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Automatic Platform Bridge in Railways

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ABSTRACT: Railway platforms are often challenging to navigate for elderly and differently-abled passengers, especially during train arrivals and departures. This project proposes an Automatic Platform Bridge System designed to provide safe and convenient crossing at railway stations. The system integrates IR sensors to detect approaching trains, enabling the bridge to respond automatically to real-time conditions. DC motors are employed to control the movement of the bridge, allowing smooth and reliable opening and closing without manual intervention. LED indicators provide visual alerts to passengers, signaling when it is safe to cross or when train movement is imminent. The system architecture ensures synchronization between train detection and bridge operation, preventing accidents and unauthorized access during unsafe periods. Data from the sensors is continuously monitored to facilitate fail-safe operations, ensuring the bridge remains stationary in emergency situations. The design emphasizes low-cost, energy-efficient components for scalability and ease of implementation in small to medium railway stations. By automating bridge operation, the system reduces reliance on human operators, minimizes operational delays, and enhances platform safety. The proposed solution demonstrates the integration of IoT, sensor technology, and automation for practical applications in railway infrastructure. Experimental results indicate that the system responds promptly to train detection, maintains stability during bridge movement, and provides clear visual signaling to passengers. This approach improves accessibility, enhances passenger safety, and promotes efficient station management. The system can be further extended with remote monitoring and additional safety features for large-scale railway networks.

KEYWORDS: Automatic Footbridge System, Railway Safety, IR Sensors, Embedded Systems, Platform Automation

I. INTRODUCTION

Railway transportation plays a crucial role in the economic and social development of many countries. It is one of the most efficient, affordable, and reliable modes of transportation for both passengers and goods. Millions of people rely on railway systems every day to travel between cities, towns, and rural areas. Railway stations therefore serve as important transit points where passengers board, disembark, and move between platforms.

With the increasing number of passengers using railway services, the safety and convenience of railway stations have become a major concern. One of the common challenges faced by passengers is the difficulty in safely crossing from one platform to another. Although railway stations often provide foot overbridges, subways, or designated crossing areas, these facilities may not always be accessible or convenient for all passengers.

Many passengers, especially in small and medium railway stations, tend to cross railway tracks directly instead of using the designated footbridge or subway. This practice is extremely dangerous, particularly during train arrivals or departures. Accidents caused by unsafe crossing continue to be a major issue in railway environments. Therefore, there is a strong need for improved infrastructure and automated systems that enhance passenger safety while ensuring smooth movement across platforms.

II.PROBLEM STATEMENT

The Automatic Footbridge Platform System operates through a coordinated sequence of sensor detection, signal processing, and mechanical control.

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Initially, the IR sensors continuously monitor the railway track area near the platform. When no train is detected, the system allows the bridge to remain open, enabling passengers to cross safely between platforms.
When a train approaches the station, the sensors detect its presence and send a signal to the control system. The control unit then activates the DC motor to close or retract the bridge, preventing passengers from crossing the track.

At the same time, LED indicators display warning signals to inform passengers that crossing is unsafe. After the train has passed and the sensors confirm that the track is clear, the system automatically reopens the bridge and the LED indicators switch to safe mode. This synchronized operation ensures that passengers can only cross when it is safe to do so.

III. EXISTING SYSTEM

In the existing railway station system, passengers usually cross from one platform to another using foot overbridges, subways, or by directly walking across the railway tracks. Foot overbridges are commonly provided in many railway stations to ensure safe movement between platforms. However, in smaller railway stations, these facilities may be limited, inconvenient, or located far from the passenger waiting areas.

Due to these reasons, many passengers prefer to cross the railway tracks directly instead of using the footbridge. This practice is extremely dangerous, especially when trains are approaching or departing from the station. Accidents may occur because passengers fail to notice the approaching train or misjudge the train's speed. In some stations, railway staff monitor passenger movement and provide warnings when trains are approaching. Public announcements and warning boards are also used to alert passengers. However, these systems depend heavily on manual supervision and passenger attention. Human errors, lack of continuous monitoring, and passenger negligence can still lead to unsafe crossing situations.

Another drawback of the existing system is the difficulty faced by elderly and differently-abled passengers in climbing stairs to use foot overbridges. This often encourages them to cross the railway tracks directly, increasing the risk of accidents. Therefore, the traditional platform crossing system lacks automation, continuous monitoring, and effective safety control mechanisms.

