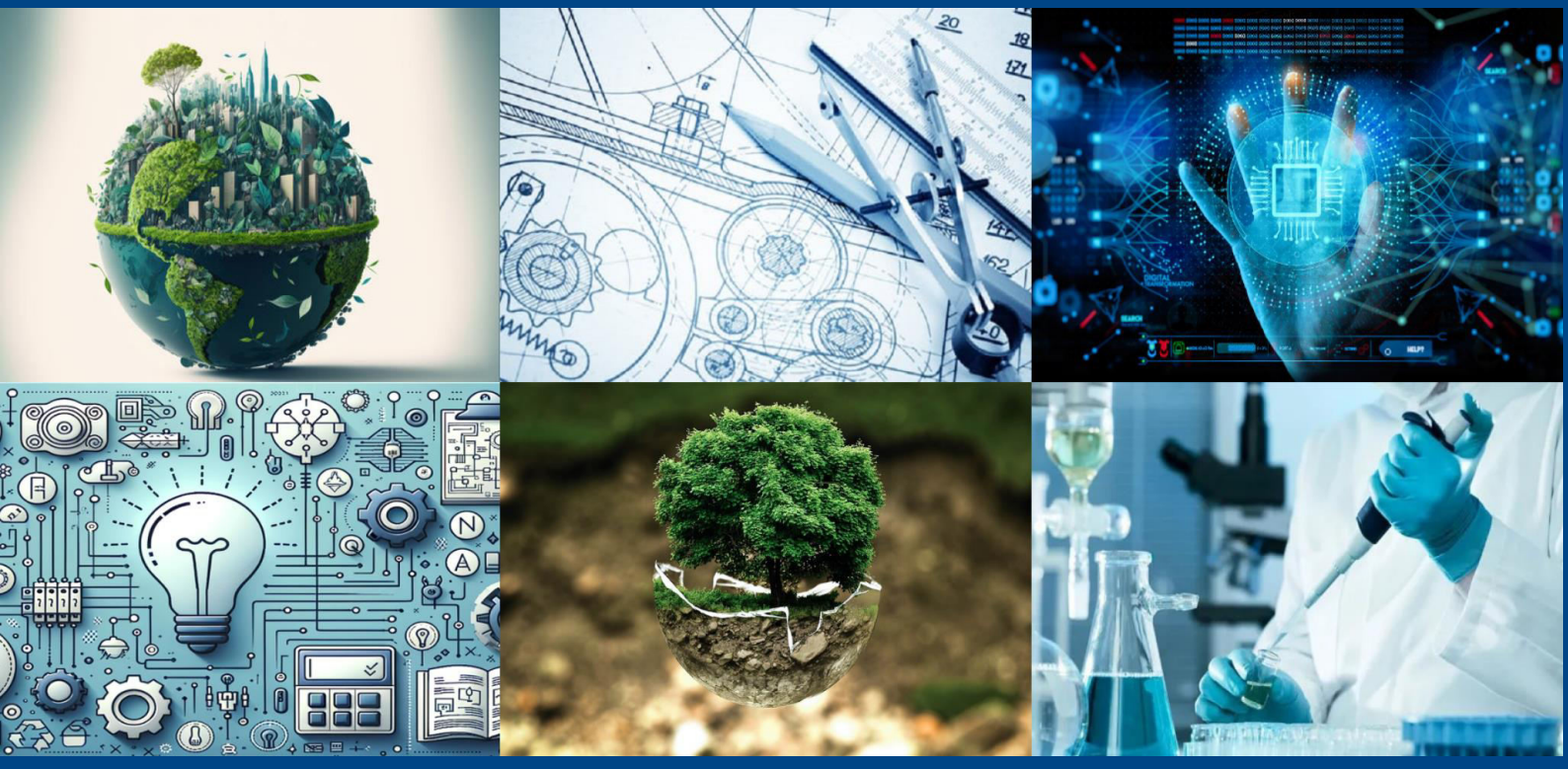
ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206 **Volume 8, Issue 5, May 2025**

