IoT Smart Pill Dispenser with Automated Medication Reminders Using Arduino UNO

Dr. N. Nanda Prakash[1], Yenduri Amulya Chowdar[2], Shaik Amanulla[3] ,MydukuriTanishq[4], Vallapaneni Mallikarjuna Rao[5]

[2,3,4,5]UG Student,ECE,Chalapathi Institute Of Engineering&Technology Guntur-Andhra Pradesh,India

[1] Associate Professor ECE,Chalapathi Institute Of Engineering&Technology Guntur-Andhra Pradesh,India

***Abstract*—Medication adherence is a major challenge, especially among elderly people and patients who need regular treatment. Missing doses or taking medicines at the wrong time can lead to serious health problems. To solve this issue, this project presents an IoT-based Smart Pill Dispenser using Arduino UNO that automates medicine reminders and dispensing.The system uses an Arduino UNO as the main controller, along with a Real-Time Clock (RTC) module to maintain accurate timing. Users can set their medication schedule using simple input switches. At the scheduled time, the system automatically dispenses pills using a servo motor mechanism. It also alerts the user through a buzzer and displays information on an LCD screen.Additionally, a GSM module is integrated to send SMS notifications to patients or caregivers, especially if a dose is missed. The IoT feature allows better monitoring and improves overall efficiency. A stable power supply ensures continuous operation of the system.This smart pill dispenser is cost-effective, user-friendly, and reliable. It helps improve medication adherence, reduces human errors, and supports better healthcare management through automation and connectivity.**

Keywords: IOT, Smart Pill Dispenser, Arduino UNO, Medication Reminder, Automated Drug Delivery, GSM, RTC, Embedded System, LCD, SMS Notification.

Introduction

In today's fast-paced lifestyle, maintaining proper medication schedules has become increasingly difficult, especially for elderly individuals and patients suffering from chronic diseases. Missing doses, taking incorrect medication, or consuming it at the wrong time can lead to serious health complications and reduced treatment effectiveness. Therefore, there is a strong need for an intelligent system that can assist patients in managing their medication routines efficiently.

With the rapid advancement of embedded systems and internet of things (IoT) technologies, healthcare devices are becoming smarter, more connected, and user friendly. Automated medication systems have gained significant attention as they help reduce human errors and improve adherence to prescribed treatments [1]. IoT based solutions further enhance these systems by enabling real time monitoring and remote communication, which is particularly useful for caregivers and family members [2].

This project focuses on the development of an IoT based Smart Pill Dispenser using Arduino UNO, designed to automate medication reminders and dispensing. The system integrates key componenys such as a real time clock (RTC) module for accurate timing, a servo motor for controlled pill dispensing, an LCD display for user interaction, and a buzzer for alert notifications. Additionally, a GSM module is incorporated to send SMS alerts in case of missed doses, ensuring continuous monitoring and support.

Similar systems proposed in earlier research emphasize cost effectiveness, ease of use, and reliability as essential features for practical healthcare applications [3][6]. By combining automation with IoT capabilities, the proposed system minimizes manual intervention, enhances patient safety and provides a dependable solution for medication management. Thus, this project demonstrates how low-cost embedded technology can be effectively utilized to address real-world health care challenges and improve overall quality of life.

I. Literature Survey

Theseveral research works have been carried out in the field of automated medication systems to improve patient adherence and reduce human errors. These studies provide a strong foundation for the development of smart pill dispensers using embedded systems and IoT technologies.

Karthika Hariprasad [1] proposed an Arduino based smart pill dispenser aimed at preventing drug overdose. The system uses a servo motor to dispense pills at scheduled intervals and highlights the importance of automation in ensuring medication safety and accuracy.

Doi:10.48047/ijiee.2026.16.2.36

The study emphasizes that such systems significantly reduce human intervention and errors.

