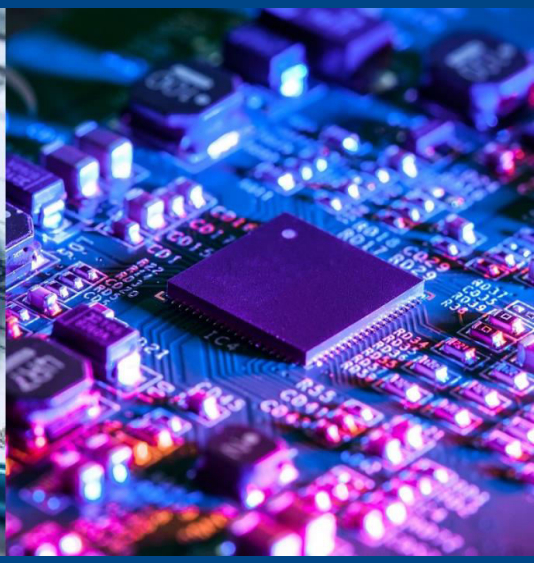
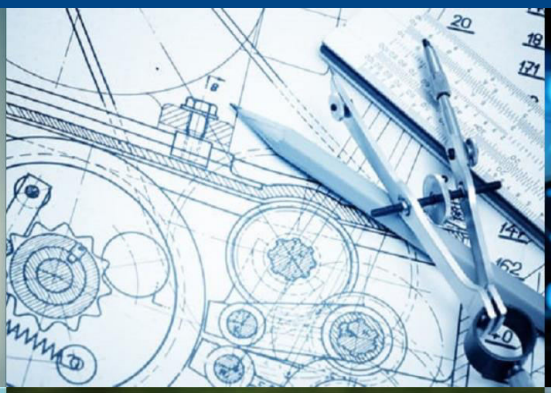
ISSN: 2582-7219

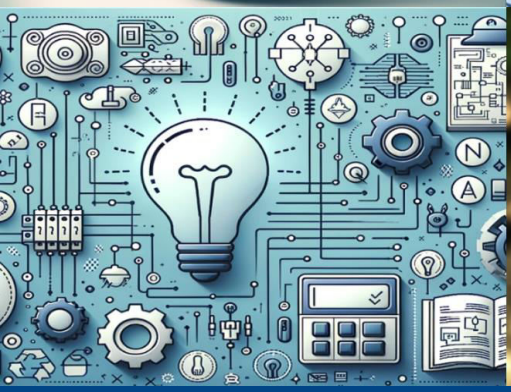




International Journal of Multidisciplinary Research in Science, Engineering and Technology

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



Impact Factor: 9.864

Volume 9, Issue 5, May 2026

© 2026 IJMRSET | Volume 9, Issue 5, May 2026| DOI:10.15680/IJMRSET.2026.0905090

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

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

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

Smart Home-Based Monitoring System for Shih Tzu Health and Daily Behavior

Daniela J. Aguhob

Email: danielajandocaguhob@gmail.com

Undergraduate Student, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Frankie C. Casipong

Email: casipongfrankie082303@gmail.com

Undergraduate Student, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Jimmy M. Panuncialman Jr.

Email: jimmypanuncialman@gmail.com

Undergraduate Student, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Engr. Cheryl O. Tayo, MIT, MSCpE

Email: cotayo@nemsu.edu.ph

Associate Professor IV, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Engr. Dione S. Duero, MSCpE

Instructor I, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Engr. Franklin M. Ganancias, DIT

Associate Professor III, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

Engr. Nelyne Lourdes Y. Plaza, PCpE, PhD

Professor VI, Department of Computer Studies, North Eastern Mindanao State University - Cantilan Campus, Cantilan, Surigao del Sur, Philippines

ABSTRACT: The Smart Home-Based Monitoring System for Shih Tzu Health and Daily Behavior was developed to help pet owners monitor their dogs using Internet of Things (IoT) technology, sensors, and Artificial Intelligence. The system utilized an ESP32 microcontroller, camera module, motion sensor, temperature sensor, and heart-rate sensor to collect real-time data on health conditions and daily activities. Machine Learning algorithms analyzed behavior patterns and detected possible abnormalities. The developed prototype supports continuous monitoring and assists pet owners in identifying potential health or behavioral concerns at an early stage. It also provides timely notifications, remote access, improved awareness, and convenient daily pet management.

