

Modern Ayurveda Platform with IoT-Based Health Monitoring

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Abstract- This work proposes the design and implementation of an Internet of Things (IoT)-based health monitoring system integrated with Ayurvedic healthcare principles. The system utilizes an ESP32 microcontroller and non-invasive sensors to measure key physiological parameters such as heart rate, blood oxygen saturation (SpO₂), body temperature, and pulse signals. The collected data are processed in real time and displayed on a web-based dashboard for continuous monitoring. The proposed system supports the Ayurvedic approach of preventive and holistic healthcare by enabling continuous observation of vital parameters and early identification of imbalances in the body. Unlike conventional monitoring systems, the platform is designed to assist in maintaining overall well-being rather than only detecting diseases. The architecture emphasizes low cost, portability, and accessibility, making it suitable for home healthcare and remote applications. By combining modern IoT technology with traditional Ayurvedic concepts, the system provides a comprehensive framework for proactive health management and improved quality of life

Keywords- IoT, ESP32, Health Monitoring, SpO₂, Body Temperature, Web Dashboard, Ayurveda

I. INTRODUCTION

Modern healthcare systems often focus more on treatment than prevention, which can delay early diagnosis and continuous patient observation. In contrast, traditional healthcare approaches such as Ayurveda emphasize maintaining body balance and preventing diseases through regular monitoring and lifestyle management.

With recent technological advancements, the Internet of Things (IoT) has enabled continuous and remote monitoring of physiological parameters using connected devices and sensors [1], [5]. IoT-based healthcare systems allow real-time data collection and transmission, improving accessibility and efficiency in patient care [3], [7].

Parameters such as heart rate, body temperature, and blood oxygen saturation (SpO₂) provide important insights into an individual's health condition. Several studies have demonstrated the effectiveness of wearable and sensor-based systems in monitoring these parameters for early detection of abnormalities [2], [4].

Furthermore, the integration of edge and cloud computing techniques enhances system performance by enabling faster data processing and reduced latency [6]. These technologies support the development of scalable and efficient healthcare monitoring solutions.

Incorporating Ayurvedic principles into such systems adds a preventive and holistic dimension. Variations in physiological parameters can be associated with imbalances in Doshas (Vata, Pitta, and Kapha), which are fundamental to Ayurvedic diagnosis and treatment.

This work proposes an IoT-based health monitoring system that combines sensor-based data acquisition with Ayurvedic interpretation. The proposed system enables real-time monitoring and supports early identification of potential health issues, making it suitable for applications such as home healthcare and remote patient monitoring.

II. METHODOLOGY

The proposed system is designed to monitor physiological parameters in real time and analyze

them using both conventional threshold-based evaluation and Ayurvedic Dosha-based logic. The system measures vital parameters such as heart rate, blood oxygen saturation (SpO2), body temperature, pulse signal using sensor modules interfaced with an ESP32 microcontroller. The processed data are transmitted to a web-based dashboard for continuous monitoring.

1. System Architecture

The overall architecture of the system is illustrated in Fig. 1. The system consists of biomedical sensors, an ESP32 microcontroller, a server/database, and a web-based dashboard.

- The MAX30100 sensor is used to measure heart rate and SpO2.
- The MLX90614 sensor measures body temperature.
- A Pulse sensor is used as a backup for pulse monitoring.

All sensor data are fed into the ESP32 microcontroller, which performs data processing, filtering, and decision-making. The ESP32 transmits the processed data to a MySQL server via Wi-Fi.

The server updates the Shrikrishna Arogyadham web dashboard, Which allows users and healthcare professionals to monitor health parameters in real-time.

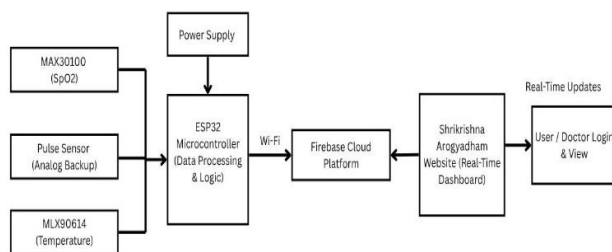


Fig. 1. System Architecture

2. Working Flow of the System

The operational flow of the system is shown in Fig. 2. The process begins with initialization of the ESP32 microcontroller and establishment of a Wi-Fi connection. The system then continuously acquires physiological parameters from the sensors.

After data acquisition, the system applies decision logic in two stages:

Clinical Threshold Analysis

The measured values are compared with predefined normal ranges and classified as Normal, Risk, or Danger.

