kumar Jain [4] Presented a case study on a collaborative approach with a remote health monitoring system that can be made with domestically available sensors with a view to making it affordable and updatable if it were to be mass produced.

Shashank KumarSanjay KumarHarshita SinhaP. Yellamma [5] Explored and investigates the variations between the collected data using HIoT devices and data acquired using known clinical healthcare technologies, as well as the potential of combining several HIoT devices to capture diverse health-related data points, and presents a configurable cardiac monitoring belt design.

METHODOLOGY

The Iterative model in software development is a methodology that underscores the significance of incremental advancements and ongoing feedback within the software development lifecycle (SDLC). This methodology entails dividing a larger project into more manageable segments that can be developed, tested, and deployed in shorter timeframes. Each iteration builds upon its predecessor, with feedback and adjustments seamlessly integrated into subsequent iterations. In essence, the Iterative model stands as a pivotal methodology in contemporary software development. It furnishes a pliable, collaborative, and adaptive framework for steering intricate projects and delivering software of superior quality. By accentuating incremental progress and perpetual feedback, this approach empowers developers to promptly adapt to evolving requirements and customer input, ensuring the final product aligns precisely with user needs. In Umoyo IoT Cloud, the development will start with assembling and setting up the Arduino kit, then this will go further in developing web interface linking to the IoT functionalities. The Umoyo IoT Cloud system will use Agile methodology, this is so because it well suited for the system development as it allows flexibility in adapting to changes of activities. With agile methodology it will involve breaking down the project into smaller tasks and delivering working version at each particular task. Using agile methodology will ensure that Umoyo IoT Cloud is developed efficiently.

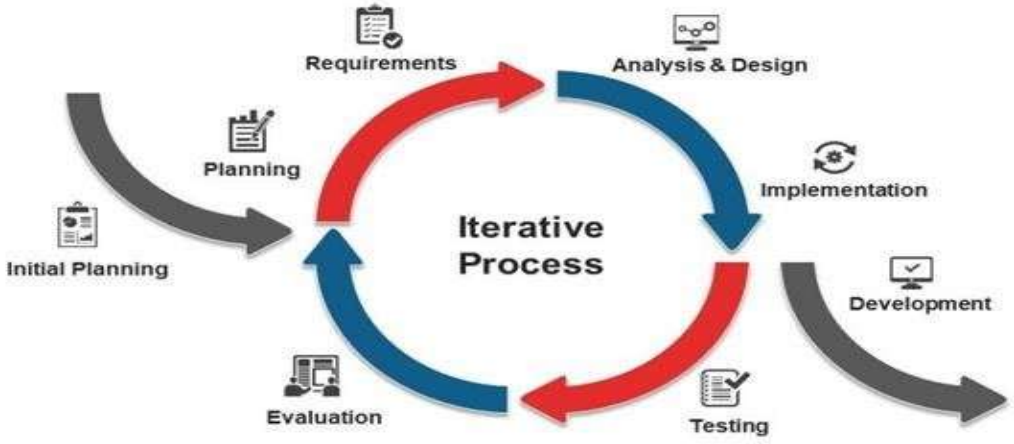

Fig. 1. Sample Iterative Model

MODULE DESCRIPTION

A module description is an elaborate exposition or documentation detailing a particular module or component within a software system. It encompasses a comprehensive overview of the module's objectives, functionalities, interfaces, dependencies, and guidelines for usage. These descriptions act as valuable references for developers, architects, and stakeholders engaged in the software development process. By offering in-depth documentation of individual components, module descriptions enhance comprehension, collaboration, and the ongoing maintenance of the software system.

Dashboard Module:

Shows the overview of the systems tabs

Administrator Module:

Handles user authentication, and access control.

Adding users and providing privileges.

Clinician module:

Adding patients and managing patients.

Processing patient data analysis.

Run Analysis Module:

Processes and analyzes patient health data.

Uses algorithms to identify anomalies or potential health issues.

Data Visualization and Reporting Module:

Presents patient data in user-friendly dashboards.

Patient Access Module:

Provides patients with access to their own health data.

Allows patients to set preferences and receive insights and recommendations.

