IOT BASED HEART MONITORING AND RISK PREDICTION

by

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Title Justification

- The title clearly reflects the project's focus on continuous heart monitoring using IoT sensors.
- It highlights the risk prediction capability, which classifies the user's heart condition into meaningful levels.
- The title is simple, direct, and descriptive, making the project's purpose easy to understand.
- It emphasizes both real-time data collection and intelligent decision-making, aligning with the system's objectives.

Abstract

Heart diseases are increasing globally due to lifestyle changes, stress, and the lack of continuous cardiac monitoring, while traditional systems fail to provide real-time tracking and accessible long-term observation.

To address this gap, the proposed work develops an IoT-based heart health monitoring and risk estimation system capable of continuously measuring key cardiac parameters such as ECG signals, heart rate, and SpO_2.

The system processes the acquired data using a lightweight rule-based algorithm to classify the user's condition into low, medium, or high risk levels, and automatically stores the values on a cloud platform for easy access.

A dashboard is included for simple visualization of cardiac trends. Experimental observations show that the system reliably captures physiological signals and provides meaningful risk indications, making it a low-cost, effective solution for remote monitoring and early detection of heart abnormalities.

Problem Statement

- Traditional heart monitoring systems are expensive, non-portable, and do not support continuous long-term tracking, leading to delayed detection of cardiac abnormalities.
- Most existing IoT-based systems only display raw physiological data without meaningful analysis or risk prediction, making it difficult for users to understand their heart condition.
- There is a need for an affordable IoT platform that can continuously collect cardiac data, analyze it using AI-assisted logic, and store it in the cloud, enabling early detection and remote monitoring.

Objectives of Project

Objective-1: IoT-Based Monitoring

Develop a system that continuously monitors essential cardiac parameters to support early detection of abnormalities in heart health.

