International Journal of Research Publications in Engineering, Technology and Management (IJRPETM)

|www.ijrpetm.com | ISSN: 2454-7875 | editor@ijrpetm.com |A Bimonthly, Peer Reviewed & Scholarly Journal|

||Volume 9, Issue 2, March - April 2026||

DOI:10.15662/IJRPETM.2026.0902007

IOT-Based Fire Alarm and Location Tracking System

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Publication History: Received: 20.02.2026; Revised: 07.03.2026; Accepted: 10.03. 2026; Published: 15.03.2026.

ABSTRACT: The Multiple smart infrastructures have reported fire incidents, requiring rapid detection, precise localization, and smart decision support for mitigating risks to lives and property. This paper proposes an advanced fire alarm and fire location tracking system based on smart IoT technology, Artificial Intelligence/Machine Learning (AI/ML) integration and 5G networks. The system detects environmental changes, such as increases in temperature and fluctuations in smoke, and gas concentration, using an extensive network of IoT environmental sensors. Ai/ML algorithms are applied to the model system to predict fires, detect anomalies, and reduce the incidence of false positives before fire events are detected. The system generates localized alerts and transmits real-time environmental data and fire event detection data to cloud servers and emergency responders using high-speed, and low latency, 5G networks. The fire location tracking system uses emergency response unit GPS coordinates and fire location tracking to reduce emergency response time. Experimental evaluations have shown improved detection accuracy, minimum response time, and sustainable real-time communication. The fire location tracking system is an innovative, intelligent, and cost-effective technology to ensure fire safety in smart buildings, industrial domains, and smart cities.

KEYWORDS: Internet of Things (IoT), Fire Detection System, Smoke Detector, Temperature Detector, Real-Time Tracking, Location Monitoring, Emergency Notification System, Embedded System, Wireless Technology, Cloud Monitoring, Disaster Management System.

I. INTRODUCTION

Fire accidents are one of the leading contributors to the loss of life as well as the loss of property and valuables in residential and commercial establishments. With the increased use of electrical devices and construction of multi-storey and complex buildings in an urbanized setting, the dangers and consequences of fire accidents have further increased. Conventional fire alarm systems which utilize ceiling mounted smoke and heat detectors have delayed responses and limited area coverage as well as a lack of remote monitoring. These systems also have a high incidence of false alarms, and many of them are incapable of providing situational awareness to emergency response teams, which is acritical component to effective emergency response.

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The Internet of Things (IoT) has made possible the creation of smart fire detection systems with features like real-time monitoring, remote access, and smart data processing. IoT-enabled fire alarms feature integrated smoke, gas, and temperature sensing equipment with microcontrollers and wireless communication to monitor environmental conditions. These systems provide real-time transmissions to the cloud to allow remote monitoring and automated fire event alerts. The latest improvements to fire detection systems are the result of advancements in Artificial Intelligence and Machine Learning (AI/ML).

AI and ML techniques offer the potential to evaluate multi variate massive data streams to improve the detection, prediction, and real-time adjustments of systems. Unlike threshold systems, AI and ML based anomaly detection systems show a significant reduction of false positives. Additionally,

intelligent systems provide flexible adaptive decision-making and enhanced detection as theenvironmental conditions change. The new 5th generation (5G) wireless communication technology is a game changer. Its ultra-low latency, high data rate, and consistent reliable transmission provide the essential components for time critical safety applications. The integration of 5G technology with IoT- enabled fire alarm systems provide uninterrupted communication for the transmission of emergency notifications

II. LITERATURE REVIEW

Recent research underscores the urgent need of systems to detect fire through the internet of things, highlighting the value of safety and benefits of emergency response systems. Other scientists have built systems that use the internet of things to combine the cloud with mobile apps to provide real- time detection and notifications through the smoke and flame and temperature internet of things sensors connected to microcontrollers like Arduino and Node Mcu. There are numerous studies on the use of mobile communication and internet communication for notifications. Some have suggested the use of the internet of things integrated global positioning system units for emergency situations to improve the detection of internet of things fire sensor units. Despite the research in the field, the need for an innovative fire detection system is warranted due to the accuracy, response time, and scalability limitations of current systems.