© 2025 IJMRSET | Volume 8, Issue 5, May 2025| DOI:10.15680/IJMRSET.2025.0805174

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Heart Disease Detection using IoT

Dr. M Satya Sai Ram

Professor, Department of ECE, R.V. R & J.C College of Engineering, Chowdavaram, Guntur A.P., India

P. Tirumala[1], P. Prasanna[2], Rohit V Y Naidu Bajiniki[3], Sk. Mahammad Asif[4]

Undergraduate Students, Department of ECE, R.V. R & J.C College of Engineering, Chowdavaram, Guntur A.P., India

ABSTRACT: The project titled **"Heart Disease Detection Using IoT"** focuses on creating a low-cost and energy-efficient device for monitoring key cardiac indicators. The prototype employs an Arduino Pro Mini for its low power consumption and a pulse oximeter sensor to measure both heart rate and blood oxygen saturation (SpO_2), which are critical parameters in identifying potential heart conditions. The system continuously monitors these vital signs and compares the readings against predefined threshold values to assess the user's cardiac status. In the event of any abnormalities—such as irregular heart rate or decreased SpO_2 levels—an alert message is automatically sent via the GSM800C module to notify medical personnel, enabling timely intervention. This project illustrates the effectiveness of IoT-based health monitoring in delivering real-time, remote diagnostics, especially for individuals at risk of cardiovascular issues.

KEYWORDS: Heart Disease, IoT, Arduino Pro Mini, Pulse Oximeter,GSM SIM800C, Health Monitoring.

I. INTRODUCTION

Heart disease one of the leading causes of death globally, often due to delayed diagnosis and lack of timely medical intervention. Early detection and continuous monitoring of heart condition is very important to reduce mortality and improve patient outcomes. With the advancement of the Internet of Things (IoT), healthcare systems are being transformed to enable real-time health monitoring and data-driven decision-making.

This project, **"Heart Disease Detection Using IoT,"** aims to develop a smart system that will continuously monitors the heart rate, oxygen saturation (SpO_2)and other relevant parameters using biomedical sensors. The collected data is transmitted to a cloud platform through IoT-enabled devices, where it can be analyzed and accessed by healthcare professionals or caregivers remotely. The system can also generate alerts in case of abnormal readings, enabling quick response to potential cardiac events.By integrating medical sensors, microcontrollers, wireless communication, and cloud computing, this IoT-based solution not only facilitates early detection of heart disease but also supports long-term patient care and remote health management. This approach paves the way for smarter, more accessible, and efficient healthcare services.

II. LITERATURESURVEY

The application of IoT in the healthcare domain, particularly for cardiovascular disease monitoring, has gained considerable attention in recent years. Numerous researchers have proposed frameworks that combine biosensors, micro-controllers, wireless communication and cloud services to facilitate continuous heart health surveillance.

In the work by Patel et al. [1], a system was developed that incorporated wearable devices for real-time heart monitoring, with data being processed through decision tree algorithms. Their model demonstrated promising results, achieving approximately 85% accuracy in identifying potential heart-related risks.

Kumar and Tripathi [2] presented a real-time detection system using Arduino microcontrollers and basic physiological sensors. They employed machine learning models, with logistic regression delivering an accuracy of 88% in classifying heart disease risks.

Another contribution by Almeshqab and Ucan [3] outlined a smart health monitoring architecture where sensor data was transmitted to a cloud platform. The system utilized predefined thresholds to trigger alerts, thereby enabling faster

© 2025 IJMRSET | Volume 8, Issue 5, May 2025| DOI:10.15680/IJMRSET.2025.0805174

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

medical response times in critical scenarios.

Despite significant progress, existing solutions face challenges related to data security, sensor energy consumption and system scalability. Addressing these issues is essential for future systems, with researchers exploring the use of edge computing and blockchain to enhance performance, reliability and privacy.