SYSTEM ARCHITECTURE

The Umoyo IoT Cloud Monitoring System is architecturally designed to provide a robust and efficient framework for health monitoring. It encompasses a user interface with web-based applications for healthcare professionals and a user-friendly web application for patients as well. The application layer hosts business logic, including real-time data processing, AI-based functionalities, and collaboration features. The data layer securely manages health data, integrating seamlessly with existing healthcare systems. The system incorporates a security and compliance module, collaboration tools, a monitoring and analytics dashboard, and an AI module for intelligent insights. Additionally, a web application development kit ensures compatibility, and a user feedback mechanism gathers insights for continuous improvement. This comprehensive architecture aims to deliver scalable, secure, and user-centric solutions for real-time health monitoring and management.

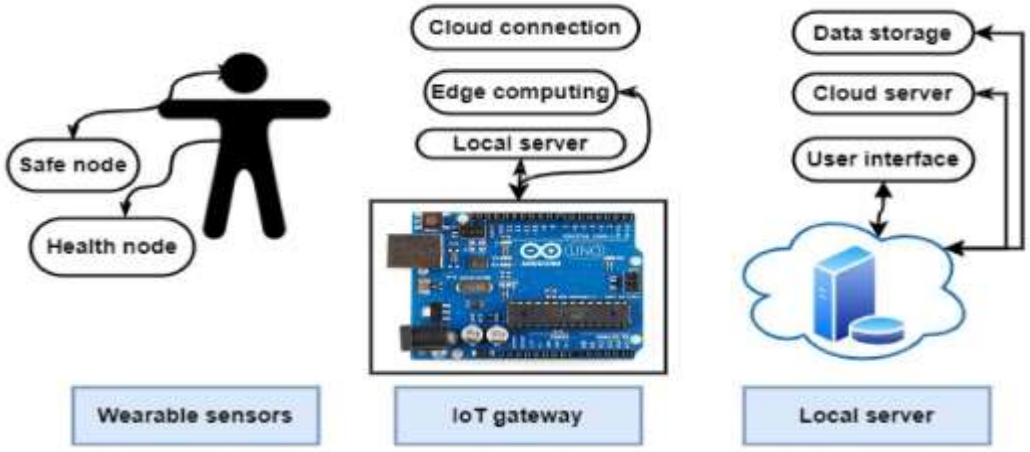

Fig:2 System Architecture

Description

Wearable sensors:

Wearable sensors worn or used by patients to collect vital sign data.

These devices include heart rate monitors, temperature and humidity monitors etc.

IoT Gateway:

IoT Gateway acts as an intermediary between IoT devices and the cloud or central server. Its primary function is to aggregate, process, and transmit data from connected devices to the cloud for further analysis and storage. Vital signs data collected by IoT devices is transmitted to a data aggregator. Data transmission can be via Wi-Fi, cellular networks, Bluetooth, or other communication protocols etc.

Note: Data is securely encrypted during transmission to protect patient privacy.

Data Aggregator:

The data aggregator is a component responsible for receiving data from IoT devices.

It processes and organizes the data for transmission to the cloud system.

Cloud server:

The cloud infrastructure consists of a set of servers, hosted in a secure cloud environment.

Local Server

A local server, also known as an on-premises server, refers to a computing server that is physically located within an organization's premises rather than being hosted by a third-party cloud service provider.

Data Storage:

The cloud system ingests data from the data aggregator and stores it in its databases.

Data storage is designed to be reliable, scalable, and secure.

User Interfaces:

User interfaces include web application that provide access to patient data.

Healthcare professionals and patients can view and interact with the data through the interface.

Patient Access:

Patients have access to their own health data through a secure login.

They can view their vital signs and interact with health personnel.