Jyothis Philip et al.[2] developed an IoT based automatic medicine dispenser that focuses on improving medication adherence, especially for elderly patients. The system provides timely alert and dispenses pre-measured doses, reducing dependency on caregivers and enabling efficient medicantion management through connected technologies.

P. Ganga Bhavani et al. [3] introduced a smart medicine reminder box using Arduino UNO, RTC module, LCD display, and buzzer. The system provides both visual and audio alerts and allows customizable scheduling. It is designed to be user friendly, portable, and cost effective, making it suitable for everyday healthcare use.

Nikhil Gawali et al. [4] proposed an automatic pill dispenser machine to assist patients in managing complex medication schedules. The system ensures that medicines are dispensed at predefined times, reducing the risk of missed doses and improving treatment outcomes.

Z. Nasir et al. [5] designed a smart medical box integrated with IoT features such as SMS notifications and biometric authentication. This system enhances security and monitoring, demonstrating how advanced technologies can improve patient care and medication tracking.

L.Gargioni et al. [6] presented a systematic review of various pill dispenser systems, highlightling their effectiveness in improving medication adherence and patient outcomes. The study discusses different technologies used in modern health care devices and emphasizes the growing importance of smart medical systems.

A. Jabeena et al. [7] proposed an automatic pill reminder system that reduces dependency on human memory. The system ensures correct dosage at the right time, thereby minimizing medication errors and improving overall health care management.

II. EXISTING METHOD

In current healthcare practices, medication management is primarily carried out using traditional methods such as manual pillboxes, alarm reminders, and caregiver supervision. These methods are simple and widely used but have several limitations in ensuring propoer medication adherence.

One common method is the use of manual pill organizers, where patients sort their medicines based on days and timings. Although this helps in basic organization, it still relies heavily on the patient's memory and discipline. There is a high chance of missed doses or incorrect intake, especially among elderly individuals.

Another approach involves alarm-based reminders, such as mobile alarms or digital timers. These systems notify users when it is time to take medication, but they do not ensure whether the medicine has actually been taken. This lack of confirmation can lead to non-adherence or overdose.

In some cases, caregiver supervision is used, where family members or healthcare providers monitor the patient's medication schedule. While this method is more reliable, it increases dependency and is not always practical, especially for patients living independently.

Previous research has introduced basic automated systems that provide alerts and timed dispensing [1][4]. However, many of these systems lack advanced features such as remote monitoring, real-time notifications, and IoT connectivity. Additionally, some designs are complex or ecpensive, limiting their widespread adoption[6].

Existing methods are either manual, partially automated, or lack real time monitoring capabities. These limitations highlight the need for a more efficient, automated, and connected solution for medication management, which is addresses by the proposed IoT based smart pill dispenser.

III. PROPOSED METHODOLOGY

The proposed system is an IoT based Smart Pill Dispenser using Arduino UNO, designed to automate medication reminders and ensure accurate dispensing at scheduled times. The methodology focuses on integrating embedded hardware components with communication technology to create a reliable and user friendly healthcare solution.

The system is built around the Arduino UNO microcontroller, which acts as the central control unit. A Real time Clock (RTC) module is used to maintain precise timing for medication schedules. Users can set the required dispensing times using input switches, making the system easy to configure according to individual needs.

When the preset time is reached, the Arduino processes the signal from the RTC and activates a servo motor mechanism to dispense the required number of pills automatically. At the same time, a buzzer alert is triggered, and a message is displayed on the LCD screen to notify the user about the medication. This ensures both visual and audio confirmation.

To Enhance system reliability, a GSM module is integrated for communication. If the patient does not take the medicine with in a specified time, the system sends an SMS notification to caregivers or family members. This

Doi:10.48047/ijiee.2026.16.2.36

feature enables remote monitoring and reduces the risk of missed doses.

This methodology combines automation, real time monitoring, and IoT communication to overcome the limitations of existing systems. Compared to earlier approaches that mainly focus on reminders or basic automation [2][3], the proposed system provides an integrated solution with improved accuracy, safety, and user convenience.