© 2026 IJMRSET | Volume 9, Issue 5, May 2026| DOI:10.15680/IJMRSET.2026.0905090

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

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

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

KEYWORDS: Internet of Things (IoT), Artificial Intelligence, Smart Pet Monitoring, Shih Tzu Behavior, Health Monitoring System

I. INTRODUCTION

The Smart Home-Based Monitoring System for Shih Tzu Health and Daily Behavior is a technology-based system designed to assist pet owners in monitoring the health condition and daily activities of their dogs inside the home. The system combines Internet of Things (IoT) technology, sensors, wireless communication, and Artificial Intelligence to provide continuous real-time monitoring of movement, physiological condition, and environmental factors. Through automated data collection and analysis, the system helps improve pet monitoring and supports more informed pet care practices.

Recent developments in intelligent monitoring technologies have expanded their application in animal care and health monitoring. According to Foster et al. (2022) wearable and sensor-based systems can support continuous observation of canine movement and physiological activity, while Kim and Moon (2022) noted that combining wearable sensors with camera-based monitoring improves behavior recognition and monitoring accuracy. These studies show that smart monitoring technologies can provide valuable support for pet owners by helping identify behavioral changes and possible health concerns more effectively.

This study was developed to address the difficulty of continuously monitoring Shih Tzus, especially when pet owners are away from home or unable to observe their pets closely. The system combines wearable sensors, camera-based observation, wireless communication, and machine learning to provide continuous monitoring and behavior analysis. Existing monitoring approaches often have limitations related to accuracy, visibility, or sensor performance. Therefore, the study aims to develop a practical home-based monitoring system that supports real-time monitoring, early abnormality detection, and improved daily pet care for Shih Tzus.

II. LITERATURE SURVEY

Foreign Related Literature (Hardware Systems)

The increasing development of smart monitoring technologies has encouraged researchers to create advanced hardware systems intended for animal health and behavior monitoring. Terence et al. (2024) explained that IoT-based monitoring infrastructures improve the collection and transmission of real-time animal data through integrated sensing and wireless communication technologies. Their study emphasized that smart monitoring hardware systems provide reliable and continuous observation capabilities suitable for companion animals and home-based environments.

Wearable sensing hardware has also become widely utilized in animal-monitoring applications to improve behavior tracking and physiological observation. Fonseca et al. (2023) developed wearable monitoring devices equipped with accelerometer and motion sensors designed to improve animal activity recognition and welfare assessment. Their findings revealed that embedded wearable technologies improve monitoring efficiency while reducing the need for continuous human observation within pet-care environments.

Local Related Literature (Hardware Systems)

In the Philippines, the growing interest in smart pet-care technologies has encouraged researchers to explore IoT-based hardware solutions for domestic animal monitoring. Reyes et al. (2022) introduced an IoT-enabled automated pet feeder and monitoring system as an alternative approach for improving remote pet-care management inside households. Their research demonstrated that integrating sensors and wireless communication technologies improves accessibility and convenience for pet owners.

The development of communication-assisted monitoring hardware also became an important focus among local researchers. Cabaltera et al. (2018) developed a GSM-controlled pet-care system capable of remotely managing feeding and monitoring operations. Their study highlighted that integrating communication hardware with pet-monitoring devices improves remote supervision capability and enhances overall monitoring effectiveness within home environments.