Ayurvedic Dosha-Based Analysis

The system interprets physiological to identify possible Dosha imbalances:

Vata: Irregular pulse patterns or fluctuating heart rate

Pitta: Elevated Body temperature

Kapha: Slower pulse rate or stable low activity

Based on this analysis, the system determines the overall health condition.

If any incorrect or noisy readings are detected, correction and validation are performed before transmission. The validated data are displayed on the dashboard and sent to the server via Wi-Fi using communication protocols such as HTTP or MQTT.

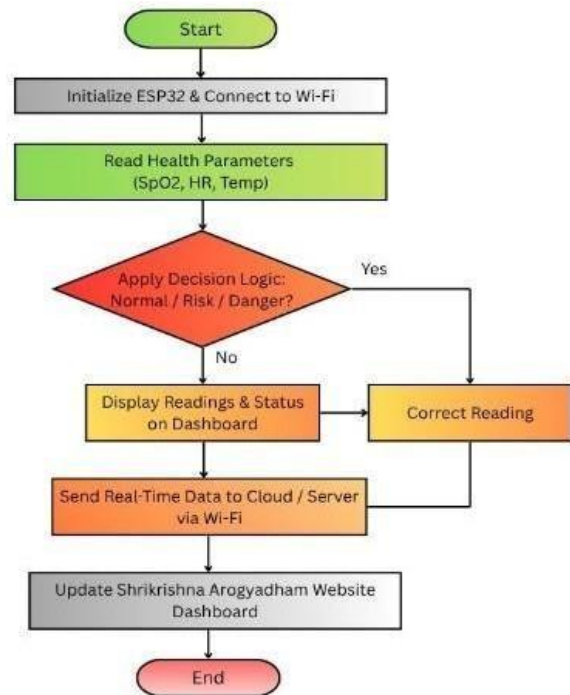


Fig. 2. Flowchart

3. Integrated Decision Logic

The system combines modern sensing techniques with Ayurvedic interpretation to support preventive healthcare. The ESP32 performs:

ESP32 Performs:

- Data filtering and validation
- Threshold comparison (Normal/Risk/Danger)
- Dosha-based classification (Vata, Pitta, Kapha imbalance)

The final output displayed on the dashboard includes:

- Real-time physiological parameters
- Health status classification
- Indicative Dosha condition

This approach enables early detection of abnormalities and support Ayurvedic recommendation such as lifestyle modification and preventive care

Hardware Specifications

Temperature Sensor (MLX90614)

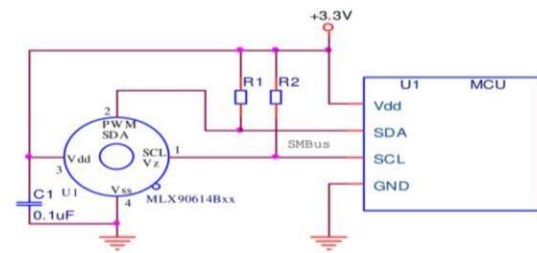


Fig 3: Temperature Sensor

The MLX90614 sensor measures body temperature without physical contact by detecting infrared radiation emitted from the human body, improving safety and user comfort. It measures temperature by detecting infrared radiation emitted from the human body and converts it into a digital temperature value. Since the sensor does not require direct contact, it improves patient comfort and reduces the risk of infection. The sensor communicates with the ESP32 through the I²C protocol and provides temperature readings in degrees Celsius.

The key features of the MLX90614 sensor are:

- Non-contact temperature measurement
- High accuracy and stability

- Digital output via I²C interface
- No external calibration required

SpO₂ Sensor (MAX30100)

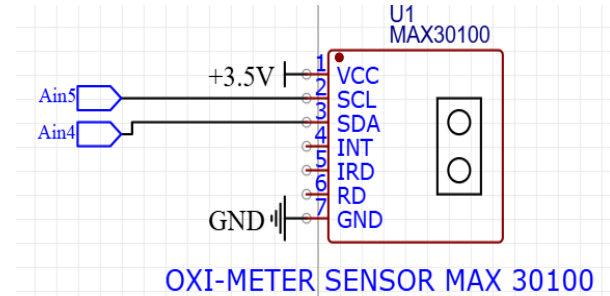


Fig 4: SpO₂ Sensor

The MAX30100 sensor is used to measure heart rate and blood oxygen saturation (SpO₂) using the photoplethysmography (PPG) technique. The MAX30100 integrates dual LEDs (red and infrared) with a photodetection unit to estimate pulse rate and oxygen saturation based on light absorption variations. Variations in light

absorption caused by blood flow are analyzed to calculate heart rate and oxygen saturation.