IV. BLOCK DIAGRAM & WORKING SYSTEM

Block Diagram:

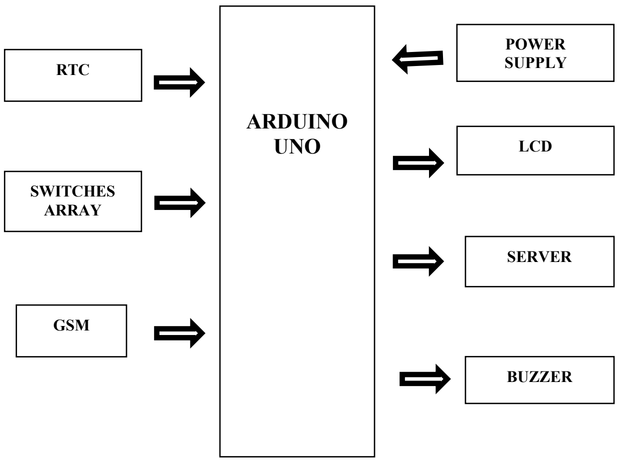

Fig:4.2: BLOCK DIAGRAM

V. WORKING SYSTEM

The working of the proposed IoT based Smart Pill Dispenser is based on the coordination of different hardware components controlled by the Arduino UNO. The system operates in a step by step manner to ensure timely medication dispensing and proper user notification.

Initially, the user sets the medication schedule using input switches. These settings are stored in Arduino, while the Real Time Clock (RTC) module continuously keeps track of the current time. The RTC ensures high accuracy in maintaining the schedule even during power interruptions.

When the current time matches the present medication time, the Aruino triggers the system. A Servo motor is activated to roatte the dispensing mechanism and release the required pills. At the same time, a buzzer alert is generated , and the LCD display shows a message indicating that it is time to take the medicine. This provides both audio and visual notification to the user.

If the user takes the medication, the system resets and waits for the next scheduled time. However, if the medication is not taken within a certain period, the GSM module is activated. It sends an SMS alert to caregivers or family members, informing them about the missed dose. This ensures continuous monitoring and timely intervention.

The system continues this cycle for all scheduled timings throughout the day. The integration of automation and communication and communication makes the process reliable and efficient compared to traditional methods [2][4]. The working system ensures accurate time-based dispensing, immediate alerts, and remote monitoring, improving adherence and overall patient safety.

VI. RESULTS AND OUTCOMES

The implemetation of the IoT based Smart Pill Dispenser using Arduino UNO demonstartes effective performance in automating medication management and improving adherence. The system was tested under different conditions to evaluate its reliability, accuracy, and usability.

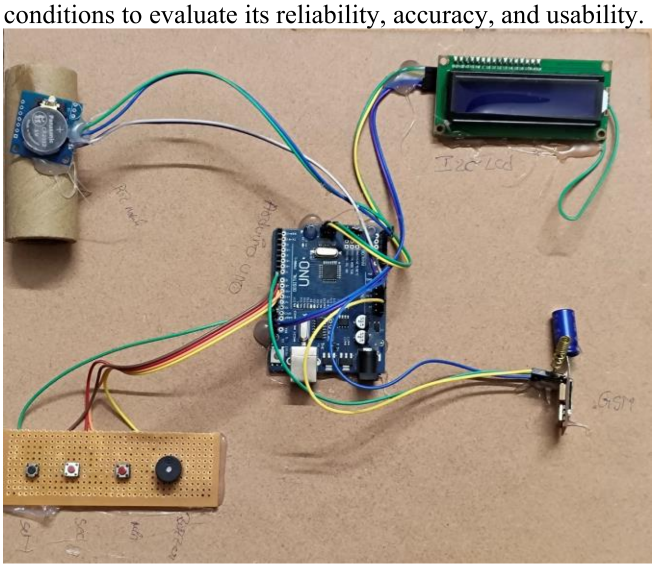

Fig: 7.1:output 1

The results show that the Real Time Clock (RTC) module provides precise timing, ensuring that medicines are dispensed exactly at the scheduled intervals. The servo motor mechanism operates accurately to deliver the correct dosage without failure. The combination of buzzer alerts and LCD display successfully notifies users, making the system easy to understand and operate, even for elderly individuals.