IV.PROPOSED SYSTEM

The proposed system introduces an **Automatic Footbridge Platform System** designed to improve passenger safety and accessibility in railway stations. The system uses sensor technology and automated mechanisms to control a bridge that allows passengers to cross between platforms safely. The system utilizes **Infrared (IR) sensors** to detect the presence of approaching trains near the railway platform. These sensors continuously monitor the railway track and send signals to the control unit when a train is detected. Based on the sensor input, the control system determines whether it is safe for passengers to cross. When no train is approaching, the bridge remains open, allowing passengers to cross safely between platforms. However, when a train is detected, the system automatically activates a **DC motor** to close or retract the bridge, preventing passengers from crossing the railway track. At the same time, **LED indicators** provide visual signals to passengers. A red LED indicates that a train is approaching and crossing is not allowed, while a green LED indicates that it is safe for passengers to cross.

Once the train has passed and the sensors confirm that the track is clear, the system automatically reopens the bridge and the LED indicators change to the safe crossing signal. The proposed system operates automatically without requiring manual supervision. This reduces the chances of human error and ensures a quick response to train movements. The system is also designed using low-cost and energy-efficient components, making it suitable for implementation in small and medium railway stations.

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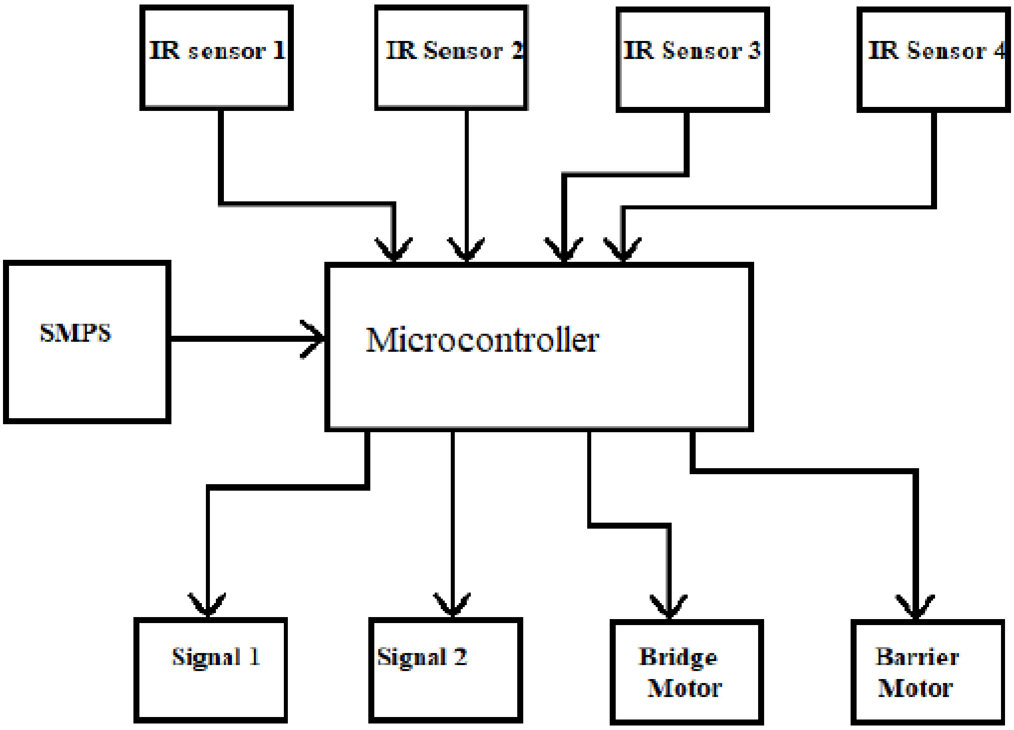
V. BLOCK DIAGRAM



VI. WORKING

An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits. An important aspect of the Arduino is the standard way that connectors are exposed, allowing the CPU board to be connected to a variety of interchangeable add-on modules known as shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²C serial bus, allowing many shields to be stacked and used in parallel. Official Arduinos have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. A handful of other processors have been used by Arduino compatibles. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer.

At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version. Serial Arduino boards contain a level shifter circuit to convert between RS-232-level and TTL-level signals. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. Some variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. (When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used.)

VII. SOFTWARE INSTALLATION

Software is an essential component in the development of embedded systems and IoT-based applications. It acts as the interface between the hardware components and the user, allowing the system to perform specific tasks automatically. In embedded systems, software is responsible for controlling sensors, processing data, managing communication modules, and executing programmed instructions to achieve the desired functionality. In most embedded and IoT projects, the microcontroller is programmed using specialized software tools that allow developers to write, compile,

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and upload programs to the hardware device. The efficiency of the software determines how effectively the system can collect data from sensors, process it, and control output devices.