The MAX30100 sensor continuously sends raw PPG data to the ESP32, where signal processing and filtering are applied to obtain accurate heart rate and SpO₂ values.

Key features include:

- Non-invasive measurement
- Low power consumption
- Integrated LEDs and photodetector
- Suitable for continuous monitoring

Pulse Sensor

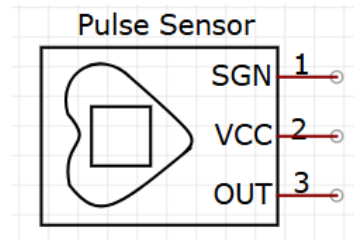


Fig 5: Pulse Sensor

The pulse sensor is an analog heart beat detection sensor used as a backup and waveform monitoring

unit. It detects changes in blood volume through a fingertip or earlobe and outputs an analog signal proportional to the pulse rate. The sensor output is connected to the analog input pin of the ESP32.

Key features of the pulse sensor include:

- Plug-and-play operation
- Low current consumption
- Built-in noise reduction
- Real-time pulse waveform output

ESP32 Microcontroller and Wi-Fi Communication

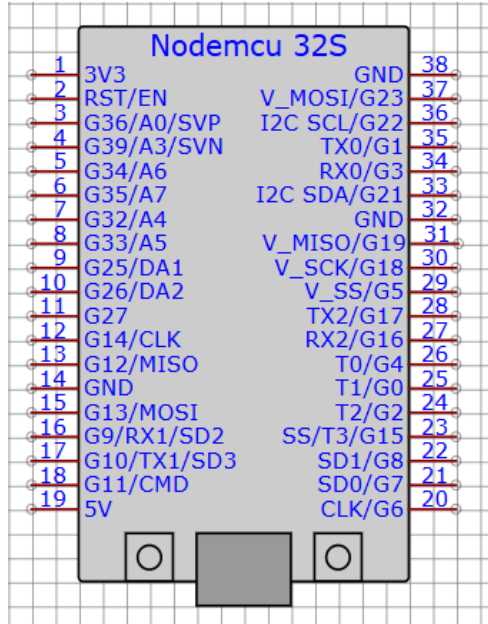


Fig 6: ESP32 Microcontroller

The ESP32 microcontroller acts as the central processing and communication unit of the system. It collects sensor data, processes and validates the readings, applies decision logic, and transmits the data wirelessly using its built-in Wi-Fi module. The ESP32 also functions as a local web server or data transmitter to a remote server using HTTP REST API, MQTT, or WebSocket protocols.

The ESP32 provides:

- High processing performance
- Integrated Wi-Fi connectivity
- Low power consumption
- Multiple ADC and I²C interfaces

Web Dashboard



Fig. 8: Shrikrishna Arogyadham Website

The web dashboard serves as the user interface for real-time visualization of health parameters and Ayurvedic healthcare services. It acts as the application layer of the system, enabling interaction between users, healthcare professionals, and the backend server.

The dashboard receives processed data from the ESP32 through secure APIs and displays it in a structured and user-friendly format. It allows continuous monitoring of physiological parameters such as heart rate, SpO₂, and body temperature.

The interface includes multiple modules such as Home, Services, About Us, Courses, Videos, Appointment Booking, Contact, Login, and Sign-Up. In addition to monitoring, the platform integrates Ayurvedic services like Panchakarma therapy, herbal treatments, diet consultation, and yoga guidance, providing a holistic healthcare experience.

Authorized users can securely access patient data through login authentication, enabling remote monitoring and timely medical support. The dashboard is designed to be responsive and accessible across multiple devices. Secure communication is ensured using encrypted APIs and authentication mechanisms.

III. RESULTS AND DISCUSSION

The developed IoT-based health monitoring system was implemented and tested under real-time conditions. The system integrates sensors, ESP32, and a web interface to continuously observe physiological parameters and display the results.

1. Real-Time Health Monitoring Output Serial Monitor Output

The serial monitor is used to verify system operation and sensor performance. It displays continuous real-time readings, which helps in debugging and checking data accuracy.