The integration of the GSM module proved highly effective for remote monitoring. In cases where doses were missed, SMS notifications were sent promptly tl caregivers, allowing timely intervention. This feature significantly

Doi:10.48047/ijiee.2026.16.2.36

enhances patient safety and reduces the risk of missed medication.

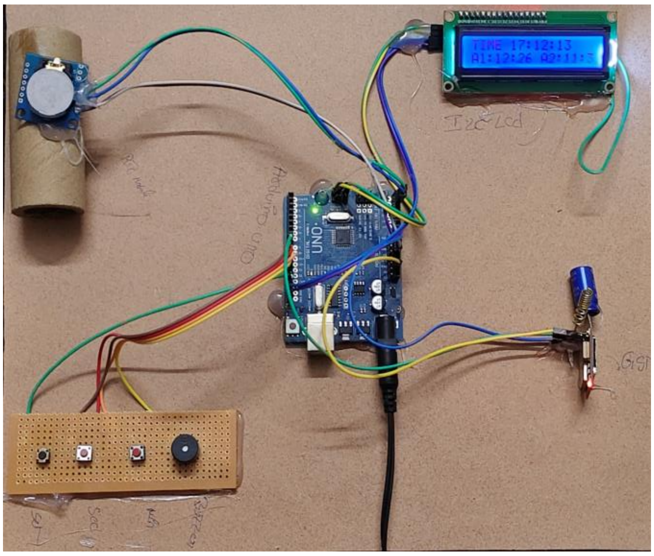

Fig: 7.2: Output 2

Compared to traditional and existing systems, the proposed model shows imporved efficiency by combining automation with communication technology [2][6]. It reduces human errors such as missed doses and incorrect timing, while also minimizing dependency on caregivers. Thus, the developed system successfully achieves its objective of improving medication adherence and contributing to smarter healthcare solutions.

VII. CONCLUSION

The proposed IoT based Smart Pill Dispenser using Arduino UNO provides an effective solution to the problem of medication non adherence. By integrating components such as the RTC module, servo motor, LCD display, buzzer, and GSM module, the system successfully automates both medication reminders and dispensing processes.

The project demonstrates how embedded systems and IoT technologies can be applied in healthcare to improve patient safety and treatment effectiveness. The automated mechanism ensures that medicines are taken at the correct time and in the right dosage, Thereby reducing human error such as missed doses or overdosing. The GSM based notification feature further enhances reliability by enabling remote monitoring and timely intervention by caregivers.

Compared to existing methods, the proposed system offers a more efficient, user-friendly, and cost-effective approach to medication management [2][6]. It reduces dependency on manual supervision and provides a practical solution for elderly patients, individuals with chronic illnesses, and busy users.

This smart pill dispenser represents a significant step toward modern health care solutions by combining automation, accuracy, and connectivity. It has the potential to improve quality of life, ensure better medical compliance, and serve as a foundation for future advancements in smart healthcare systems.