Numerous studies have developed IoT-based fire detection systems to improve early warning and emergency response systems. Current studies focus on the use of smoke and flame sensors, temperature sensors, and microcontrollers (like Arduino and Node MCU) for the continuous monitoring of the environment. Environmental monitoring systems usually use technologies like Wi- Fi, GSM, and cloud systems to send alerts and provide remote and real time access to alerts. A few of these systems even include GPS modules to track locations. Though, some systems have inherent deficiencies (e.g. the other systems have delayed alerts, low levels of scalability, and low levels of accuracy, improved and more reliable IoT-based fire safety solutions are needed).

Existing studies on fire detection systems based on IoT noted the integration of smoke, heat, and flame sensors with microcontrollers to monitor and report changes in real-time. Users receive notifications via Wi-Fi or GSM networks. Some systems may employ GPS to monitor the fire's location.

Prior studies on IoT based fire detection systems, showcase the integration of smoke, temp, and flame sensors, in conjunction with microcontrollers, for the purpose of real time monitoring and the transmission of alerts via the Wi-Fi or GSM networks, to users in real time. Some systems provide location tracking via GPS. However, response delays, and issues with accuracy and scalability have pointed to the necessity for the development of systems that are both more efficient reliable , response time delays, accuracy, and scalability presents the need for other reliable and efficient systems.

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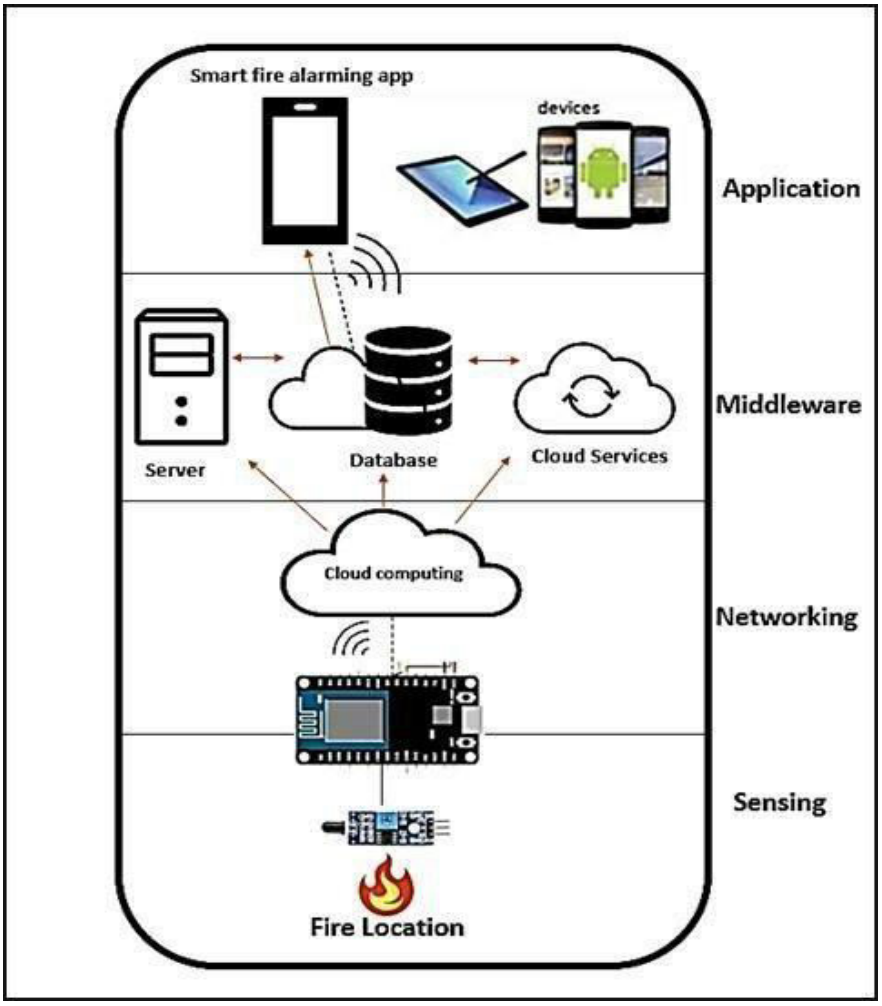