III. BLOCK DIAGRAM

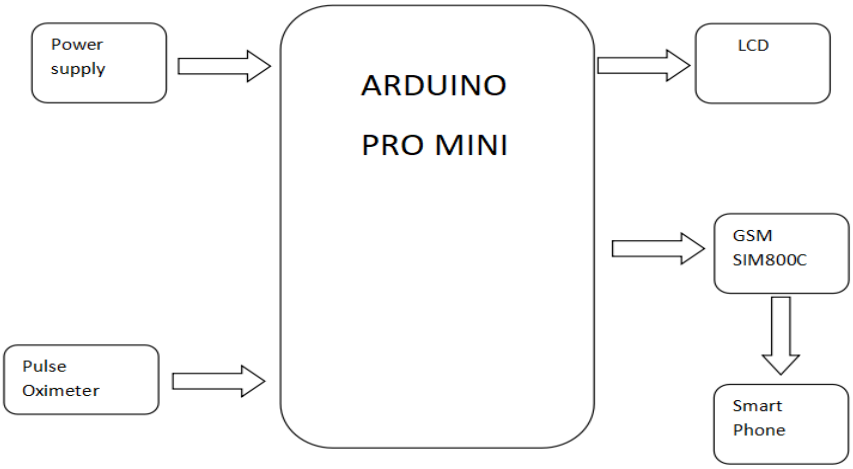


Fig1: Block diagram

Arduino Pro Mini:The Arduino Pro Mini is a microcontroller board based on the ATmega328P.It features 14 digital I/O pins (6 PWM), 6 analog inputs, a built-in resonator, and a reset button. It lacks a USB port, so programming requires an FTDI cable or SparkFun breakout board. It's ideal for space- and power-sensitive projects.

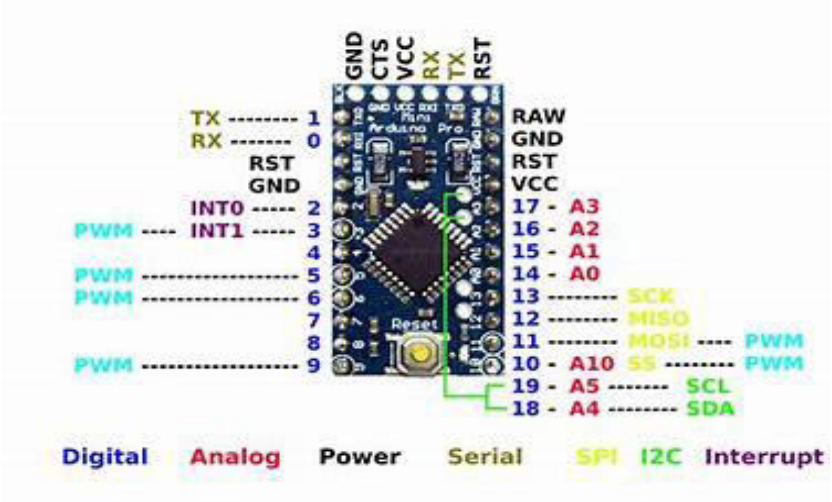


Fig2: Arduino Pro Mini

The dimensions of the Pro Mini PCB are approximately 0.7" x 1.3".The Arduino Pro Mini offers multiple communication options for interfacing with a computer, other Arduino boards, or microcontrollers. It utilizes the ATmega328P's UART-based TTL serial communication, accessible through digital pins 0 (RX) and 1 (TX). Through a USB connection, the Arduino development environment provides a serial monitor that enables the exchange of simple text-based data between the board and a connected system.

© 2025 IJMRSET | Volume 8, Issue 5, May 2025| DOI:10.15680/IJMRSET.2025.0805174

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Microcontroller	ATmega328P
Board Power Supply	3.35 -12 V (3.3V model) or 5 - 12 V (5V model)
Circuit Operating Voltage	3.3V or 5V (depending on model)
Digital I/O Pins	14
PWM Pins	6
I2C	1
Analog Input Pins	6
External Interrupts	2
DC Current per I/O Pin	40mA
Flash Memory	32KB of which 2 KB used by bootloader
SRAM	2KB
Clock Speed	8 MHz (3.3V versions) or 16 MHz (5V versions)

Table 1: Tech Specifications o Arduino Pro Mini

Pulse Oximeter Sensor(MAX30102):The MAX30102 is a small sensor used to measure heart rate and oxygen levels in the blood. It has tiny lights and detectors built in, and it works well even in different lighting conditions. It's perfect for use in wearable devices like fitness bands and health monitors.

