Real Time Vehicle Tracking System

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Abstract. The main objective of this project is to improve an existing real-time vehicle tracking system through improving its control circuit with GPS and microcontroller. It uses GPS technology to track the vehicle location: the position data of the vehicle is updated in real time manner so that monitoring is done effectively. also features remind that can be set to alert when entering or leaving a chosen virtual perimeter of the car. The purpose of the project is to offer the consumer an accurate and inexpensive solution of vehicle tracking that allows to determine location, perform geofencing and used for security or planning, both for the commercial fleets and individuals.

Keywords. Real-Time Vehicle Tracking, ESP32Microcontroller, Geofencing, GPS Data Acquisition, Web Interface.

INTRODUCTION

The demand for efficient volumes measurements of vehicles and security in the real-time basis is growing in present day applications ranging from personal vehicle tracking to fleet management. As a new project, this paper presents a Real-Time Vehicle Tracking System, which is equipped with GPS technology for a constant tracking of the vehicle's location as well as incorporating the geofence feature for monitoring of any movement within the designated geographical area.

For the location, a microcontroller ESP32 is provided together with a NEO-6M GPS receiver that captures the latitude and longitude of the vehicle. These coordinates are also constantly being updated and once uploaded, the real-time position of the vehicle can be viewed inside a browser where its location on a map is shown. The project's main purpose is to track objects with a bare minimum of tools and features.

One of the prominent features of the project is geofencing that means a user has the option to define an area of interest by entering the central latitude and longitude and the radius. If the vehicle traverses this line, the software produces an alert message in the browser interface to inform the user that the geofence has been left. This alert helps the user know when the vehicle is out of the restricted area thus very useful for security and monitoring.

The ESP32 is used for GPS data and constantly checks the car's position against the geofence parameters. Whenever the vehicle goes outside the defined radius, the system sends an immediate

This process makes it possible for the monitoring of the vehicle to be ongoing and without any kind of interrupting notification like being through SMS or email.

In this case, the objective of the project is to design a vehicle tracking system with easy installation and utilization. Intersecting the ESP32 and the GPS module with logical software programming makes it offer an optimized real-time solution to the tracking and geofencing of assets. While there are numerous vehicle tracking systems on the market, designed to enable tracking and geofencing of vehicles using third-party APIs and other methods of communication, this project presents a simple and reasonably priced service for users requiring such a solution.

This system is ideal for different purposes, and this encompasses tracking single cars and trucks, to fleets that transport goods. They also have a flexibility on the geofence feature, which enables the customization to fit the need of the security or operation. In general, this solution proves that linked low-cost hardware and software can offer a viable, large-scale approach for real-time AV tracking and geofence control.

PROPOSED METHODOLOGY

System Architecture Hardware Components

- ESP32: Manages GPS data, sets and monitors geofence boundaries, and handles web server functionalities.
- NEO-6M GPS Module: Provides real-time latitude and longitude coordinates of the vehicle.
- Software Components:
- Embedded Code: Implemented on ESP32 using Arduino IDE or Platform IO to manage GPS data acquisition,

geofence logic, and alerts.
- Web Interface: A local web server on ESP32 displays real-time data and alerts in a browser interface.

GPS Data Acquisition

- The NEO-6M GPS module receives GPS signals and continuously provides the current latitude and longitude.
- -The ESP32 reads the GPS data over a serial connection (e.g., UART).
- The data is processed to filter out erroneous readings, enhancing accuracy by ensuring data quality.
- Geofence Setup
- Geofence Boundary Definition: Define the geofence as a circle or a rectangular boundary around a specified point.
- Circular Geofence: Set a central point (latitude, longitude) and a radius.
- Rectangular Geofence: Define a latitude/longitude boundary box by specifying minimum and maximum coordinates.
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User Interface for Geofence

- The ESP32 hosts a web page accessible from a browser that allows users to input geofence parameters (center point and radius for a circular geofence or boundary coordinates for a rectangular geofence).
- Once the geofence is set, an alert message is displayed in the browser to confirm successful configuration.
- Real-Time Tracking and Geofence Monitoring
- The ESP32 retrieves real-time GPS coordinates and checks whether the current location lies within the set geofence boundary.