III. RESEARCH METHODOLOGY

This section describes the proposed methodology concerning the IoT-based fire alarm and tracking system, and it will cover the design, implementation, and testing phases of the methodology. First, the system requirements were derived and combined with the relevant safety provisions, as well as the requirement of the system to be monitored in real time. Some of the relevant components were smoke and temperature flame sensors, and microcontrollers such as Node MCU/ Arduino combined with a GPS module. The sensors were integrated with the microcontroller to monitor theenvironment, and embedded programming was used to design software that processes the data received from the various sensors and generates alerts when the sensors threshold levels preset are crossed. The data transfer to be monitored in the cloud and/or mobile application was done through Wi-Fi and/or GSM.

KEY FINDINGS:

1. The system monitored smoke, temperature, and flames. It triggered alarms when smoke, temperature, and/or flames crossed preset thresholds. The system allows early warnings and fast response to emergencies.
2. The information will transfer owners and fire department for the emergency.
3. The system sends users, authorities, and fire-fighting personnel with fire emergencies in real-time.
4. The system has been tested under fire emergencies and has shown to be reliable, accurate in detecting fires, and cost-effective. This makes the system suitable for home, business, and industrial fire safety.

WORKFLOW

1. **System Initialization** - The microcontroller performs an initialization sequence that connects all of the smoke detector, temperature detector, flame detector, GPS, and communication modules to appear to make them all function correctly upon start-up.

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2. **Continuous Monitoring** - Environmental parameters for the flame, smoke density, temperature detector will be continuously monitored and measured. 3. Data Processing - The microcontroller processes each collected data from the sensors and compares them to abnormal reading and threshold values.
4. **Fire Detection** - If any parameters measures above the normal range, the system detects the service as a fire threat.
5. **Alert Transmission** - Users and fire services are alerted through subdivided networks with instant notifications using Wi-Fi / GSM and cloud services.
6. **Location Tracking** - GPS services are able to track their location and add them to the alerts.
7. **User Notification & Monitoring** - A mobile application / web interface shows Users flame status reports and alerts as they occur which allows users to act on it.

Advantages

Early Fire Detection — The system detects smoke, heat, and flame, and identifies fire hazards in their earliest stages and reduces/eliminates damages and loss of life.
Real-Time monitoring — Systems that operate continuously and autonomously detect abnormal situations and provide a report in real-time.
Instant alerts — The system improves emergency response and can report through Wi-Fi or GSM. **Location tracking** — The system provides real-time GPS coordinates to the affected area, improving the efficiency of rescue activities.
Remote accessibility — Monitoring the system through cloud services and receiving alerts is possible through mobile or web apps

Disadvantages

Eliance on Internet Connectivity - Real-time notifications are dependent on Internet connection stability since alerts are transmitted via Wi-Fi or GSM networks. Emergency notifications could be delayed or missed due to weak, unstable, or poor Internet connection.

Reliance on Power Supply - The system unction is dependant on a stable power source. The system may lose reliability and power outage may unction due toa absence of backup system.

Sensor Limitations - Smoke, fire, and temperature sensors are subject to generate an unceasing, false positive in alarms due to environmental factors, such as dust, high temperature, humidity, or ambient temperature.