REFERENCES

1. Vellela, S. S., & Balamanigandan, R. (2024). Optimized clustering routing framework to maintain the optimal energy status in the wsn mobile cloud environment. Multimedia Tools and Applications, 83(3), 7919-7938.
2. Vellela, S. S., & Balamanigandan, R. (2023). An intelligent sleep-awake energy management system for wireless sensor network. Peer-to-Peer Networking and Applications, 16(6), 2714-2731.
3. Vellela, S. S., & Balamanigandan, R. (2024). An efficient attack detection and prevention approach for secure WSN mobile cloud environment. Soft Computing, 28(19), 11279-11293.
4. Vellela, S. S. (2023). Enhanced speckle noise reduction in breast cancer ultrasound imagery using a hybrid deep learning model. Ingénierie des Systèmes d'Information.
5. Polasi, P. K., Vellela, S. S., Narayana, J. L., Simon, J., Kapileswar, N., Prabu, R. T., & Rashed, A. N. Z. (2026). Data rates transmission, operation performance speed and figure of merit signature for various quadurature light sources under spectral and thermal effects. Journal of Optics, 55(1), 633-643.
6. Praveen, S. P., Nakka, R., Chokka, A., Thatha, V. N., Vellela, S. S., & Sirisha, U. (2023). A novel classification approach for grape leaf disease detection based on different attention deep learning techniques. International Journal

Doi:10.48047/ijiee.2026.16.2.36

of Advanced Computer Science and Applications (IJACSA), 14(6), 2023.
7. Vellela, S. S., Rao, M. V., Mantena, S. V., Reddy, M. J., Vatambeti, R., & Rahman, S. Z. (2024). Evaluation of Tennis Teaching Effect Using Optimized DL Model with Cloud Computing System. International Journal of Modern Education and Computer Science (IJMECS), 16(2), 16-28.
8. Vellela, S. S., & Krishna, A. M. (2020). On Board Artificial Intelligence With Service Aggregation for Edge Computing in Industrial Applications. Journal of Critical Reviews, 7(07).
9. Madhuri, A., Jyothi, V. E., Praveen, S. P., Sindhura, S., Srinivas, V. S., & Kumar, D. L. S. (2024). A new multi-level semi-supervised learning approach for network intrusion detection system based on the 'goa'. Journal of Interconnection Networks, 24(supp01), 2143047.
10. Raju, V. V. K., Bhavani, Y. V. K. D., Nandikonda, P., Kareemunnisa, F. N. U., Brahmeswara, K. B., & Sindhura, S. (2026). Iterative and Statistical Analytical Review of Predictive Modeling Approaches in Educational Systems: A Comprehensive Benchmark of AI-Driven Methods. International Journal of Innovative Technology and Interdisciplinary Sciences, 9(1), 490-522.
11. Biyyapu, N., Veerapaneni, E. J., Surapaneni, P. P., Vellela, S. S., & Vatambeti, R. (2024). Designing a modified feature aggregation model with hybrid sampling techniques for network intrusion detection. Cluster Computing, 27(5), 5913-5931.
12. Praveen, S. P., Vellela, S. S., & Balamanigandan, R. (2024). SmartIris ML: harnessing machine learning for enhanced multi-biometric authentication. Journal of Next Generation Technology (ISSN: 2583-021X), 4(1).
13. Vuyyuru, L. R., Purimetla, N. R., Reddy, K. Y., Vellela, S. S., Basha, S. K., & Vatambeti, R. (2025). Advancing automated street crime detection: a drone-based system integrating CNN models and enhanced feature selection techniques. International Journal of Machine Learning and Cybernetics, 16(2), 959-981.
14. Vellela, S. S., Roja, D., Purimetla, N. R., Thalakola, S., Vuyyuru, L. R., & Vatambeti, R. (2025). Cyber threat detection in industry 4.0: Leveraging GloVe and self-attention mechanisms in BiLSTM for enhanced intrusion detection. Computers and Electrical Engineering, 124, 110368.
15. Vellela, S. S., Pushpalatha, D., Sarathkumar, G., Kavitha, C. H., & Harshithkumar, D. (2023). Advanced intelligence health insurance cost prediction using random forest. ZKG International, 8.
16. Vellela, S. S., Babu, B. V., & Mahendra, Y. B. (2024). IoT-based tank water monitoring systems: enhancing efficiency and sustainability. International Journal for Modern Trends in Science and Technology, 10(02), 291-298.
17. Vellela, S. S., Varshini, K., Jeevana, M., Kadheer, S. K., & Kumar, T. P. (2024). Iot based smart irrigation and controlling system. IoT Based Smart Irrigation and Controlling System, International Journal for Modern Trends in Science and Technology, 10(02), 77-85.
18. Vellela, S. S., Chaganti, A., Gadde, S., Bachina, P., & Karre, R. (2022). A Novel Approach for Detecting Automated Spammers in Twitter. Mukt Shabd, 11, 49-53.
19. Vellela, S. S., Narapasetty, S., Somepalli, M., Merikapudi, V., & Pathuri, S. (2022). Fake News Articles Classifying Using Natural Language Processing to Identify in-article Attribution as a Supervised Learning Estimator. Mukt Shabd Journal, 11.
20. Vellela, S. S., Vineeth, S., & Suresh, V. (2024). IoT Based ICU Patient Monitoring System. IoT Based ICU Patient Monitoring System, International Journal for Modern Trends in Science and Technology, 10(02), 265-273.
21. Vellela, S. S., & Balamanigandan, R. (2025). Designing a Dynamic News App Using Python. Available at SSRN 5250912.