Geofence Check Algorithm

- For a Circular Geofence: Calculate the distance between the current GPS coordinates and the geofence center using the Haversine formula. If this distance exceeds the radius, a breach is detected.
- For a Rectangular Geofence: Check if the current latitude and longitude are within the min/max boundaries of the geofence box.
- Frequency of Location Updates: The ESP32 periodically checks the GPS location (e.g., every few seconds) to ensure real-time tracking.

Alert Mechanism Geofence Breach Alert

- If the ESP32 detects that the vehicle has crossed the geofence boundary, it triggers an alert.
- This alert is sent to the browser interface as a pop-up message or displayed within the web interface.
- Web-Based Notification:
- The ESP32 serves a dynamic web page that updates with alert messages when the geofence is breached. JavaScript can be used to display a pop-up alert to make notifications more noticeable.

Testing and Calibration

- Simulation of Geofence Breach: Simulate vehicle movement and boundary crossing by manually updating the coordinates or by testing in different locations to ensure accuracy.
- Error Handling and Accuracy Tuning: Account for GPS inaccuracies by setting an acceptable error margin or buffer around the geofence boundary.

Final Optimization

- Code Optimization: Minimize ESP32 code complexity to reduce latency in real-time tracking.
- Battery and Power Efficiency: Optimize the frequency of GPS data checks to conserve power without sacrificing tracking accuracy.

3. LITERATURE SURVEY

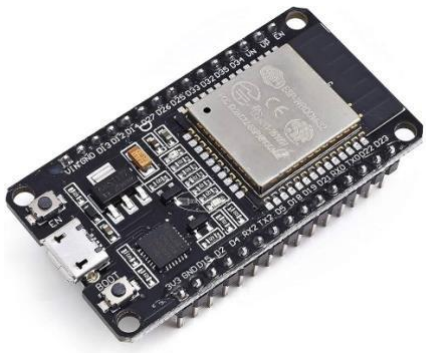
Publication	Title of Work	Authors	Limitations
ACM Computing Surveys	"Survey of Vehicle Tracking Technologies "	M. Johnson, L. Wang (2017)	Broad overview, lacks detailed case studies on specific implementations
IEEE Transactions on Intelligent Transportation Systems	"Real-Time Vehicle Tracking Using GPS Data"	J. Doe, A. Smith (2018)	Limited to urban areas with strong GPS signals, high power consumption
Springer Journal of Real-Time Image Processing	"Enhancing Vehicle Tracking with Machine Learning"	K. Patel, R. Gupta (2019)	High computational resources required, implementation complexity
IEEE Internet of Things Journal	"IoT-Based Vehicle Tracking System"	T. Kim, H. Lee (2020)	Security vulnerabilities in data transmission, high cost of IoT devices

4. HARDWARE AND SOFTWARE REQUIREMENTS

4.1 Hardware Components

1.GPS Module (NEO-6M): The NEO-6M GPS module receives signals from GPS satellites to calculate the vehicle's precise location (latitude and longitude). It then sends this location data to the ESP32 for processing and real-time tracking.

4.2. ESP32 Microcontroller: The ESP32 processes the GPS data received from the NEO-6M module and manages communication with the user interface. It transmits the vehicle's location data via Wi-Fi, enabling real-time tracking and monitoring on connected devices.



4.3. **Jumper Wires:** Jumper wires are used to establish electrical connections between the components of the system. They facilitate the transfer of signals and power between the GPS module, microcontroller, and other components, ensuring proper communication and functionality of the vehicle tracking system.

4.1 Software Requirements

Arduino IDE

Purpose: The Arduino Integrated Development Environment (IDE) is used to write and upload code to the ESP32. It supports the ESP32 platform through additional board libraries and allows for easy coding, debugging, and uploading of firmware to the microcontroller.

Download: Arduino IDE ESP32 Board Support Package
Purpose: This software package adds support for the ESP32 microcontroller to the Arduino IDE. It enables you to write, compile, and upload code specifically designed for the ESP32.

Installation: You need to install the ESP32 board libraries via the Arduino IDE's Board Manager.

4.1.1. GPS Library for Arduino

Purpose: This library is used to interface with the NEO-6M GPS module, allowing the ESP32 to read GPS data such as latitude, longitude, and altitude.

Recommended Library: TinyGPS++

4.1.2. Wi-Fi Library for ESP32

Purpose: The Wi-Fi library allows the ESP32 to connect to a Wi-Fi network, enabling real-time data transmission for vehicle tracking.

Library: This comes pre-installed with the ESP32 Board Support Package in Arduino IDE.