Fig3:MAX30102

Applications:
Fitness Assistant Devices
Smartphones
Tablets
Wearable Devices
GSM : A GSM or GPRS module is a device used to connect computers or microcontrollers to mobile networks for communication. The SIM800C is one such module, which includes a GSM modem, power circuit and interfaces like USB or RS-232. IT can be a standalone device or built into a mobile phone for data and SMS communication.

© 2025 IJMRSET | Volume 8, Issue 5, May 2025| DOI:10.15680/IJMRSET.2025.0805174

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Fig4: GSM Module

Functions:

- Read, write and delete SMS messages.
- Send SMS messages.
- Monitor the signal strength.
- Monitor the charging status and charge level of the battery.
- Read, write and search phone book entries.

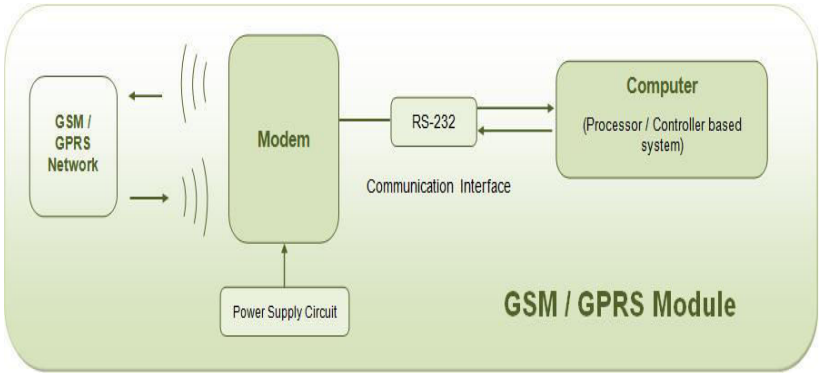


Fig5: Block Diagram Showing Different Parts of Typical GSM/GPRS Module

IV. METHODOLOGY

a) Initialization:

·Power Supply Module: Delivers a stable 5V DC output to power the Arduino Pro Mini and its connected peripherals, ensuring consistent operation of the entire system.

·Pulse Oximeter Sensor Integration: The pulse oximeter sensor is interfaced with the Arduino Pro Mini through appropriate analog or digital pins to continuously monitor the user's heart rate and blood oxygen saturation (SpO_2).

·GSM SIM800C Module Configuration: The GSM SIM800C module is connected to the Arduino Pro Mini via UART communication (TX and RX pins) to enable the transmission of alert messages via SMS in the event of abnormal health readings

.

b) Sensor Data Collection:

·Pulse Oximeter Reading: The system continuously acquires physiological data—specifically, heart rate (in beats per minute) and blood oxygen saturation (SpO_2)—from the pulse oximeter sensor.

·Data Preprocessing: The raw sensor outputs are processed in real-time to determine if any values fall outside the normal physiological range, potentially indicating a cardiac abnormality.

c) Data Analysis:

∟Heart Rate Monitoring: The system actively monitors heart rate values. If the reading exceeds or drops below pre-established threshold values, an alert condition is triggered.

© 2025 IJMRSET | Volume 8, Issue 5, May 2025| DOI:10.15680/IJMRSET.2025.0805174

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

∟Oxygen Saturation Monitoring: SpO_2 levels are assessed, and a warning is issued if values fall below a critical minimum, suggesting hypoxemia or a related issue.
∟Health Status Determination: Based on the evaluated thresholds, the system determines whether the individual's heart and oxygen levels suggest a normal or risk-prone condition.

D) Alert System:

- Threshold Violation: When either the heart rate or SpO_2 values breach the defined safe limits, the system initiates the alert protocol.
- SMS Notification: Using the GSM SIM800C module, the device sends a text message to predefined contacts. The alert contains information such as:
- Heart rate detected: (60-100) is normal
- Oxygen level detected: Less than 90%

e) Message Content:

- The message sent via GSM will contain:
- Heart rate (bpm)
- Oxygen saturation (SpO2 %)
- Status (normal or critical)

f) Continuous Monitoring:
Real-Time Looping: The Arduino microcontroller continuously loops through the process of acquiring, analyzing, and responding to sensor data at regular intervals.