Features

- Continuous real-time data display
- Useful for debugging and testing
- Helps in validating sensor accuracy

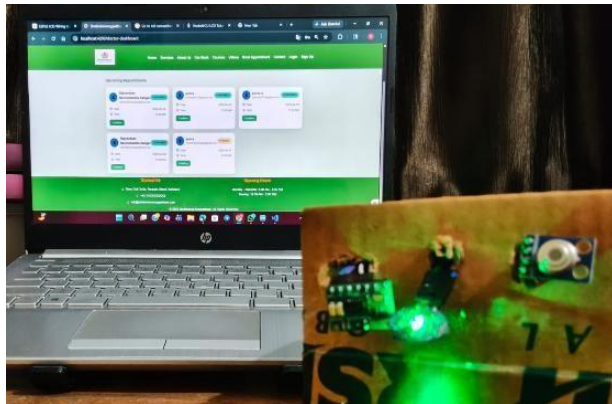


Fig. 9: Serial Monitor Output

2. Measured Health Parameters

The system successfully measured the following physiological parameters:

- Heart Rate: 60 BPM
- SpO₂: 98%
- Body Temperature: 37°C

These readings fall within normal ranges, indicating correct system functionality and reliable data acquisition.

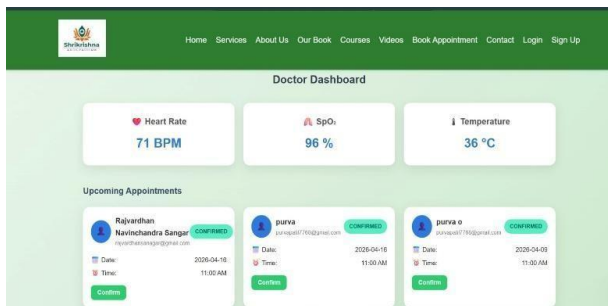


Figure 10: Measured Health Parameters

Web Application Output Screens

The web dashboard provides an interface for monitoring and accessing healthcare services. The main modules are summarized below:

Home Page: The Home Page serves as the main interface of the system. It introduces the platform “Shrikrishna Arogyadham” and provides navigation to all available modules. It includes sections such as Services, About Us, Courses, Videos, Appointment Booking, Contact, Login, and Sign-Up. The layout is designed to ensure easy access and better user experience.



Figure 11: Home Page.

Services Page

This page presents the various Ayurvedic healthcare services offered by the platform. It includes:

- Panchakarma Therapy: Focuses on detoxification and body purification.
- Herbal Medicine: Provides natural and customized treatments.
- Diet Consultation: Offers personalized diet plans based on body constitution (dosha).
- Yoga Classes: Promotes physical and mental well-being. Each service is displayed in the form of cards with descriptions and an “Explore” option for detailed information.

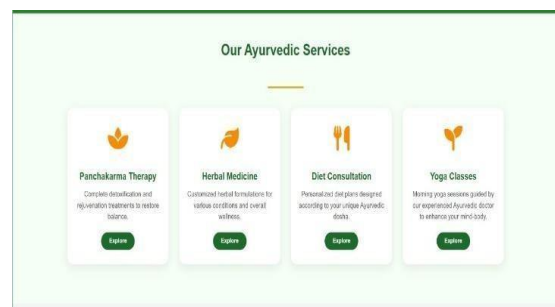


Figure 12: Ayurvedic Services

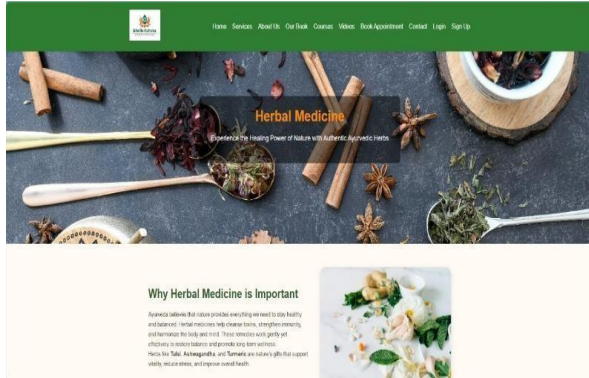


Figure 13: Panchakarma Therapies



Figure 14: Herbal Medicine

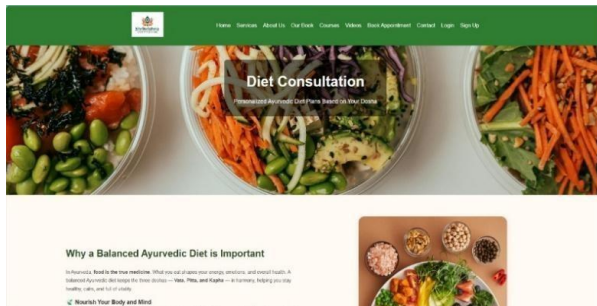


Figure 15: Diet Consultation



Figure 16: Yoga Classes

About Page

The About Page provides information about the purpose and vision of the platform. It explains the

integration of traditional Ayurvedic practices with modern IoT-based monitoring, helping users understand the system's objective.