RESULTS

Doctor's login this is where the authorized user will be able to login

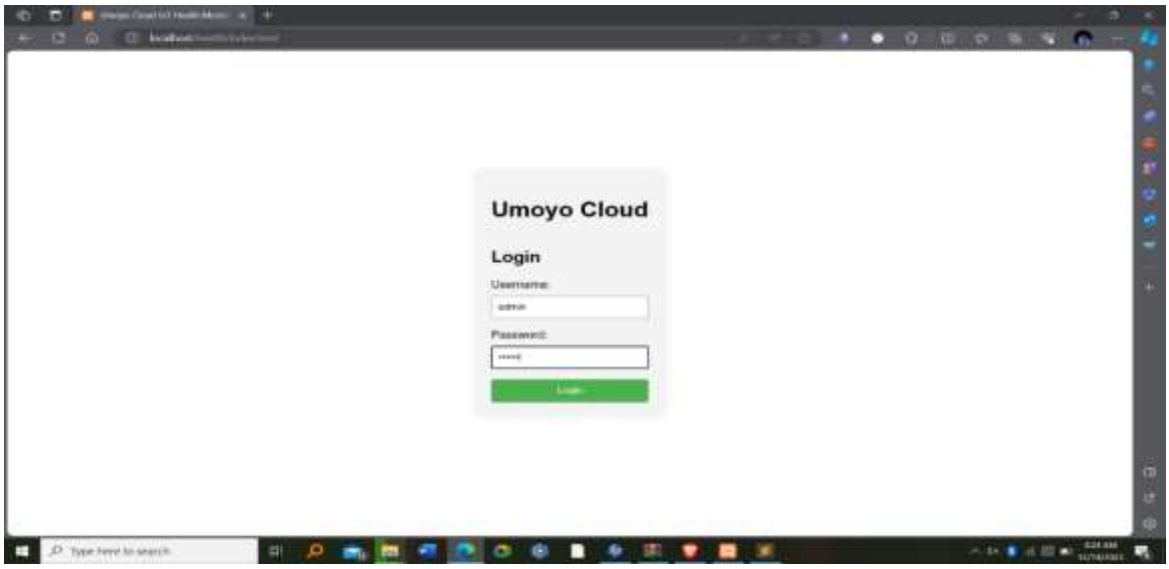

Fig 3 Doctor login

Dashboard after successful the Doctor will be able to navigate into the system and access hospital details