V. RESULT

1. Hardware Implementation:
The proposed system integrates essential biomedical components for efficient real-time monitoring. An Arduino Pro Mini serves as the central processing unit due to its compact size and low power consumption. A pulse oximeter sensor is interfaced with the microcontroller to acquire heart rate and SpO_2 data. The SIM800C GSM module facilitates wireless transmission of alert messages when abnormal physiological values are detected. All components are powered through a regulated supply to ensure stable operation. This configuration allows for portable deployment, making it ideal for continuous remote health surveillance.

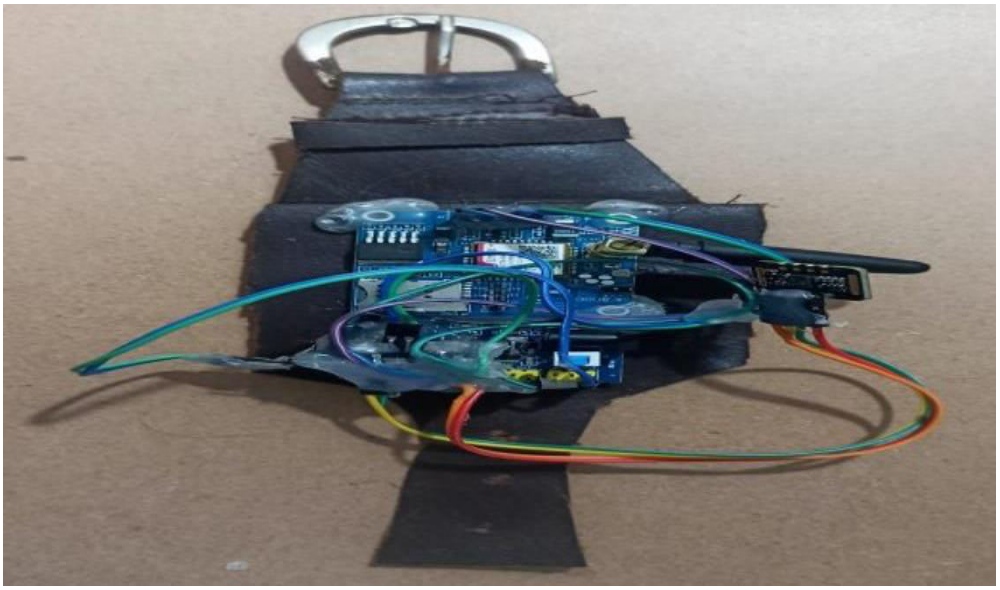


Fig 6: Hardware model

© 2025 IJMRSET | Volume 8, Issue 5, May 2025| DOI:10.15680/IJMRSET.2025.0805174

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

2. Message Content:

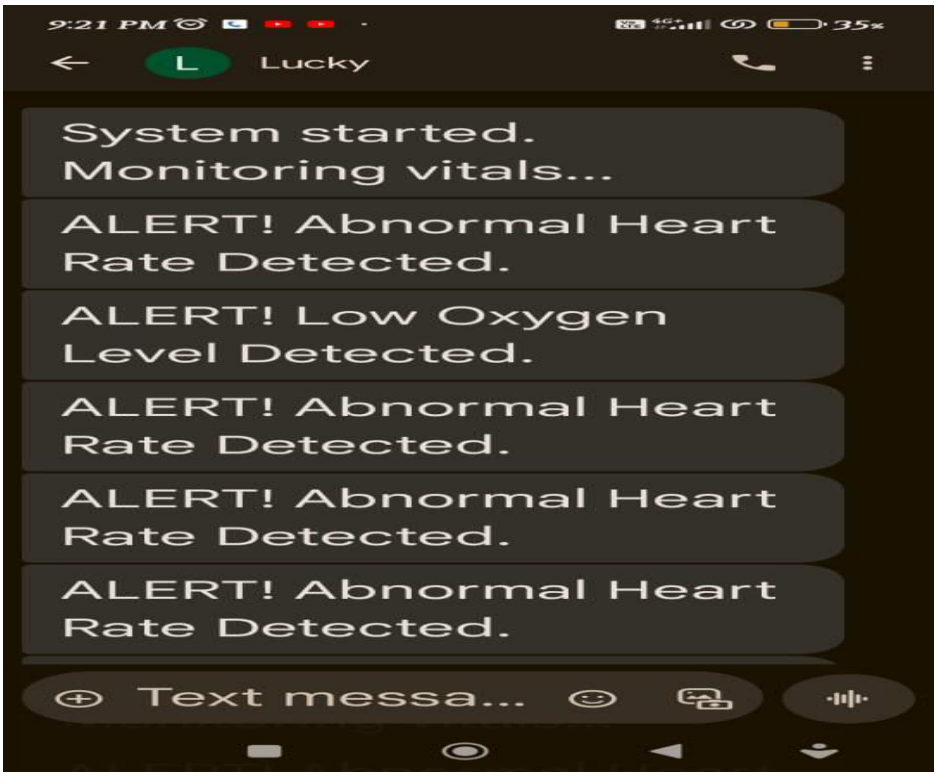


Fig 7: Alert Message

Applications:

1. **Remote Patient Monitoring: This** system enables real-time tracking of heart rate and blood oxygen levels (SpO_2) from a distance, making it particularly valuable for monitoring elderly individuals or patients with chronic heart conditions in rural or undeserved regions.
2. **Automated Emergency Notification: Upon** detecting abnormal heart parameters, the system automatically sends SMS alerts to caregivers or healthcare professionals through the GSM module, facilitating timely medical intervention.
3. **Clinical and Hospital Use:** The device can be deployed in hospital settings to continuously monitor patients' cardiovascular status, helping to streamline workflow and reduce the manual workload on healthcare personnel.
4. **Personal Health Tracker:**
   Functions as a compact, wearable health tracker for individualswith a history of cardiac problems.
5. **Smart Health Infrastructure:**