© 2026 IJMRSET | Volume 9, Issue 5, May 2026| DOI:10.15680/IJMRSET.2026.0905090

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

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

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

Foreign Related Literature (Software Systems)

Intelligent software applications have become essential in smart animal-monitoring systems because they improve data analysis, behavior recognition, and operational monitoring. Aguilar-Lazcano et al. (2023) stated that automated monitoring software helps process sensor and image data while maintaining reliable monitoring performance despite environmental and movement variations. Their findings emphasized the significance of intelligent software controls in improving real-time animal-monitoring efficiency.

Researchers also investigated software-driven machine-learning systems for behavior-recognition applications. Atif et al. (2023) designed intelligent monitoring software powered by deep learning algorithms for canine behavior analysis. Their study showed that software-controlled behavior-recognition systems contribute to more reliable activity classification and improve monitoring accuracy within home-based environments.

Local Related Literature (Software Systems)

The advancement of intelligent monitoring technologies in the Philippines has encouraged researchers to develop software systems that support smart pet-care operations. Reyes et al. (2022) emphasized that IoT-based monitoring software contributes to more efficient pet management and improves accessibility for pet owners through remote monitoring applications. Their findings revealed that intelligent software systems improve operational convenience and strengthen continuous pet supervision.

Researchers also explored communication-based software systems for remote monitoring and notification delivery. Cabaltera et al. (2018) explained that GSM-supported monitoring software improves remote pet management by enabling real-time notifications and automated monitoring updates. Their study demonstrated that communication-integrated software systems enhance monitoring reliability and improve user awareness within domestic environments.

Foreign Related Studies

Researchers worldwide have continuously explored the integration of wearable sensing, camera-based monitoring, and machine-learning technologies to improve intelligent pet-monitoring systems. Kim and Moon (2022) developed a multi modal dog-behavior recognition system that combined wearable-device data with camera-based observation. Their findings demonstrated that integrating multiple monitoring technologies improves activity-recognition accuracy and strengthens overall monitoring reliability in real-world environments.

The advancement of artificial intelligence technologies also encouraged researchers to create intelligent systems for behavior analysis and activity classification. Foster et al. (2022) introduced an integrated canine-monitoring platform equipped with physiological sensing and external visual tracking functions. Their research revealed that combining multiple sensing approaches improves behavior interpretation and enhances monitoring efficiency within animal-monitoring applications.

Local Related Studies

In the Philippine context, researchers have increasingly focused on IoT-based pet-monitoring technologies that support home-based animal care and automation. Reyes et al. (2022) developed an IoT-enabled pet-care system capable of providing remote feeding and monitoring operations through wireless communication technologies. Their findings demonstrated improved accessibility, monitoring convenience, and operational reliability within domestic pet-care applications.

To improve remote supervision and automated monitoring, Cabaltera et al. (2018) designed a GSM-assisted pet-monitoring and feeding system capable of transmitting monitoring updates and remote-control functions through communication technologies. Results from the study showed that communication-supported monitoring technologies improve monitoring efficiency and strengthen remote pet-care management within home environments.

Synthesis of the Review

The reviewed literature and related studies demonstrate continuous developments in smart animal-monitoring systems, wearable sensing technologies, camera-based monitoring, machine learning, and IoT communication platforms intended to improve pet care and animal behavior analysis. Both international and local researchers emphasized the

© 2026 IJMRSET | Volume 9, Issue 5, May 2026| DOI:10.15680/IJMRSET.2026.0905090

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

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

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

importance of integrating sensing devices, wireless communication, embedded systems, and intelligent data-processing mechanisms to improve monitoring accuracy, usability, and real-time observation within home-based environments.

Despite these technological advancements, several gaps remain evident in existing monitoring systems. Many studies focused only on individual monitoring approaches such as wearable sensing, movement tracking, or camera-based observation without fully integrating these technologies into a unified and user-friendly monitoring platform. Some systems also lacked practical real-time notification features, multi modal data interpretation, and breed-specific monitoring capabilities necessary for everyday companion-animal care. These limitations support the development of the proposed Smart Home System for Monitoring Shih Tzu's Health and Daily Behavior. By combining wearable telemetry, camera-based behavior analysis, IoT communication, machine learning, and mobile-based monitoring into one integrated framework, the proposed system offers a more reliable, practical, and intelligent solution for monitoring the health-related indicators and daily behavior of Shih Tzus within a home environment.