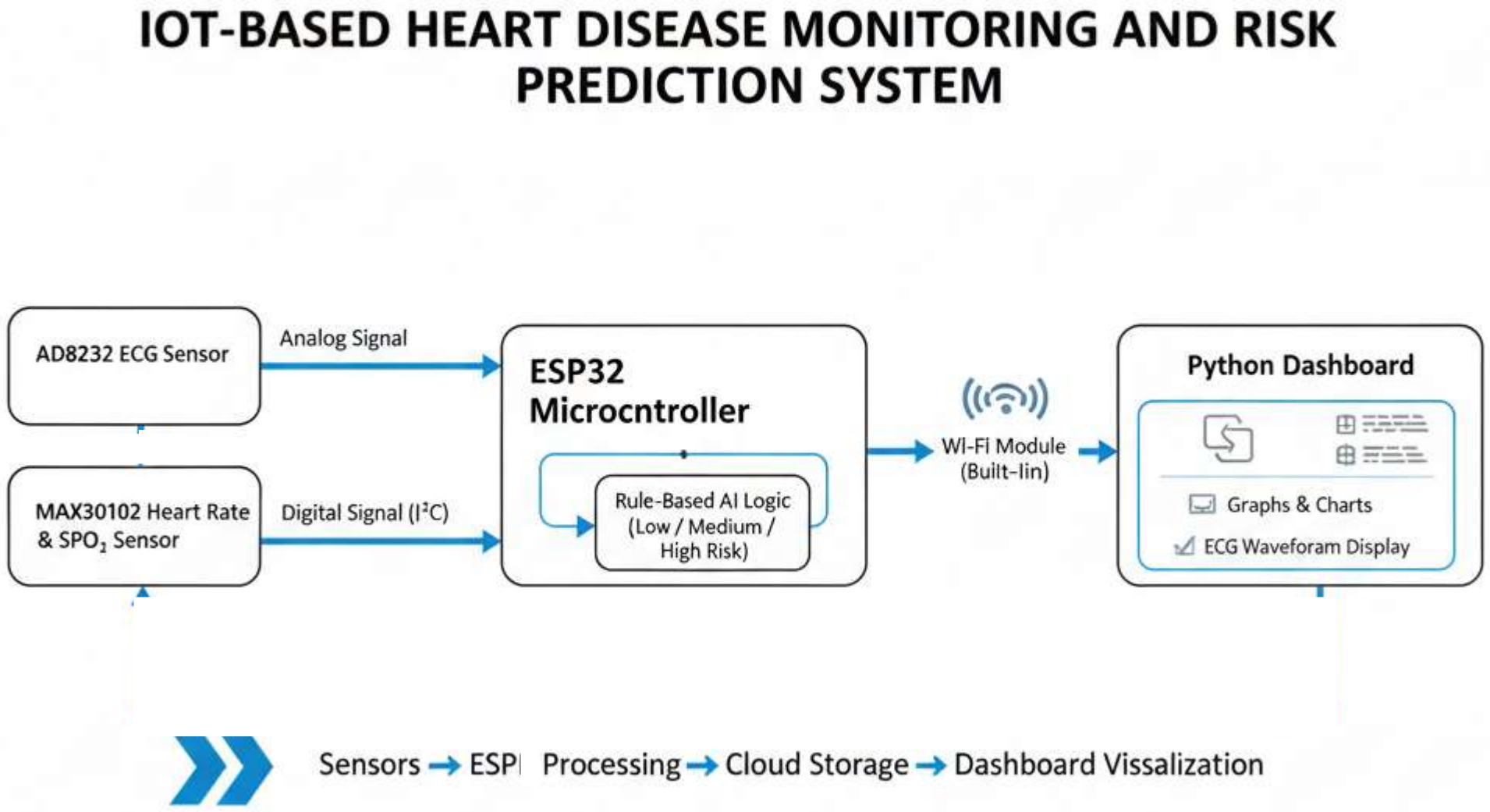
Objective-2 : AI-Assisted Analysis

Design and implement an AI-assisted rule-based model that analyzes real-time cardiac data and classifies heart condition into meaningful risk levels through cloud-based visualization.

Literature survey for objectives

Author(s) / Source	Year	Objective Linked	Main Contribution	Research Gap Identified
PhilStat – *IoT-Based ECG Monitoring System for Health Care Applications*	2022	Objective 1	Authors developed an IoT-based ECG monitoring system capable of transmitting ECG signals for basic remote health monitoring.	Only raw ECG data is transmitted; no cloud storage, no dashboard, no trend visualization.
IJRASET – *IoT-Based Smart ECG Monitoring System*	2023	Objective 1	Authors implemented a low-cost ECG monitoring prototype providing real-time ECG display on IoT hardware.	Provides only basic real-time display; lacks long-term storage, analytics, and user-friendly visualization.
Kim et al. – *TinyML-Based Classification in an ECG Monitoring Embedded System*	2023	Objective 2	Authors demonstrated that TinyML can run ECG classifiers directly on embedded devices with reduced memory and power usage.	Does not provide simple interpretable rule-based risk levels; still computationally heavier than basic embedded logic.
N. Divya, M. Riyazuddin, A. Ahad, S.& R. Vulapula,, "*Predicting Heart Disease Using Machine Learning and IoT Techniques*,"	2024	Objective 2	The authors propose a ml and IoT-based framework that collects patient physiological and contextual data, then uses multiple classifiers (SVM, Naïve Bayes,) to predict heart disease risk.	Does not present an embedded, low-compute rule-based model for real-time microcontroller operation, nor does it clearly provide cloud dashboard visualization with risk levels.

Proposed System



Proposed System

Module 01

Data Acquisition

AD8232 ECG sensor captures electrical cardiac activity. MAX30102 sensor measures heart rate and SpO_2.

Module 02

Processing & Classification

ESP32 microcontroller performs on-device processing. Lightweight AI rule-based algorithm classifies condition into Low, Medium, or High risk.

Module 03

Cloud Storage

Data transmitted via Wi-Fi to Google Sheets for real-time storage and remote accessibility.

Module 04

Visualization

Dashboard displays visual trends, ECG patterns, risk indicators, and interpreted summaries.

References

[1] S. K. Singh and R. Verma, “IoT-Based ECG Monitoring System for Health Care Applications,” *PhilStat Journal*, vol. 20, no. 3, pp. 1–6, 2022.

[2] B. Lucas, A. Mahamuni, V. Kulal, A. Gupta, and K. Deorukhkar, “Affordable Real-Time Heart Rate, ECG & SpO_2 Monitoring System Using Internet of Things,” International Journal for Research in Applied Science & Engineering Technology (IJRASET), vol. 10, no. 11, pp. 1–8, Nov. 2022. DOI: 10.22214/ijraset.2022.47731.