   Can be integrated into smart healthcare systems to collect patientvitals and upload them to a cloud platform for analysis(with optional IoT upgrades like ESP8266 for WiFi).
6. **Wearable Medical Devices:**
   Can be adapted into a wearable format for continuous, onthego health monitoring.

VI. CONCLUSION

The proposed IoT-based system for heart disease detection utilizes the Arduino Pro Mini to continuously track essential health metrics such as heart rate and blood oxygen saturation (SpO_2). By combining a pulse oximeter sensor with the energy-efficient and compact Arduino Pro Mini, the system enables uninterrupted health monitoring. The inclusion of the GSM SIM800C module ensures timely transmission of alert messages to medical personnel or family members when irregular values, possibly indicating heart-related problems, are identified. Powered by a stable energy source, the system is designed to be portable and ideal for remote health monitoring. This project offers a practical, affordable, and

scalable approach for early identification of cardiac conditions, promoting quicker medical response and better patient care.

REFERENCES

[1] Turai, U. B., Bari, A. S., Garba, A., & Baballe, M. A. (2025). Construction of the Heart Rate Monitoring Devices with Pulse Sensors using an Arduino and GSM Module. Global Journal of Research in Engineering & Computer Sciences, 5(1), 44–53. https://doi.org/10.5281/zenodo.14741799

[2] Devi Priya, A., Brindha, D., Rexie, J. A. M., Ranjeethapriya, K., & Regina Elwin, J. G. (2020). IOT Based Cardiac Rhythm Monitoring System Using Geolocation and Automation. Indian Journal of Science and Technology, 13(5), 597–605. https://doi.org/10.17485/ijst/2020/v13i05/148671

[3] Gurjar, A., & Neha, M. (2023). Developing a Low-Cost IoT-Based Remote Cardiovascular Patient Monitoring System. Retrieved from https://pdfs.semanticscholar.org/9e74/9ce2b61129f207ce42fce3fced558a910e35.pdf