III. METHODOLOGY

The study employed a Developmental Research Design guided by the Agile Development Methodology to systematically design, develop, test, and evaluate the proposed Smart Home System for Monitoring Shih Tzu's Health and Daily Behavior. This approach allowed the researchers to continuously improve the prototype while considering the practical needs of pet owners and the behavioral and health characteristics commonly observed in Shih Tzus. The hardware components consisted of an ESP32 microcontroller, ESP32-CAM module, MAX30102 heart-rate sensor, PIR motion sensor, temperature and humidity sensor, power modules, and supporting communication devices. These components were integrated to create a smart home monitoring platform capable of collecting physiological, environmental, and behavioral data in real time. Software development involved the use of Arduino IDE, Python programming language, embedded firmware, and mobile application integration. The prototype was programmed to monitor temperature, heart rate, activity levels, and movement patterns while transmitting collected data wirelessly through Wi-Fi communication. Artificial intelligence and machine-learning algorithms were also implemented to analyze behavior patterns and detect unusual activities or possible health-related concerns.

Testing and calibration procedures were conducted to evaluate sensor accuracy, wireless communication reliability, real-time monitoring capability, and overall operational performance. The researchers also assessed the functionality, reliability, accuracy, and efficiency of the developed prototype to determine its effectiveness for monitoring the health and daily behavior of Shih Tzus within a home environment. The developed system was evaluated by a total of 50 participants composed of 15 students, 15 professionals, and 20 pet owners. A purposive sampling method was utilized to select respondents capable of providing relevant feedback regarding the usability and effectiveness of the prototype. A survey questionnaire based on a five-point Likert Scale served as the primary evaluation instrument in assessing the system in terms of functionality, reliability, accuracy, and efficiency. The collected responses were analyzed using weighted mean to determine the overall acceptability and performance level of the developed Smart Home-Based Monitoring System for Shih Tzu Health and Daily Behavior.

IV. RESULTS AND DISCUSSION

System Implementation

The Smart Home System for Monitoring Shih Tzu's Health and Daily Behavior was successfully implemented as an integrated IoT-based pet monitoring platform. The system effectively combined environmental monitoring, motion detection, heart-rate sensing, camera-based observation, and wireless communication to provide continuous real-time monitoring inside a home environment. Testing showed stable sensor performance, reliable Wi-Fi connectivity, and accurate data transmission between the hardware components and the mobile application. The activity monitoring system successfully detected movement patterns, resting periods, and daily activity levels using motion sensors and camera-based monitoring. The embedded system continuously collected and processed data through the ESP32 microcontroller, reducing the need for constant manual observation while allowing pet owners to monitor their Shih Tzu remotely. Monitoring results also confirmed that the mobile application effectively displayed real-time information including temperature readings, heart-rate status, activity summaries, and system notifications.

© 2026 IJMRSET | Volume 9, Issue 5, May 2026| DOI:10.15680/IJMRSET.2026.0905090

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

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

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

Health and safety monitoring mechanisms also demonstrated reliable performance during testing. The MAX30102 sensor successfully captured heart-rate signals under controlled conditions, while the temperature and humidity sensors provided stable environmental readings. The notification system transmitted alerts to the mobile application whenever unusual behavior or abnormal sensor readings were detected. Overall findings demonstrated that the proposed Smart Home System improves pet monitoring, supports early detection of possible health concerns, and enhances responsible pet care practices. The integration of IoT technology, artificial intelligence, embedded systems, and mobile-based monitoring provides an affordable and practical framework capable of assisting pet owners in monitoring the health and daily behavior of Shih Tzus more effectively.