For many embedded projects, **Arduino IDE** is used as the development environment, while **Embedded C** is used as the programming language. These tools provide a simple and flexible platform for designing and implementing embedded applications. The software continuously monitors input signals from sensors and performs operations based on predefined conditions. It also enables communication between the system and external devices such as displays, IoT platforms, or mobile applications. Proper software design ensures that the system operates reliably, responds quickly to changing conditions, and performs its functions efficiently. Therefore, selecting the right programming tools and developing optimized code are important aspects of embedded system development.

VIII. RESULT AND ANALYSIS

The Automatic Footbridge Platform System was developed and tested to evaluate its performance in detecting train movement and controlling the bridge mechanism. The system was implemented using IR sensors, a microcontroller programmed with Embedded C using Arduino IDE, a DC motor for bridge movement, and LED indicators for passenger alerts. During testing, the IR sensors successfully detected the presence of an approaching train model placed near the railway track area. When the sensor detected the train, the microcontroller processed the input signal and activated the DC motor to close the bridge automatically. At the same time, the LED indicator changed from green to red to warn passengers that crossing was not allowed.

After the train passed and the sensors detected that the track was clear, the system reopened the bridge automatically. The LED indicator changed back to green, indicating that passengers could safely cross the platform. The experimental results demonstrated that the system responded quickly and accurately to train detection. The synchronization between sensor detection and bridge movement was stable and reliable. The automated operation reduced the need for manual supervision and ensured consistent safety control. The LED indicators provided clear visual signals, making it easy for passengers to understand the system status. Overall, the system performed effectively in providing a safe and automated platform crossing mechanism.

IX. CONCLUSION

The Automatic Footbridge Platform System on Railway is designed to improve passenger safety and accessibility at railway stations. The project demonstrates how automation, sensor technology, and embedded systems can be used to enhance railway infrastructure. The proposed system uses IR sensors to detect approaching trains and automatically controls the movement of a bridge using a DC motor. LED indicators provide visual alerts to passengers, ensuring that they are informed about safe and unsafe crossing conditions.

The implementation of this system helps prevent accidents caused by unsafe track crossing and reduces reliance on manual supervision. The use of low-cost components makes the system practical for deployment in small and medium railway stations. The experimental results show that the system successfully detects train movement and responds quickly by controlling the bridge mechanism. The automated design improves reliability, efficiency, and passenger safety. Overall, the project demonstrates a practical and innovative solution for safer railway platform crossing. With further development and integration of advanced technologies such as IoT and remote monitoring, the system can be expanded for large-scale railway networks in the future.

REFERENCES

1. Ahmed Salih Mahdi Al-Zuhairi, "Automatic Railway Gate and Crossing Control Based Sensors & Microcontroller," International Journal of Computer Trends and Technology, 2013.
2. A. Allwyn Clarence Asis, Mathavasuthan S., Ram Prabhu S., "Automated Pedestrian Crossing for the Safety of Disabled People in Railway Platform Using Microcontroller," Journal of Microprocessor and Microcontroller Research, 2024.
3. Priyadarshi Guha, Sukanya Kool, Rishabh Pipalwa, Aakash Acharjee, Abhijit Paul, "A Prototype Model of an Unmanned Automated Railway Level Crossing Traffic Control System Using Ultrasonic and Infrared Sensors," International Journal of Wireless and Mobile Computing, 2024.