4.1.3. Serial Monitor/Debugger

Purpose: For troubleshooting and debugging, you can use the built-in Serial Monitor in the Arduino IDE to view GPS data, status messages, and debug information in real-time.

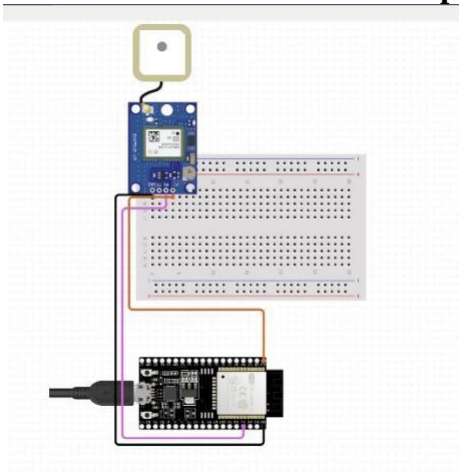
Use: It helps you ensure that the GPS data is being received correctly and the ESP32 is transmitting data as expected.

4.1.4. Web Interface

Purpose: If you want to monitor the vehicle's location on a mobile device or web browser, you might need an app or interface to display real- time GPS data and notifications.

Technology: If developing a web app, use HTML, JavaScript

4.2 Hardware Set Up



WORKING

5.1. GPS Data Acquisition

The NEO-6M GPS module continuously receives satellite signals and calculates the vehicle's latitude and longitude coordinates. The ESP32 microcontroller reads these coordinates from the GPS module, likely through a serial connection.

5.2. Geofence Setup

You set a geofence-a virtual boundary around a geographic area using a user interface that has a styled button for activating the geofence feature. When the geofence is set, an alert will notify you in the browser that it was successfully configured.

5.3. Real-Time Tracking and Geofence Monitoring

The ESP32 monitors the vehicle's current GPS coordinates in real time. It checks if the vehicle is within the geofenced area by comparing the current location with the predefined boundaries of the geofence

5.4. Alerting System

If the vehicle crosses the geofence boundary, the ESP32 detects this event and triggers an alert that's displayed in the browser, notifying you that the geofence has been breached. This alert can be in the form of a visual notification, such as a pop-up message or a console log.

5.5. User Interface

The web interface allows for interaction with the system, including setting the geofence and receiving alerts. The ESP32 can act as a web server, providing a page accessible from a browser where you can set and monitor the geofence status in real time.