Evaluation Results

Category	Mean	Interpretation
Functionality	4.43	Outstanding
Reliability	4.32	Outstanding
Accuracy	4.43	Outstanding
Efficiency	4.49	Outstanding
Overall Mean	**4.41**	**Outstanding**

The functionality of the Smart Home System for Monitoring Shih Tzu's Health and Daily Behavior was evaluated based on its monitoring capabilities, system integration, mobile application usability, and overall performance, resulting in an overall mean score of 4.43, interpreted as Outstanding. Respondents agreed that the system provides the necessary features for monitoring Shih Tzus effectively (4.35) and that the monitoring, alert, and tracking functions work properly as intended (4.25). The mobile application received the highest functionality rating (4.65), indicating that users found it easy to navigate and operate. Respondents also rated the system highly in terms of integration with smart home devices (4.45) and overall satisfaction with pet health and behavior monitoring (4.45). These findings indicate that the system successfully performs its intended functions while providing a convenient and user-friendly monitoring experience. The reliability of the system was assessed in terms of operational consistency, stability, and dependable monitoring performance, yielding an overall mean score of 4.32, interpreted as Outstanding. Respondents confirmed that the system operates consistently without unexpected failures (4.40) and remains functional even during extended periods of use (4.45). The monitoring system also demonstrated reliable operation when pet owners were away from home (4.40), showing its capability for continuous remote monitoring. Although internet stability and notification delivery received slightly lower ratings of 4.15 and 4.20 respectively, both were still interpreted as Very Satisfactory, indicating that the system maintained dependable communication and monitoring performance under normal operating conditions. Overall, the results demonstrate that the system is stable, reliable, and suitable for long-term pet monitoring applications.

The accuracy of the system was evaluated based on its ability to correctly monitor activity levels, health indicators, and behavior patterns, with an overall mean score of 4.43, interpreted as Outstanding. Respondents strongly agreed that the system accurately tracks Shih Tzu activity levels (4.55) and that the health-related data such as heart rate and temperature readings are precise (4.40). The behavior detection capability of the system was also rated highly (4.50), indicating that the monitored results reflected the pet's actual condition. Notification accuracy received a mean score of 4.25, interpreted as Very Satisfactory, suggesting that alerts and warnings were generally based on correct monitoring data. The highest rating in this category was obtained for overall trustworthiness of the monitoring results (4.65), reflecting strong user confidence in the system's monitoring capabilities. These findings demonstrate that the system provides accurate and dependable monitoring information for pet owners. The efficiency of the system was measured in terms of responsiveness, resource utilization, and monitoring convenience, achieving the highest overall mean score of 4.49, interpreted as Outstanding. Respondents agreed that the system responds quickly when monitoring their Shih Tzu (4.45) and that the mobile application loads and updates data promptly (4.35). The efficient use of internet and power resources was also rated highly (4.50), indicating that the system performs effectively without excessive resource consumption. The highest individual score in this category was obtained for reducing the time spent manually monitoring pets (4.65), emphasizing the convenience provided by the system. Overall system task performance was also rated Outstanding (4.50), demonstrating that the monitoring platform operates efficiently and supports practical pet care applications within a smart home environment. The table illustrates the survey findings, showing that the Smart

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 9.864| ESTD Year: 2018|

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

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

Home System for Monitoring Shih Tzu's Health and Daily Behavior obtained consistently high ratings from respondents. The computed mean scores ranged from 4.15 to 4.65, corresponding to interpretations of Very Satisfactory and Outstanding. The highest evaluations were observed in terms of mobile application usability, monitoring accuracy, convenience, and overall user satisfaction, indicating that respondents found the system effective, practical, and beneficial for monitoring their pets. Slightly lower but still positive ratings were observed in areas related to internet stability and notification delivery, suggesting possible opportunities for future improvement in communication reliability. Overall, the survey results confirm that the developed system is highly acceptable, reliable, and capable of supporting responsible pet care through smart home monitoring technology.