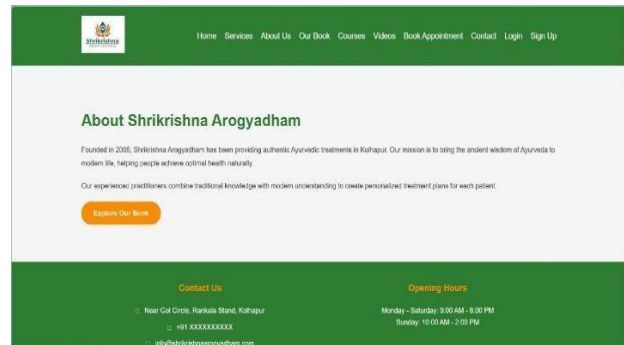


Figure 17: About Shrikrishna Arogyadham

Video Section

This module includes educational content related to Ayurveda and wellness. Users can view embedded videos directly on the platform, which helps in spreading awareness about healthy lifestyle practices.



Figure 18: YouTube Video

Book Appointment Page

This module enables users to schedule consultations online. It includes input fields such as:

- Full Name
- Phone Number
- Date
- Time Slot
- Message (optional)

The submitted data is stored in the backend database and can be accessed by healthcare providers for appointment management.

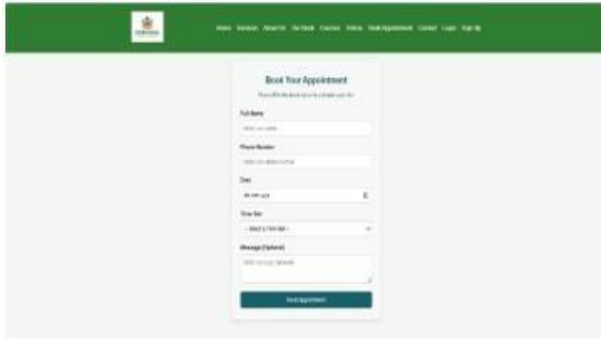


Figure 19: Book Your Appointment

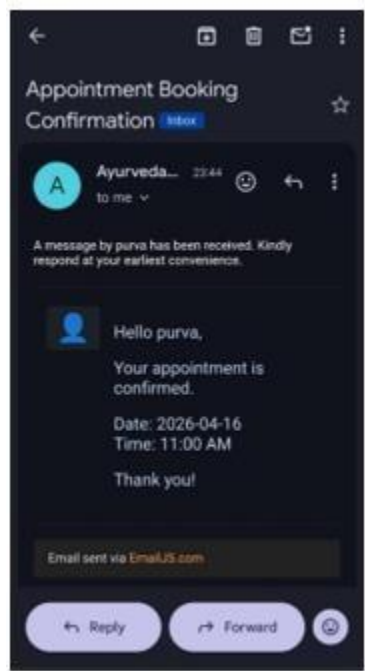


Figure 20: Appointment Booking Confirmation Email Output

Courses Page

The Courses Page displays online Ayurvedic learning modules designed especially for BAMS students and health enthusiasts. It includes courses such as:

- Padartha Vigyan
- Kriya Sharir
- Dravyaguna Vigyan

Each course includes pricing details and options such as "Buy Now" or "Add to Cart," enabling users to enroll easily.

Experimental results indicate that the system reliably captures and presents physiological parameters with

stable performance under real-time conditions. The web-based observation of health access, efficient visualization, and continuous observation of health conditions. The design is suitable for application such as home monitoring and remote healthcare support.

The inclusion of Ayurvedic concepts provides a preventive and holistic perspective by relating physiological data to overall well-being. The system is compact, cost-effective, and adaptable for practical use.



Figure 21: Ayurveda Courses Page

Login and Sign-Up Pages

These pages provide secure user authentication.

- Sign-Up Page: Allows new users to register using email and password.
- Login Page: Enables existing users to access personalized features.

Authentication is integrated with a backend service (e.g., Firebase), ensuring secure data handling and user management.



Figure 22: Login Page

Book Purchase Page

The Book Buy Page allows users to view and purchase Ayurvedic books through the platform. It displays book details such as title, author, description, and price. Users can select options like "Buy Now" or "Add to Cart" for purchasing. The page is user-friendly, responsive, and connected to the backend for order processing.