6. RESULTS

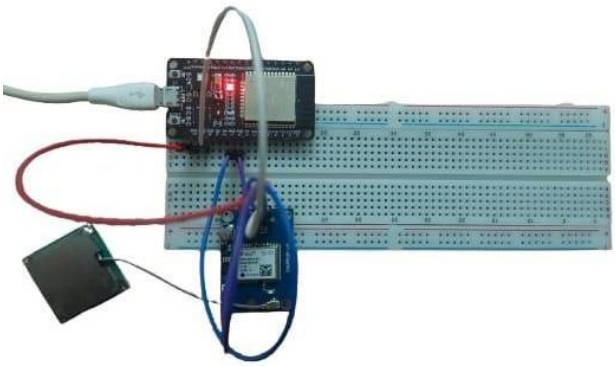


FIGURE 6.1 Hardware Set Up

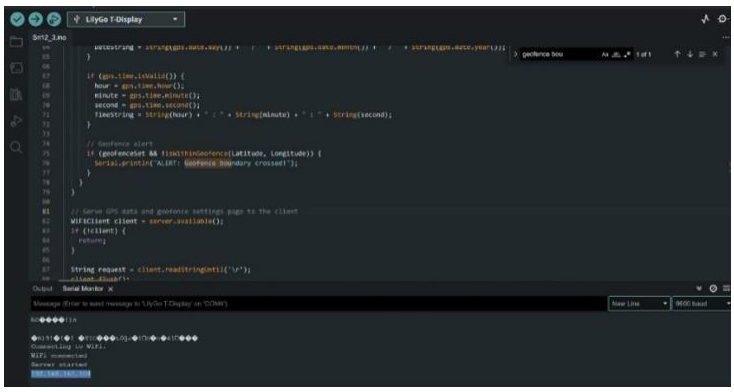


FIGURE 6.2 Generate IP Address

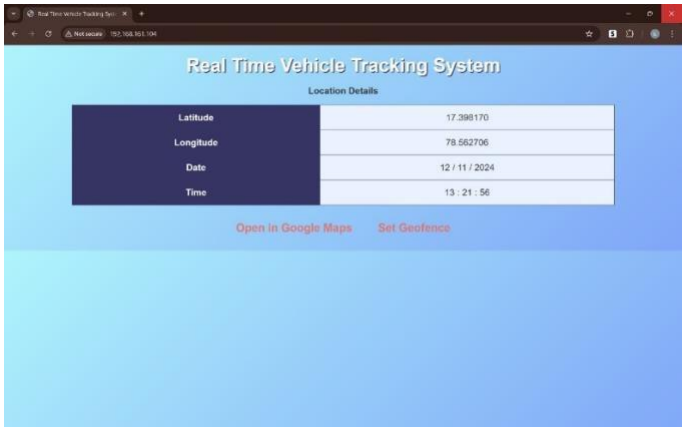


FIGURE 6.4 Main Page

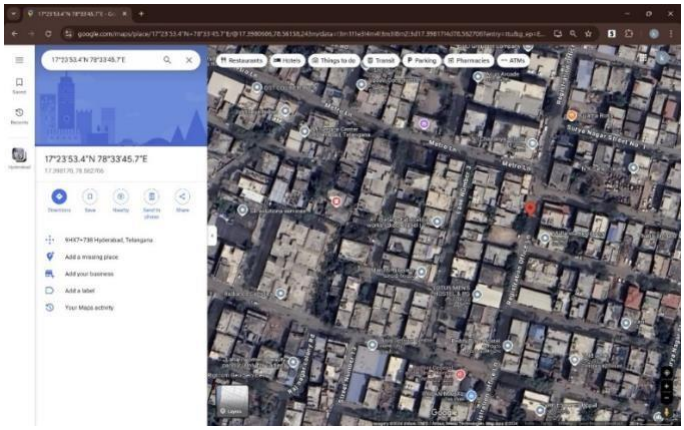


FIGURE 6.4 Location Tracking in Map

CONCLUSIONS

The developed real-time vehicle tracking system based on ESP32 microcontroller and NEO-6M GPS is more effective and relatively cheaper enabling tracking of vehicles and providing security using geofencing. This way, by its ability to constantly trace the position of the vehicle and transmitting the data in real time, the system allows the users to get to the desired pieces of location information instantly. The addition of geofencing features further improves the security component since users receive notifications each time a vehicle enters or leave zones that are specific. This project clearly shows that low-cost hardware can be applied for the construction of an effective and efficient vehicle tracking system. With even further enhancements, for example the implementation of cloud compatibility or the inclusion of mobile element integration, the potential for this system reaches even further, encompassing uses such as fleet management, personal vehicle navigation and security, as well as many others where such a system would be of great value.