Maintenance Requirement - to be accurate and reliable, sensors require regular maintenance and calibration Maintenance is time-consuming and sensors require unceasing maintenance to be accurate and reliable.

Initial Setup Complexity - The configuration of Internet of Things (IoT) and cloud components, as well as the GPS system, may involve configuration and technical skills.

IV. RESULTS AND DISCUSSION

The implementation of the IoT-Based Fire Alarm and Location Tracking System was completed, and the simulations of fire scenarios demonstrated the system's capabilities. The system's sensors correctly identified smoke, temperature, and flame thresholds. The system's microcontroller was able to process all of the above information and issues an alarm in an acceptable time frame. The system's real-time monitoring capabilities were documented via rapid communication to the cloud and mobile app. The GPS module's rapid fire response.

V. CONCLUSION

An Internet of Things (IoT)-Based Fire Alarm and Location Tracking System enables early detection of fire emergencies as well as quick fire response emergencies. The system has been designed with smoke, temperature, and flame sensors along with a microcontroller, and wireless communication modules to ensure consistent, real-time, and responsive monitoring of the environment It has the capability to send instantaneous alerts over Wi-Fi and GSM, which greatly diminishes time to respond in an emergency. Furthermore, the system comes equipped with a GPS Module to enhance the quick dispatch of emergency response teams to the active fire and emergency location.

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VI. FUTURE WORK

•Advanced Sensors Integration - Improved detection under changing environmental conditions, as well as better false alarm reduction, is possible with the addition of high sensitivity, multi-parameter, multi-function, and all-in-one sensor technologies

•AI & ML Implementation - The ability to identify and assess intelligent fire dangers and improve fire situation decision making can be accomplished by employing cognitive algorithms for intelligent prediction and the ability to evaluate built-in sensors.

•Addition of an Integrated Camera Module - The integration of a camera to gain situation awareness of a fire and facilitate emergency response will be beneficial.

•Integration of Smart Buildings - Overall safety management will be enhanced by integrating your system with the automated fire suppression and smart building technologies.

•Mobile App Enhancements - Analysis and monitoring capabilities will improve with the development of a mobile application that is easy to use and has multiple, simultaneous users.

REFERENCES

1. Amitha, K., Ram Manohar Reddy, M., Yashwanth, K., Shylaja, K., Rahul Reddy, M., Srinu, B., & Dharnasi, P. (2026). AI empowered security monitoring system with the help of deployed ML models. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 69–73.
2. Gogada, S., Gopichand, K., Reddy, K. C., Keerthana, G., Nithish Kumar, M., Shivalingam, N., & Dharnasi, P. (2026). Cloud computing/deep learning customer churn prediction for SaaS platforms. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 74–78.
3. Akula, A., Budha, G., Bingi, G., Chanda, U., Borra, A. R., Yadav, D. B., & Saravanan, M. (2026). Emotion recognition from facial expressions using CNNs. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(1), 120–125.
4. Gopinathan, V. R. (2025). AI-Powered Kubernetes Orchestration for Complex Cloud-Native Workloads. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 8(6), 13215-13225.
5. Varshini, M., Chandrapathi, M., Manirekha, G., Balaraju, M., Afraz, M., Sarvanan, M., & Dharnasi, P. (2026). ATM access using card scanner and face recognition with AIML. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 113–118.
6. Feroz, A., Pranay, D., Srikar Sai Raj, B., Harsha Vardhan, C., Rohith Raja, B., Nirmala, B., & Dharnasi, P. (2026). Blockchain and machine learning combined secured voting system. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 119–124.
7. Tirupalli, S. R., Munduri, S. K., Sangaraju, V., Yeruva, S. D., Saravanan, M., & Dharnasi, P. (2026). Blockchain integration with cloud storage for secure and transparent file management. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 79–86.
8. Chandu, S., Goutham, T., Badrinath, P., Prashanth Reddy, V., Yadav, D. B., & Dharnas, P. (2026). Biometric authentication using IoT devices powered by deep learning and encrypted verification. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 87–92.
9. Singh, K., Amrutha Varshini, G., Karthikeya, M., Manideep, G., Sarvanan, M., & Dharnasi, P. (2026). Automatic brand logo detection using deep learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(1), 126–130.
10. Sridevi, V., Azath, H., Vijayakumar, R., Anbuselvan, N., Amirthalingam, V., & Arunkumar, S. (2024, April). Augmented Reality Shopping and IoT-Enabled Virtual Try-On with Cloud Services for Interactive Product Displays. In 2024 10th International Conference on Communication and Signal Processing (ICCSP) (pp. 880-885). IEEE.
11. Keerthana, L. M., Mounika, G., Abhinaya, K., Zakeer, M., Chowdary, K. M., Bhagyaraj, K., & Prasad, D. (2026). Floods and landslide prediction using machine learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 125–129.
12. Vimal Raja, G. (2024). Intelligent Data Transition in Automotive Manufacturing Systems Using Machine Learning. International Journal of Multidisciplinary and Scientific Emerging Research, 12(2), 515-518.
13. Dadigari, M., Appikatla, S., Gandhala, Y., Bollu, S., Macha, K., & Saravanan, M. (2026). Bitcoin price prediction with ML through blockchain technology. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 130–136.