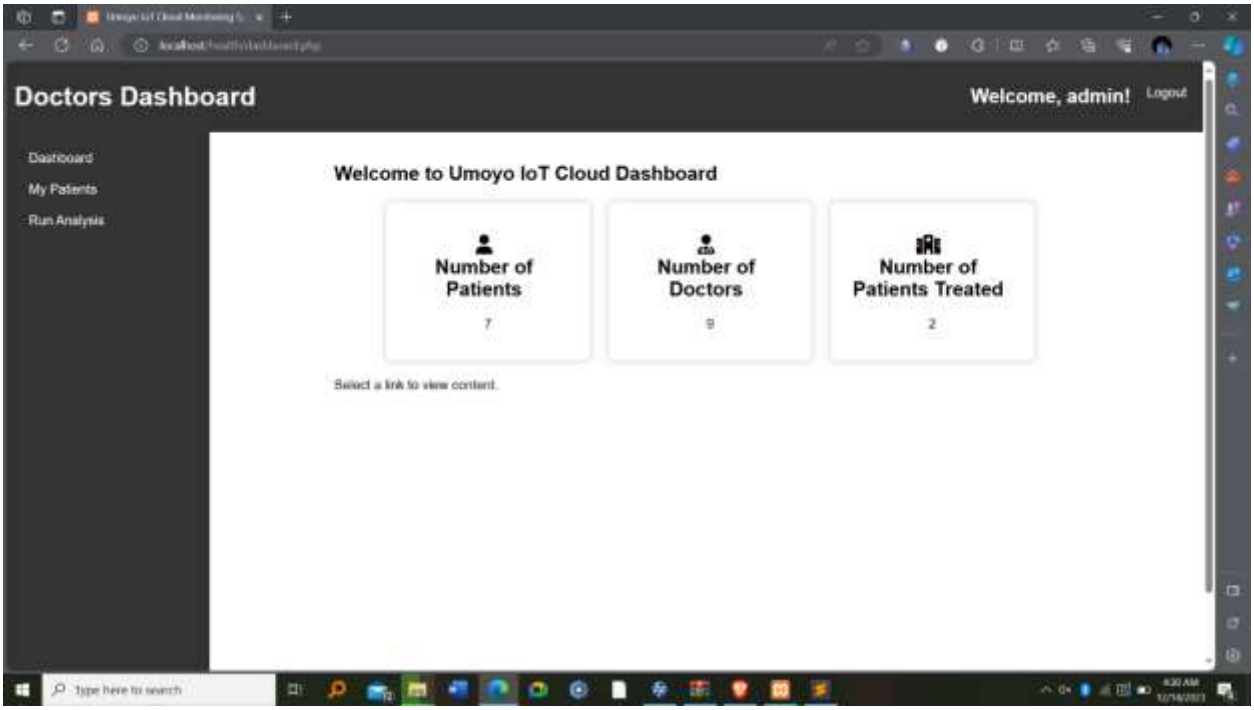

Figure 4 Dashboard

In clinician section the system will show individual patient data to be analyzed

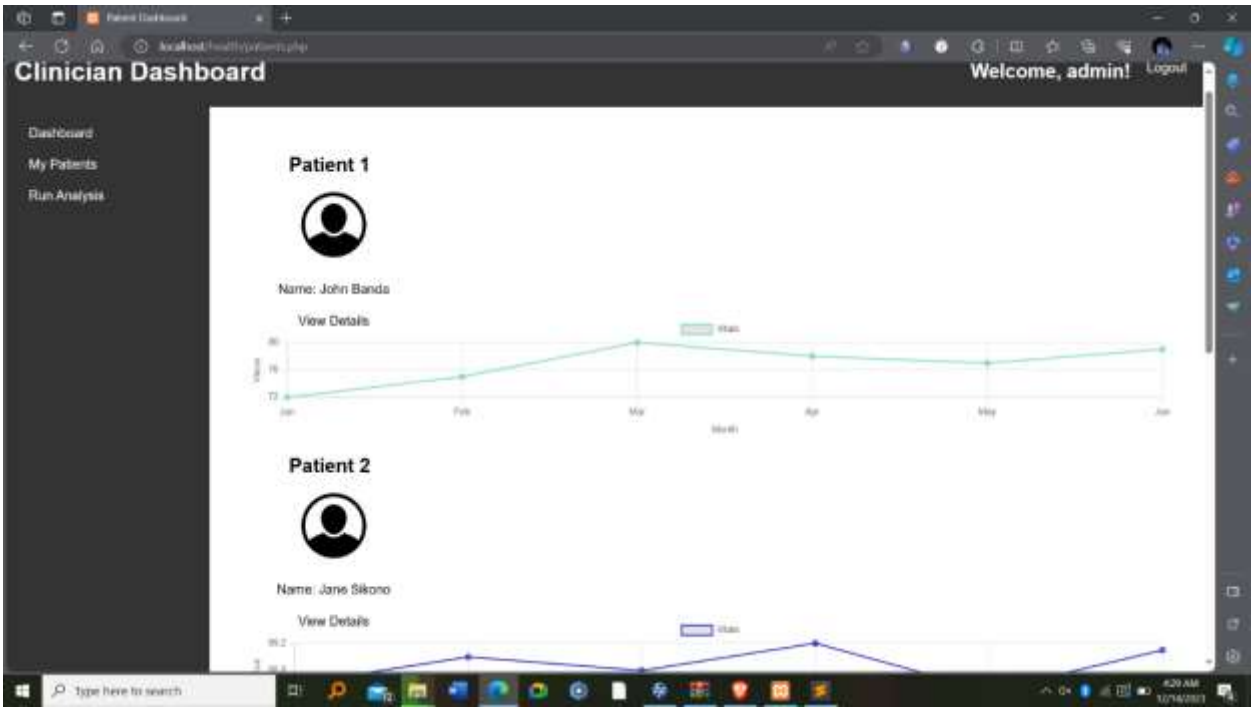

Figure 5 Clinician Dashboard

Analysis section this where the data will be analyzed for reporting

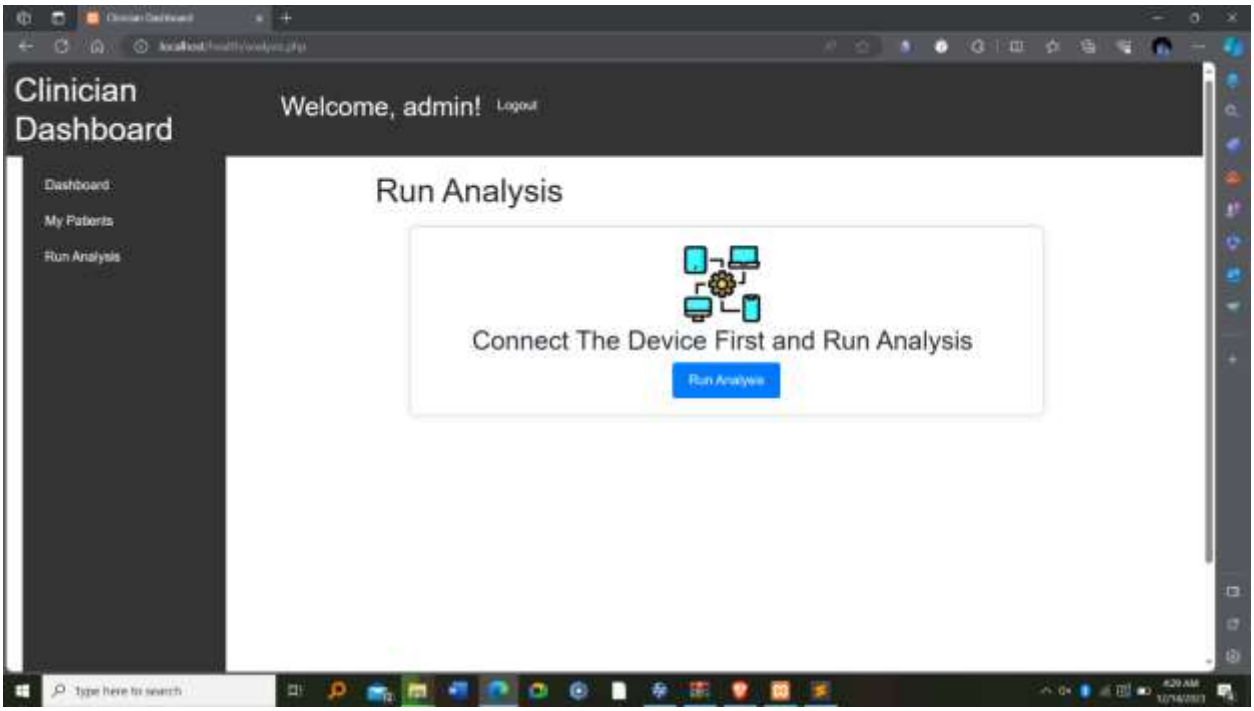

Figure 6 showing command to run data analysis

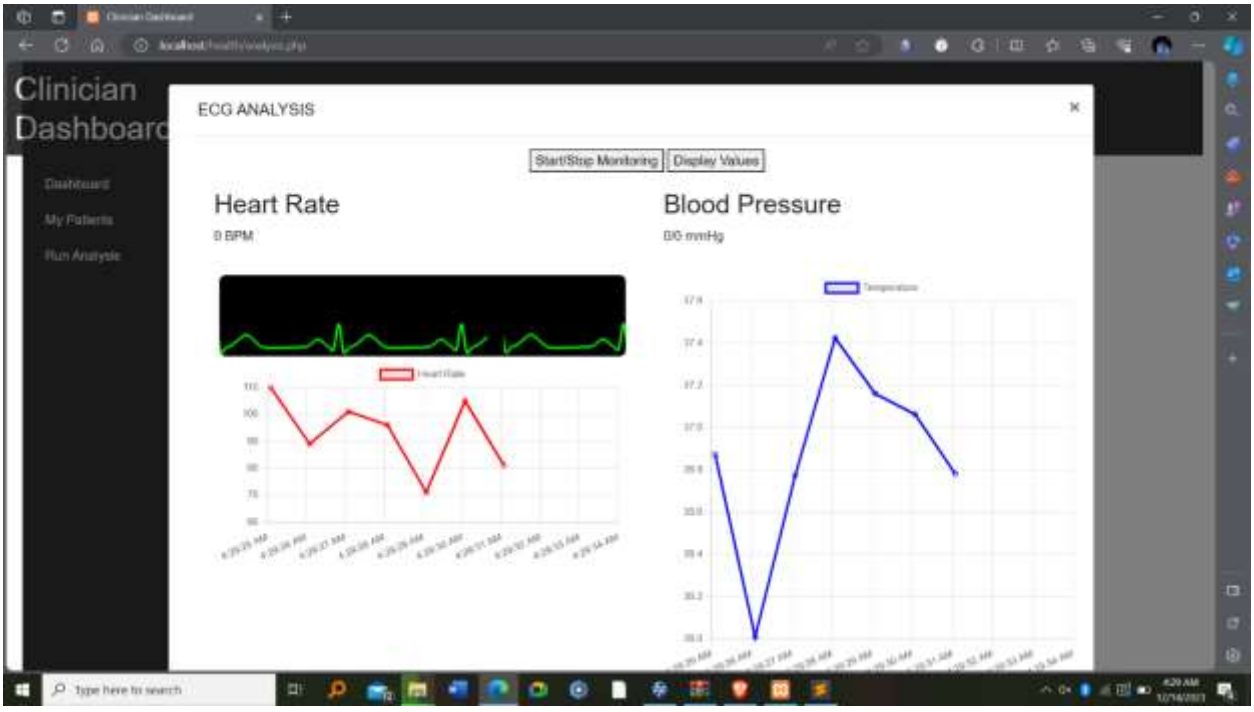