V. CONCLUSION

The study successfully developed the Smart Home System for Monitoring Shih Tzu's Health and Daily Behavior as an integrated IoT-based monitoring platform designed to support pet owners in observing their pets' health conditions and daily activities within a home environment. The system effectively addressed challenges related to limited pet monitoring, delayed detection of unusual behavior, and difficulties in continuous observation through the integration of smart sensors, wireless communication, artificial intelligence, and mobile-based monitoring technologies. The findings confirmed that combining IoT devices, embedded systems, and AI-based monitoring techniques improves the reliability, accuracy, and efficiency of pet health and behavior monitoring. The developed prototype demonstrated dependable performance in terms of real-time monitoring, wireless communication, notification delivery, behavior detection, and overall system operation. The study also provides a practical foundation for future researchers, developers, and pet care technology innovators interested in developing intelligent smart home monitoring systems for animals. Future improvements may focus on integrating additional health-monitoring sensors, improving artificial intelligence accuracy, enhancing cloud-based data analysis, and expanding the system's monitoring capabilities for other dog breeds and pet environments

REFERENCES

[1] Holgado-Terriza, J. A., Ruiz-Sánchez, J. A., & Gómez-Nieto, M. Á. (2025). Internet of Things–based smart home systems for pet health and behavior monitoring. *Applied Sciences, 15*(4), 1722. https://doi.org/10.3390/app15041722

[2] Siciliano, M., Carlini, C., & Felici, G. (2023). Vision-based smart home system for monitoring dog behavior and welfare. *Sensors, 23*(6), 2892. https://doi.org/10.3390/s23062892

[3] Meegahapola, L., Kim, Y., & Ghasemzadeh, H. (2023). Quantified canine: Inferring dog behavior from wearable sensors. *arXiv*. https://doi.org/10.48550/arXiv.2301.06964

[4] Atif, M., Hussain, S., & Kim, J. (2023). Deep learning-based video monitoring and summarization system for companion dogs. *Sensors, 23*(14), 6125. https://doi.org/10.3390/s23146125

[5] Fonseca, R., Almeida, P., & Costa, M. (2023). Wearable monitoring systems for animal welfare assessment: Challenges in sensor placement and usability. *Animals, 13*(9), 1520. https://doi.org/10.3390/ani13091520

[6] Foster, L., Harrison, K., & Bennett, J. (2022). Integrated physiological and behavioral sensing platform for working-dog monitoring applications. *Frontiers in Veterinary Science, 9*, 845621. https://doi.org/10.3389/fvets.2022.845621

[7] Kumpulainen, P., Virtanen, T., & Heikkinen, J. (2021). Classification of canine behavior using accelerometer and gyroscope sensor data. *Sensors, 21*(18), 6171. https://doi.org/10.3390/s21186171

[8] Hu, Y., Zhang, X., & Li, J. (2024). IoT-enabled intelligent monitoring systems for companion animal healthcare applications. *IEEE Access, 12*, 44215–44231. https://doi.org/10.1109/ACCESS.2024.3372194

[9] Zhao, L., Chen, Y., & Xu, P. (2024). Artificial intelligence approaches for behavior recognition in smart animal-monitoring systems. *IEEE Access, 12*, 55421–55438. https://doi.org/10.1109/ACCESS.2024.3378452

[10] Kim, S., & Moon, H. (2022). Multimodal dog behavior recognition using wearable and vision-based monitoring systems. *Applied Artificial Intelligence, 36*(1), 1–16. https://doi.org/10.1080/08839514.2022.2035198

[11] Chen, Z., Wang, Y., & Liu, H. (2023). Intelligent IoT-based healthcare monitoring systems using embedded sensors and wireless communication technologies. *IEEE Access, 11*, 102455–102470. https://doi.org/10.1109/ACCESS.2023.3312458

[12] Park, J., Lee, S., & Kim, H. (2024). Artificial intelligence-enabled embedded systems for smart health and activity monitoring applications. *Sensors, 24*(5), 1842. https://doi.org/10.3390/s24051842

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