Doi:10.48047/ijiee.2026.16.2.36

22. Vellela, S. S., Rao, M. V., Krishna, C. V. M., Rao, T. S., & Dasthavejula, R. (2026). Piezoelectric and Shape-Memory Materials for Actuators and Energy Harvesting in Mechanical, Electronics, and Biomedical Engineering Using AI-Based Design. In Advanced Materials for Biomedical Devices (pp. 195-206). CRC Press.
23. Vellela, S. S., Singu, K., Kakarla, L. S., Tadikonda, P., & Sattenapalli, S. N. R. (2025). NLP-Driven Summarization: Efficient Extraction of Key Information from Legal and Financial Documents. Available at SSRN 5250908.
24. Vellela, S. S., Anusha, P., Vullam, N. R., Jala, J., Bellapu, V. S., & Vindhya, A. S. (2025, October). Quantum Cryptography and Key Distribution for Secure Communication in the Post Quantum World. In 2025 International Conference on Sustainable Communication Networks and Application (ICSCN) (pp. 619-624). IEEE.
25. Roja, D., Jidugu, S. K., Rao, T. S., Vuyyuru, L. R., Vellela, S. S., & Ranjani, B. S. (2025, December). High-Fidelity Image Synthesis using Enhanced Generative Adversarial Networks with Attention Mechanisms. In 2025 International Conference on NexGen Networks and Cybernetics (IC2NC) (pp. 885-890). IEEE.
26. Vellela, S. S., Vuyyuru, L. R., Jidugu, S. K., Rao, M. P., & Srinivas, B. R. (2025, November). The Impact Of Quantum Computing On Blockchain Security And Quantum Resistant Protocols. In 2025 2nd International Conference on Intelligent Systems for Cybersecurity (ISCS) (pp. 1-6). IEEE.
27. Yanamadala, N., & Vellela, S. S. (2025, June). Ensuring Authenticity and Confidentiality in Images using SHA-ECC Fusion. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 684-689). IEEE.
28. Vellela, S. S. (2024). A Comprehensive Review of AI Techniques in Serious Games: Decision Making and Machine Learning.
29. Burra, R. S., APCV, G. R., & Vellela, S. S. (2024). Strategic Insights: Unleashing the Power of Big Data Analytics for Credit Investigation and Risk Mitigation in Commercial Banking. International Journal of Progressive Research in Engineering Management and Science, 4(01), 458-464.
30. Vellela, S. S., Purimetla, N. R., Vindhya, A. S., Vullam, N. R., Srinivas, B. R., & Vuyyuru, L. R. (2025, October). Design and Simulation of Quantum Error Correction Codes for Scalable Quantum Architectures. In 2025 7th International Conference on Innovative Data Communication Technologies and Application (ICIDCA) (pp. 1570-1575). IEEE.
31. Vellela, S. S., Purimetla, N. R., Rao, P. V., Daniel, V. A. A., Koppolu, H. K. R., & Janani, B. (2025). AI-Enabled Wearable Hemodynamic Monitoring System for Early Identification of Thrombotic Events. Vascular and Endovascular Review, 8(16s), 321-336.
32. Venkatesh, N., Maheswari, S., & Triveni, P. (2024). Harnessing IoT for Real-Time Plant Health Monitoring: Challenges and Opportunities.
33. Reddy, B. V., Kumar, A. H., Gopi, C., Prasad, Y. V. D., Vellela, S. S., & Roja, D. (2025, April). Machine learning based automated liver fibrosis stage diagnosis with prediction. In 2025 International Conference on Advances in Modern Age Technologies for Health and Engineering Science (AMATHE) (pp. 1-6). IEEE.
34. Rao, M. V., Sreeraman, Y., Mantena, S. V., Gundu, V., Roja, D., & Vatambeti, R. (2024). Brinjal Crop yield prediction using Shuffled shepherd optimization algorithm based ACNN-OBDLSTM model in Smart Agriculture. Journal of Integrated Science and Technology, 12(1), 710-710.
35. Haritha, K., Geethika, N. S., Venkateswarlu, K., Kumar, R. H., & Ramakrishna, Y. Enhancing Public Safety with AI & ML-Based CCTV Surveillance.
36. Haritha, K., Prakash, P. B., Pravallika, D., Venkatesh, K., & Venkatesh, G. Enhancing Object Detection in Autonomous Vehicles