Figure 7 showing Data analysis results

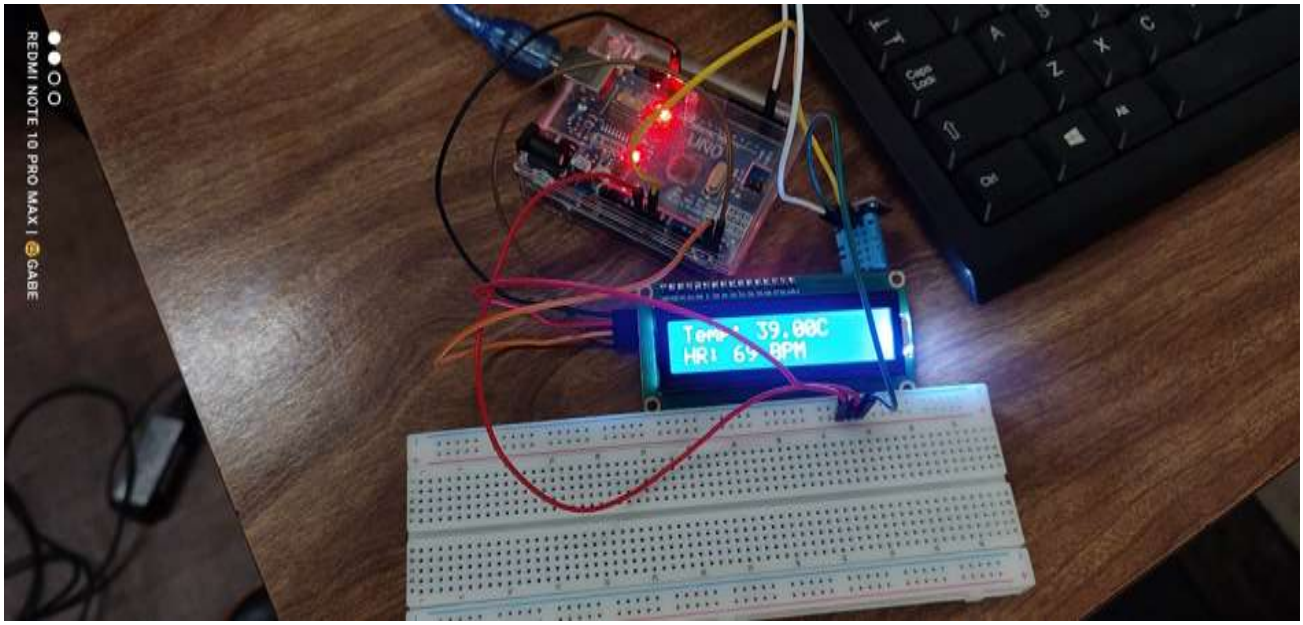

Figure 8 showing Data recorded using Arduino gadget

CONCLUSION

The Umoyo Cloud IoT health monitoring system is an effective solution for modern healthcare needs. It improves healthcare delivery by allowing for real-time data analysis and remote monitoring. Its scalability ensures adaptability to changing demands, and the potential cost savings make it an economically viable option. However, maintaining stringent data security and privacy measures is critical to preserving patient trust and regulatory compliance. Additionally, the Cloud IoT health monitoring system is a critical tool for improving healthcare outcomes and advancing patient care in the digital age.

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