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4. B. S. Dhande, U. S. Pacharaney, "Railway Management System Using IR Sensors and Internet of Things Technology," International Journal of Scientific Research in Network Security and Communication, 2017.
5. Md Hasan, Arifur Rahaman, Md Saidul Hasan, Turjaun Akter Onika, Yeakob Ali, Abhijit Pathak, "Automated Railway Crossing System Using Multi-Sensor Integration for Enhanced Safety," Internet of Things and Cloud Computing, 2025.
6. Michael Margolis, "Arduino Cookbook," O'Reilly Media, 2011.
7. Simon Monk, "Programming Arduino: Getting Started with Sketches," McGraw-Hill Education, 2016.
8. C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor &Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011. DOI: 10.1080/15325008.2010.541746
9. C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of Electrical Engineering, Vol.63 (6), pp.365-372, Dec.2012. DOI: 10.2478/v10187-012-0054-2
10. C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011. DOI 10.1007/s00202-011-0203-9
11. S.Tamilselvi, R.Prakash, C.Nagarajan,"Solar System Integrated Smart Grid Utilizing Hybrid Coot-Genetic Algorithm Optimized ANN Controller" Iranian Journal Of Science And Technology-Transactions Of Electrical Engineering, DOI10.1007/s40998-025-00917-z,2025
12. S.Tamilselvi, R.Prakash, C.Nagarajan," Adaptive sliding mode control of multilevel grid-connected inverters using reinforcement learning for enhanced LVRT performance" Electric Power Systems Research 253 (2026) 112428, doi.org/10.1016/j.epsr.2025.112428
13. S.Thirunavukkarasu, C. Nagarajan, 2024, "Performance Investigation on OCF and SCF study in BLDC machine using FTANN Controller," Journal of Electrical Engineering And Technology, Volume 20, pages 2675–2688, (2025), doi.org/10.1007/s42835-024-02126-w
14. C. Nagarajan, M.Madheswaran and D.Ramasubramanian- 'Development of DSP based Robust Control Method for General Resonant Converter Topologies using Transfer Function Model'- Acta Electrotechnica et Informatica Journal , Vol.13 (2), pp.18-31,April-June.2013, DOI: 10.2478/aeei-2013-0025.
15. C.Nagarajan and M.Madheswaran - 'DSP Based Fuzzy Controller for Series Parallel Resonant converter'- Springer, Frontiers of Electrical and Electronic Engineering, Vol. 7(4), pp. 438-446, Dec.12. DOI 10.1007/s11460-012-0212-0.
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. C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007
18. Suganthi Mullainathan, Ramesh Natarajan, "An SPSS and CNN modelling based quality assessment using ceramic materials and membrane filtration techniques", Revista Materia (Rio J.) Vol. 30, 2025, DOI: https://doi.org/10.1590/1517-7076-RMAT-2024-0721
19. M Suganthi, N Ramesh, "Treatment of water using natural zeolite as membrane filter", Journal of Environmental Protection and Ecology, Volume 23, Issue 2, pp: 520-530,2022
20. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems," Pearson Education, 2013.
21. K. V. K. K. Prasad, "Embedded Real Time Systems: Concepts, Design and Programming," Dreamtech Press, 2017.
22. Raj Kamal, "Embedded Systems: Architecture, Programming and Design," McGraw-Hill Education, 2018.
23. **Kiran, A., Rubini, P., & Kumar, S. S. (2025).** Comprehensive review of privacy, utility and fairness offered by synthetic data. IEEE Access.
24. **Gopinathan, V. R. (2024).** Real-Time Financial Risk Intelligence Using Secure-by-Design AI in SAP-Enabled Cloud Digital Banking. International Journal of Computer Technology and Electronics Communication, 7(6), 9837-9845.
25. **Udayakumar, R., Elankavi, R., Vimal, R., & Sugumar, R. (2023).** Improved Particle Swarm Optimization with Deep Learning-Based Municipal Solid Waste Management in Smart Cities. Environmental & Social Management Journal, 17(4).
26. **Anand, L. (2023).** An Intelligent AI and ML–Driven Cloud Security Framework for Financial Workflows and Wastewater Analytics. International Journal of Humanities and Information Technology, 5(02), 87-94.
27. **Soundappan, S. J. (2020).** Big Data Analytics in Healthcare: Applications for Pandemic Forecasting. International Journal of Advanced Research in Computer Science & Technology, 3(1), 2248-2253.