Figure 23: Buy Book

IV. CONCLUSION

This work presented an IoT-based health monitoring system using the ESP32 for real-time tracking of vital parameters. The system utilizes sensors such as MAX3010, MLX90614, and a pulse sensor to measure heart rate, SpO2, and body temperature. The collected data are processed and transmitted to a web dashboard for remote monitoring.

Future improvements may include additional sensors, enhanced data analysis techniques, and improved security features. Overall, the proposed system offers a simple and efficient solution for real-time health monitoring.

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REFERENCES

1. M. Hassanalieragh et al., "Health monitoring and management using Internet of Things (IoT) sensing with cloud-based processing: Opportunities and challenges," in Proc. IEEE Int. Conf. Services Computing, 2015, pp. 285–292.
2. H. N. Saha, S. Chaudhury, R. Mukherjee, D. Paul, and S. Haldar, "IoT-based health monitoring system," Kolkata, India, 2017.
3. H. B. Aziz, S. Sharmin, and T. Ahammad, "Cloud-based remote healthcare monitoring system using IoT," in Proc. IEEE Int. Conf. Services Computing, 2019.
4. S. Joseph, D. F. D. Shahila, and S. Patnaik, "Remote heartbeat monitoring using IoT," Int. J. Comput. Appl., 2019.
5. J. Islam, T. Kumar, I. Kovacevic, and E. Harjula, "Resource-aware service deployment for IoT edge healthcare systems," IEEE Access, vol. 9, pp. 1–18, 2021.
6. M. Hartmann, U. S. Hashmi, and A. Imran, "Edge computing in smart healthcare systems: A review," Trans. Emerging Telecommun. Technol., 2022.

7. M. Beri, B. Kumar, S. Tiwari, and N. Sharma, "ESP32-based IoT health monitoring system," in Proc. ICACITE, 2022.
8. M. J. Hossain, M. A. Bari, and M. M. Khan, "IoT-based e-health monitoring system," North South University, Dhaka, Bangladesh.
9. S. K. Sharma et al., "Cloud-based diabetes monitoring and service model," IEEE Access, vol. 11, pp. 32804–32819, 2023.
10. A. Nagelli and R. Kumar, "Machine learning for medical diagnosis support," J. Adv. Scholarly Res., vol. 20, no. 4, pp. 587–591, 2023.
11. F. Tsvetanov, "AI integration in remote patient monitoring systems," in Proc. Int. Conf. EEPES, 2024.
12. D. Ester and M. Song, "IoT and machine learning for real-time health monitoring," 2024.
13. P. C. Ingale et al., "AI and IoT in healthcare monitoring systems," J. Adv. Sci. Technol., vol. 20, no. 2, pp. 120–123, 2024.
14. U. Musa et al., "IoT-based healthcare monitoring using antenna systems," IEEE Access, vol. 12, pp. 1–18, 2024.
15. N. Alharbe and M. Almalki, "IoT-enabled healthcare using deep learning," J. Cloud Comput., vol. 13, 2024.
16. C. Reano et al., "Cloud-edge architecture for monitoring systems," J. Cloud Comput., vol. 13, 2024.
17. S. U. R. Khan and S. Asif, "Oral cancer detection using feature fusion," Biomed. Signal Process. Control, vol. 95, p. 106437, 2024.
18. S. U. R. Khan et al., "Deep learning model for Mpox diagnosis," Int. J. Imaging Syst. Technol., vol. 34, 2024.
19. A. Raza et al., "Transfer learning for IoT security classification," J. Innov. Comput., vol. 5, no. 1, 2025.
20. S. U. R. Khan et al., "Brain tumor classification using optimization techniques," Multimedia Syst., vol. 31, 2025.
21. S. U. R. Khan, M. Zhao, and Y. Li, "MRI tumor detection using deep models," Cluster Comput., vol. 28, 2025.
22. A. Hekmat et al., "Attention-based brain tumor diagnosis," Biomed. Signal Process. Control, vol. 101, 2025.
23. Z. Khan et al., "Deep learning for cervical lesion detection," in Proc. ICACS, 2025.
24. O. Bilal et al., "CNN-based cervical cancer diagnosis," Netw. Model. Anal. Health Inform., vol. 14, 2025.
25. S. U. R. Khan, "Kidney Disease detection using feature fusion," Comput. Biol. Med., vol. 191, 2025.