[4] Ghosh, S., Dasgupta, S., & Bhattacharya, I. (2025). An Intelligent Integrated Prediction Based Approach for Heart Disease Detection - A Comprehensive Study. Retrieved from https://www.researchgate.net/publication/342983094_IOT_Based_Cardiac_Rhythm_Monitoring_System_Using_Geolocation_and_Automation

[5] IOT Based Disease Prediction and Diagnosis System for Healthcare. International Journal of Engineering Development and Research, 7(2), 47–53. https://rjwave.org/ijedr/papers/IJEDR1902047.pdf

[6] IoT-Based Healthcare-Monitoring System towards Improving Quality of Life. Sensors, 22(20), 7651. https://doi.org/10.3390/s22207651

[7] Diagnosing People at Risk of Heart Diseases Using the Arduino Platform and Machine Learning. International Journal of Advanced Computer Science and Applications, 15(7). https://thesai.org/Publications/ViewPaper?Code=IJACSA&Issue=7&SerialNo=123&Volume=15

[8] IoT Based Patient's Smart Healthcare Monitoring and Recording Using GSM Module. E3S Web of Conferences, 399, 04008. https://www.e3s-conferences.org/articles/e3sconf/pdf/2023/36/e3sconf_iconnect2023_04008.pdf

[9] IoT Based Health Monitoring System. Journal of Engineering Science, 10(2), 45–50. https://journal.esrgroups.org/jes/article/download/5223/3783/9597

[10] Heart Monitoring and Heart Disease Prediction System. International Journal of Advanced Scientific Research and Engineering Trends, 5(4), 396–402. https://www.ijasret.com/VolumeArticles/FullTextPDF/396_6.HEART_MONITORING_AND_HEART_DISEASE_PREDICTION.pdf

[11] Heart Monitoring and Alarming System. International Journal of Recent Technology and Engineering, 9(1), 270–275. https://www.ijrte.org/wp-content/uploads/papers/v9i1/A2701059120.pdf

[12] IoT-Based Heart Rate Monitoring: A Comparative Analysis of Microcontroller Systems for Real-Time Health Monitoring. Preprints, 2025(03), 0968. https://www.preprints.org/manuscript/202503.0968

[13] IoT Based ECG Monitoring System with GSM Module. International Research Journal of Modern Engineering and Technology and Science, 5(6), 42144. https://www.irjmets.com/uploadedfiles/paper//issue_6_june_2023/42144/final/fin_irjmets1687076991.pdf

[14] IoT Based Health Monitoring System Using Arduino UNO, GSM SIM900D Module and WiFi Module ESP8266. International Journal of Scientific & Engineering Research, 10(5), 1234–1240. https://www.ijser.org/researchpaper/IOT-BASED-HEALTH-MONITORING-SYSTEM-USING-ARDUINO-UNO-GSM-SIM900D-MODULE-ANDWIFI-MODULE-ESP8266.pdf

[15] GSM Patient Health Monitoring System. University of Misan, Iraq. https://systems.uomisan.edu.iq/projects/uploads/files/5ohyvp92aj4_lur.pdf

[16] Arduino Based IoT Platform for Remote Monitoring of Heart Attacks and Falls. Journal of Computer Science, 14(4), 574–584. https://thescipub.com/abstract/jcssp.2018.574.584

[17] Mobile IoT Device for BPM Monitoring People with Heart Problems. arXiv preprint, arXiv:2410.05674. https://arxiv.org/abs/2410.05674

[18] IoT-Based Coma Patient Monitoring System. arXiv preprint, arXiv:2411.13345. https://arxiv.org/abs/2411.13345

[19] Smart Medical Data Sensing and IoT Systems Design in Healthcare. Asian Scientific Association. https://www.asau.ru/files/pdf/2257536.pdf

[20] IoT Based Health Monitoring System Using Arduino UNO. International Journal for Research in Applied Science and Engineering Technology, 8(7), 123–130. https://www.ijraset.com/research-paper/iot-based-health-monitoring-system-using-arduino

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com