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28. **Rajasekar, M. (2024).** Real-Time Predictive DevOps Intelligence for Risk-Aware Digital Business Processes in Cloud and SAP Ecosystems. International Journal of Advanced Research in Computer Science & Technology, 7(4), 10713-10718.
29. **Poornima, G., & Anand, L. (2024, May). Novel AI Multimodal Approach for Combating Against Pulmonary Carcinoma. In 2024 5th International Conference for Emerging Technology (INCET) (pp. 1-6). IEEE.**
30. **Prabha, P. S., & Rengarajan, A. (2025).** Adaptive Cloud Resource Allocation Using Attention-Driven Deep Reinforcement Learning. Engineering, Technology & Applied Science Research, 15(6), 29334-29340.
31. **Jagadeesh, S., & Sugumar, R. (2017).** A Comparative study on Artificial Bee Colony with modified ABC algorithm. European Journal of Applied Sciences, 9(5), 243-248.
32. **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.**
33. **Kumar, S. A., & Anand, L. (2025). A Novel EEG-Based Deep Learning Framework for Enhancing Communication in Locked-In Syndrome Using P300 Speller and Attention Mechanisms. KSII TRANSACTIONS ON INTERNET AND INFORMATION SYSTEMS, 19(11), 3841-3855.**
34. **Poornima, G., & Anand, L. (2025). Medical image fusion model using CT and MRI images based on dual scale weighted fusion based residual attention network with encoder-decoder architecture. Biomedical Signal Processing and Control, 108, 107932.**
35. **Archana, R., & Anand, L. (2025). Residual u-net with Self-Attention based deep convolutional adaptive capsule network for liver cancer segmentation and classification. Biomedical Signal Processing and Control, 105, 107665.Kumar, S. A., & Anand, L. (2025).** A Novel EEG-Based Deep Learning Framework for Enhancing Communication in Locked-In Syndrome Using P300 Speller and Attention Mechanisms. KSII Transactions on Internet and Information Systems, 19(11), 3841-3855.
36. **Rengarajan, A. (2025).** Cloud-Based AI-Driven Threat Detection Framework for Smart Grid Cybersecurity. International Journal of Future Innovative Science and Technology, 8(6), 16065.
37. **Murugeshwari, B., Sudharson, K., Panimalar, S. P., Shanmugapriya, M., & Abinaya, M. (2020).** SAFE–Secure Authentication in Federated Environment using CEG Key code.
38. **Raj A. A., & Sugumar, R. (2023).** Early Detection of COVID-19 with Impact on Cardiovascular Complications using CNN Utilising Pre-Processed Chest X-Ray Images. 2023 International Conference on Applied Intelligence and Sustainable Computing (ICAISC), IEEE.
39. **Jagadeesh, S., & Sugumar, R. (2017). A Comparative study on Artificial Bee Colony with modified ABC algorithm. European Journal of Applied Sciences, 9(5), 243-248.**
40. **Selvi, G. V., Anbarasan, A. B., Murthy, B. A., & Prabavathy, S. (2023).** An Application Oriented Integrated Unequal Clustering Algorithm for Wireless Sensor Network. In Underwater Vehicle Control and Communication Systems Based on Machine Learning Techniques (pp. 140-154). CRC Press.
41. **Sruthi, R. S., Ananya, S., & Murugeshwari, B. (2010).** Web Based Virtual Control System Laboratory and On-Line Temperature Control of Electrophoresis Equipment using LabVIEW. International Journal of Computer Applications, 975, 8887.
42. **Vimal Raja, G. (2021).** Mining Customer Sentiments from Financial Feedback and Reviews using Data Mining Algorithms. International Journal of Innovative Research in Computer and Communication Engineering, 9(12), 14705-14710.
43. MATHEW, A. R. (2025). Neurosecurity and Brain-Computer Interfaces.
44. Soundappan, S. J. (2024). AI-Driven Customer Intelligence in Enterprise Lakehouse Systems Sentiment Mining Governance-Aware Analytics and Real-Time Data Synchronization. International Journal of Advanced Engineering Science and Information Technology (IJAESIT), 7(5), 14905.
45. Mathew, A. (2025). Human–AI Collaboration in Security Operations: Measuring Alert Trust, Automation Bias, and Analyst Upskilling in AI-Augmented SOC Environments. International Journal of Computer Technology and Electronics Communication, 8(5), 11375-11380.
46. Soundappan, S. J. (2022). AI-Based Fault Detection and Isolation for Reliability in Modern Power Systems. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 5(4), 7106-7110.
47. **Poornima, G., & Anand, L. (2024, April). Effective Machine Learning Methods for the Detection of Pulmonary Carcinoma. In 2024 Ninth International Conference on Science Technology Engineering and Mathematics (ICONSTEM) (pp. 1-7). IEEE.Garg, V. K., Soundappan, S. J., & Kaur, E. M. (2020).** Enhancement in intrusion detection system for WLAN using genetic algorithms. South Asian Research Journal of Engineering and Technology, 2(6), 62–64.

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| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802266

48. Rengarajan, A., Jayakumar, C., & Sugumar, R. (2012). Optimization Of Recent Attacks Using Internet Protocol. National Journal of System and Information Technology, 5(1), 8.

49. Mathew, A. (2024). AI TRiSM: Trust, Risk, and Security Management in Cybersecurity. Cybersecurity, 4(3), 84-90.

50. Mathew, A. (2025). Deep seek vs. ChatGPT: A deep dive into AI Language mastery. Int J Multidisciplinary Res, 7(1), 1-5.