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14. Chinthala, S., Erla, P. K., Dongari, A., Bantu, A., Chityala, S. G., & Saravanan, M. S. (2026). Food recognition and calorie estimation using machine learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(2), 480–488.
15. Sugumar, R. (2024). AI-Driven Cloud Framework for Real-Time Financial Threat Detection in Digital Banking and SAP Environments. International Journal of Technology, Management and Humanities, 10(04), 165-175.
16. C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
17. Chinthamalla, N., Anumula, G., Banja, N., Chelluboina, L., Dangeti, S., Jitendra, A., & Saravanan, M. (2026). IoT-based vehicle tracking with accident alert system. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 486–494.
18. Nagamani, K., Laxmikala, K., Sreeram, K., Eshwar, K., Jitendra, A., & Dharnasi, P. (2026). Disaster management and earthquake prediction system using machine learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 495–499.
19. Prasad, E. D., Sahithi, B., Jyoshnavi, C., Swathi, D., Arun Kumar, T., Dharnasi, P., & Saravanan, M. (2026). A technology driven – solution for food and hunger management. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 440–448.
20. Rakesh, V., Vinay Kumar, M., Bharath Patel, P., Varun Raj, B., Saravanan, M., & Dharnasi, P. (2026). IoT-based gas leakage detector with SMS alert. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 449–456.
21. Jagadeesh, S., & Soundappan, R. S. (2014). Survey on knowledge discovery in speech emotion detection. International Journal of Innovative Research in Computer and Communication Engineering, 2(5), 4476–4481. Retrieved from https://ijircce.com/admin/main/storage/app/pdf/i7mLTWLAd6a4VqXoYxeMRM6m0zylGcBFKaMTHo5H.pdf
22. Chanamalla, B., Murali, V. N., Suresh, B., Deepak, M. S., Zakriya, M., Yadav, D. B., & Saravanan, M. (2026). AI-driven multi-agent shopping system through e-commerce system. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 463–470.
23. Bhagyasri, Y., Bhargavi, P., Akshaya, T., Pavansai, S., Dharnasi, P., & Jitendra, A. (2026). IoT based security & smart home intrusion prevention system. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 457–462.
24. Poornachandar, T., Latha, A., Nisha, K., Revathi, K., & Sathishkumar, V. E. (2025, September). Cloud-Based Extreme Learning Machines for Mining Waste Detoxification Efficiency. In 2025 4th International Conference on Innovative Mechanisms for Industry Applications (ICIMIA) (pp. 1348-1353). IEEE.
25. Nandhini, T., Babu, M. R., Natarajan, B., Subramaniam, K., & Prasanna, D. (2024). A NOVEL HYBRID ALGORITHM COMBINING NEURAL NETWORKS AND GENETIC PROGRAMMING FOR CLOUD RESOURCE MANAGEMENT. Frontiers in Health Informatics, 13(8).
26. Thotla, S. B., Vyshnavi, S., Anusha, P., Vinisha, R., Mahesh, S., Yadav, D. B., & Dharnasi, P. (2026). Traffic congestion prediction using real time data by using deep learning techniques. , 8(2), 489–494.
27. Rupika, M., Nandini, G., Mythri, M., Vasu, K., Abhiram, M., Shivalingam, N., & Dharnasi, P. (2026). Electronic gadget addiction prediction using machine learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 500–505.
28. Akshaya, N., Balaji, Y., Chennarao, J., Sathwik, P., & Dharnasi, P. (2026). Diabetic retinopathy diagnosis with deep learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 506–512.
29. Kiran, A., & Kumar, S. A methodology and an empirical analysis to determine the most suitable synthetic data generator. IEEE Access 12, 12209–12228 (2024).
30. S. Vishwarup et al., "Automatic Person Count Indication System using IoT in a Hotel Infrastructure," 2020 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, 2020, pp. 1-4, doi: 10.1109/ICCCI48352.2020.9104195
31. Fazilath, M., & Umasankar, P. (2025, February). Comprehensive Analysis of Artificial Intelligence Applications for Early Detection of Ovarian Tumours: Current Trends and Future Directions. In 2025 3rd International Conference on Integrated Circuits and Communication Systems (ICICACS) (pp. 1-9). IEEE.
32. Pavan Kumar, T., Abhishek Goud, T., Yogesh, S., Manikanta, V., Dinesh, P., Srinu, B., & Dharnasi, P. (2026). Smart attendance system using facial recognition for staff using AI/ML. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 513–519. https://doi.org/10.15662/IJRPETM.2026.0902005