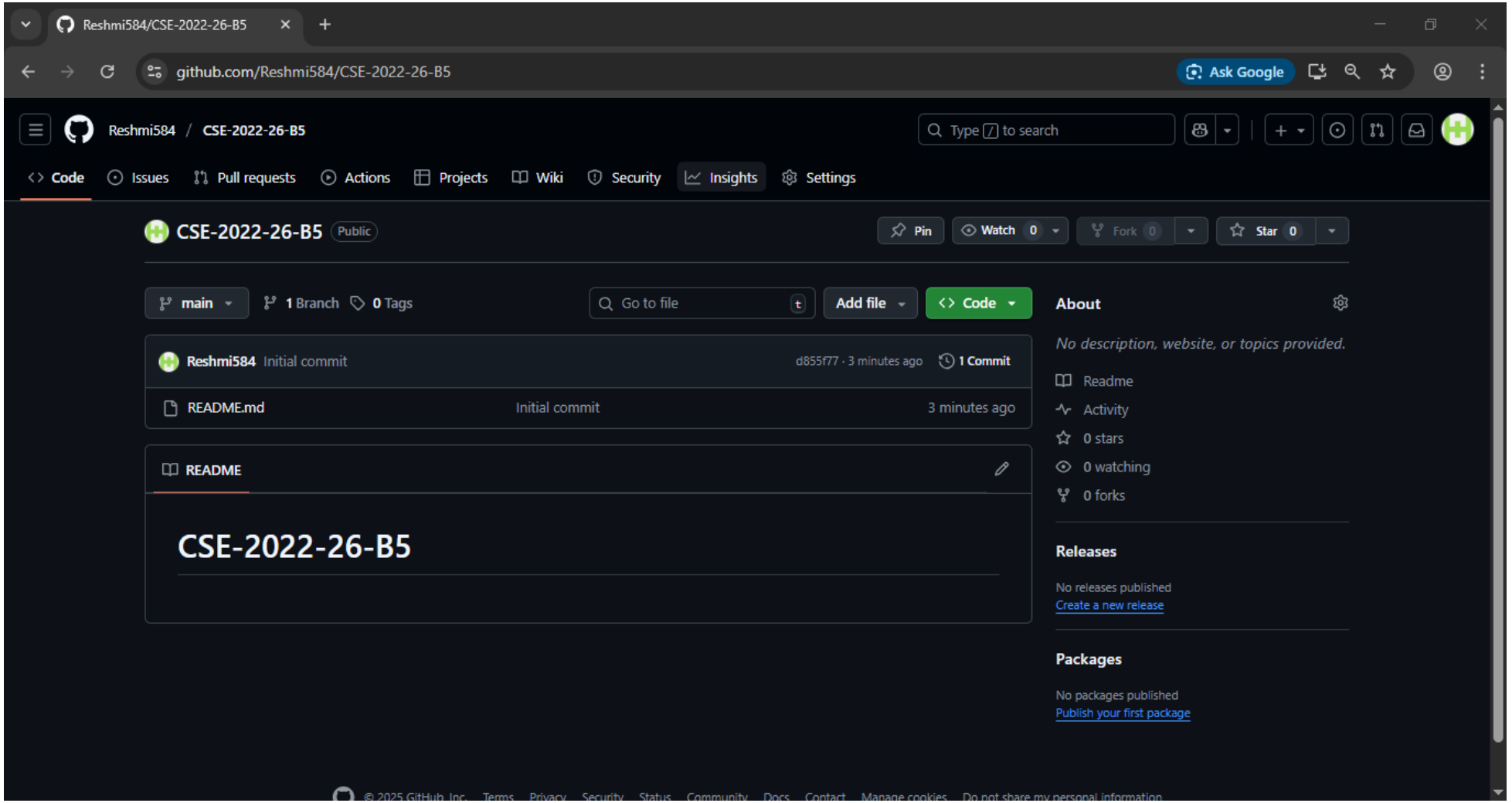
[3] A. C. Miguel, M. M. Afonso, and A. S. Azevedo, “TinyML-Based Classification in an ECG Monitoring Embedded System,” *Computers, Materials & Continua*, vol. 75, no. 2, pp. 2683–2701, 2023.

[4] N. Divya, M. Riyazuddin, A. Ahad, S. R. Vulapula, A. Manjula & M. Sirajuddin, “Predicting Heart Disease Using Machine Learning and IoT Techniques,” *Onkologia i Radioterapia*, vol. 18, no. 9, pp. 001–011, Nov. 2024.

[5] A. O. Mulani, M. P. Sardey, K. Kinage, S. S. Salunkhe, T. Fegade, and P. G. Fegade, “ML-Powered Internet of Medical Things (MLIoMT) Structure for Heart Disease Prediction,” *Journal of Advances in Research*, vol. 25, no. 2, pp. 101–112, 2024.

[6] M. N. Ihsan, A. Taqwa, and C. Ciksadan, “Design of Medical Devices to Monitor Body Temperature, Heart Rate and Oxygen Saturation Levels in Human Body Based on IoT,” *J. Teknol. Inf. Pendidik.*, vol. 16, no. 2, pp. 218–228, Dec. 2023.

Git Hub Dashboards of each student



https://github.com/Reshmi584/CSE-2022-26-B5

Any Queries?