Doi:10.48047/ijiee.2026.16.2.36

Under Low-Light Conditions Using Federated Learning and YOLOv5.
37. Ram, C. S., Vellela, S. S., Sravanthi Javvadi, D. V., Rashid, S. Z., & Madhumathi, S. M. (2025). Integrated Robotic–Imaging Platforms in Endovascular Surgery: Current Capabilities and Future Directions. Vascular and Endovascular Review, 8(16s), 285-298.
38. Roja, D., Navya, G., Srujana, B. S., Mamatha, P., & Sai, C. Y. K. Deep Learning for Hotel Reviews: A Framework for Sentiment Classification and Fake Review Detection.
39. Pakalapati, S., Rani, C. J., Vellela, S. S., Thanuja, N., & Bindu, M. N. H. (2025, November). Progressive GAN-based Framework for Realistic Image Generation and Style Transfer. In 2025 5th International Conference on Evolutionary Computing and Mobile Sustainable Networks (ICECMSN) (pp. 474-479). IEEE.
40. Balamanigandan, R., Vellela, S. S., Gorintla, S., Vuyyuru, L. R., Thanuja, N., & Rao, T. S. (2025, September). Quantum-Enhanced Data Security for Electronic Health Records: A Framework for Post-Quantum Cryptography in Healthcare Systems. In 2025 6th International Conference on Smart Electronics and Communication (ICOSEC) (pp. 1924-1929). IEEE.
41. Roja, D., Amulya, P., Nagasai, M., Prasad, D. D., & Babu, A. V. Machine Learning-Based Early Diagnosis of Fish Diseases via Water Quality Data.
42. Sai, M. B., & Vellela, S. S. (2025, December). Hybrid ML Driven Multi-Cloud Service Work Load Prediction For Financial Systems. In 2025 1st International Conference on Advancement in Futuristic Technologies (ICAFT) (pp. 1-6). IEEE.
43. Kareemunnisa, D., Haritha, K., Ranjani, B. S., Venkateswarlu, K., & Bindu, M. N. H. DUAL-STAGE PRIVACY PROTECTION FOR GRAPH NEURAL NETWORKS AGAINST INFERENCE ATTACKS.
44. Mandava, R., Haritha, K., Vellela, S. S., Purimetla, N. R., Mohan, B. K., & Harinadh, T. (2025, June). Analysing User Perceptions of Trust in Financial Systems Using Explainable AI. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 26-30). IEEE.

Doi:10.48047/ijiee.2026.16.2.36