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33. Reddy, V. N., Rao, P. H. S., Singh, N. S., Kumar, V. S. S., Reddy, Y. B., & Dharnasi, P. (2026). Face recognition using criminal identification system. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 520–527.
34. Rachana, P., Kalyan, P. P., Kumar, T. S., Reddy, P. M., Rohan, P., Saravanan, M., & Dharnasi, P. (2026). Secure chat application with end-to-end encryption using deep learning. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 472–478.
35. Krishna, G., Rajesh, B., Dinesh, B., Sravani, B., Rajesh, G., Dharnasi, P., & Sarvanan, M. (2026). Smart agriculture system using IoT with help of AI-techniques. International Journal of Computer Technology and Electronics Communication, 9(2), 479–487.
36. Reddy, N. H. V., Reddy, N. T., Bharath, M., Hemanth, N., Dharnasi, D. P., Nirmala, B., & Jitendra, A. (2026). AI based learning assistant using machine learning. International Journal of Engineering & Extended Technologies Research, 8(2), 495–504.
37. Inbavalli, M., & Arasu, T. (2015). Efficient Analysis of Frequent Item Set Association Rule Mining Methods. International Journal of Scientific & Engineering Research, 6(4).
38. Vangara, N., Bhargavi, P., Chandu, R., Bhavani, V., Yadav, D. B., & Dharnasi, P. (2026). Machine learning based intrusion detection system using supervised and unsupervised learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(2), 505–511.
39. Varma, K. K., & Anand, L. (2025, March). Deep Learning Driven Proactive Auto Scaler for High-Quality Cloud Services. In International Conference on Computing and Communication Systems for Industrial Applications (pp. 329-338). Singapore: Springer Nature Singapore.
40. Yadamakanti, S., Mahesh, Y., Rathnam, S. A., Praveen, V., Jitendra, A., & Dharnasi, P. (2026). Unified Payments Interface fraud detection using machine learning. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 488–497.