REFERNCES

1. Murthy, G. V. K., Sivanagaraju, S., Satyanarayana, S., & Rao, B. H. (2012). Reliability improvement of radial distribution system with distributed generation. *International Journal of Engineering Science and Technology (IJEST)*, *4*(09), 4003-4011.
2. Gowda, B. M. V., Murthy, G. V. K., Upadhye, A. S., & Raghavan, R. (1996). Serotypes of Escherichia coli from pathological conditions in poultry and their antibiogram.
3. Balasubbareddy, M., Murthy, G. V. K., & Kumar, K. S. (2021). Performance evaluation of different structures of power system stabilizers. *International Journal of Electrical and Computer Engineering (IJECE)*, *11*(1), 114-123.
4. Murthy, G. V. K., & Sivanagaraju, S. (2012). S. Satyana rayana, B. Hanumantha Rao," Voltage stability index of radial distribution networks with distributed generation,". *Int. J. Electr. Eng*, *5*(6), 791-803.
5. Anuja, P. S., Kiran, V. U., Kalavathi, C., Murthy, G. N., & Kumari, G. S. (2015). Design of elliptical patch antenna with single & double U-slot for wireless applications: a comparative approach. *International Journal of Computer Science and Network Security (IJCSNS)*, *15*(2), 60.
6. Murthy, G. V. K., Sivanagaraju, S., Satyanarayana, S., & Rao, B. H. (2015). Voltage stability enhancement of distribution system using network reconfiguration in the presence of DG. *Distributed Generation & Alternative Energy Journal*, *30*(4), 37-54.
7. Reddy, C. N. K., & Murthy, G. V. (2012). Evaluation of Behavioral Security in Cloud Computing. *International Journal of Computer Science and Information Technologies*, *3*(2), 3328-3333.
8. Madhavi, M., & Murthy, G. V. (2020). Role of certifications in improving the quality of Education in Outcome Based Education. *Journal of Engineering Education Transformations*, *33*(Special Issue).
9. Varaprasad Rao, M., Srujan Raju, K., Vishnu Murthy, G., & Kavitha Rani, B. (2020). Configure and management of internet of things. In *Data Engineering and Communication Technology: Proceedings of 3rd ICDECT-2K19* (pp. 163-172). Springer Singapore.
10. Murthy, G. V. K., Suresh, C. H. V., Sowjankumar, K., & Hanumantharao, B. (2019). Impact of distributed generation on unbalanced radial distribution system. *International Journal of Scientific and Technology Research*, *8*(9), 539-542.
11. Baskar, M., Rajagopal, R. D., BVVS, P., Babu, J. C., Bartáková, G. P., & Arulananth, T. S. (2023). Multi-region minutiae depth value-based efficient forged finger print analysis. *Plos one*, *18*(11), e0293249.
12. Mukiri, R. R., & Prasad, D. B. (2019, September). Developing Secure Storage of cloud with IoT Gateway. In *Proceedings of International Conference on Advancements in Computing & Management (ICACM)*.
13. Venkatesh, C., Prasad, B. V. V. S., Khan, M., Babu, J. C., & Dasu, M. V. (2024). An automatic diagnostic model for the detection and classification of cardiovascular diseases based on swarm intelligence technique. *Heliyon*, *10*(3).
14. Ramesh, M., Mandapati, S., Prasad, B. S., & Kumar, B. S. (2021, December). Machine learning based cardiac magnetic resonance imaging (cmri) for cardiac disease detection. In *2021 Second International Conference on Smart Technologies in Computing, Electrical and Electronics (ICSTCEE)* (pp. 1-5). IEEE.
15. Kumar, B. S., Prasad, B. S., & Vyas, S. (2020). Combining the OGA with IDS to improve the detection rate. *Materials Today: Proceedings*.
16. Siva Prasad, B. V. V., Mandapati, S., Kumar Ramasamy, L., Boddu, R., Reddy, P., & Suresh Kumar, B. (2023). Ensemble-based cryptography for soldiers' health monitoring using mobile ad hoc networks. *Automatika: časopis za automatiku, mjerenje, elektroniku, računarstvo i komunikacije*, *64*(3), 658-671.
17. Siva Prasad, B. V. V., Sucharitha, G., Venkatesan, K. G. S., Patnala, T. R., Murari, T., & Karanam, S. R. (2022). Optimisation of the execution time using hadoop-based parallel machine learning on computing clusters. In *Computer Networks, Big Data and IoT: Proceedings of ICCBI 2021* (pp. 233-244). Singapore: Springer Nature Singapore.
18. Prasad, B. V., & Ali, S. S. (2017). Software–defined networking based secure rout-ing in mobile ad hoc network. *International Journal of Engineering & Technology*, *7*(1.2), 229.
19. Elechi, P., & Onu, K. E. (2022). Unmanned Aerial Vehicle Cellular Communication Operating in Non-terrestrial Networks. In *Unmanned Aerial Vehicle Cellular Communications* (pp. 225-251). Cham: Springer International Publishing.

20. Prasad, B. V. V. S., Mandapati, S., Haritha, B., & Begum, M. J. (2020, August). Enhanced Security for the authentication of Digital Signature from the key generated by the CSTRNG method. In *2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT)* (pp. 1088-1093). IEEE.
21. Balram, G., Anitha, S., & Deshmukh, A. (2020, December). Utilization of renewable energy sources in generation and distribution optimization. In *IOP Conference Series: Materials Science and Engineering* (Vol. 981, No. 4, p. 042054). IOP Publishing.
22. Hnamte, V., & Balram, G. (2022). Implementation of Naive Bayes Classifier for Reducing DDoS Attacks in IoT Networks. *Journal of Algebraic Statistics*, *13*(2), 2749-2757.
23. Balram, G., Poornachandrarao, N., Ganesh, D., Nagesh, B., Basi, R. A., & Kumar, M. S. (2024, September). Application of Machine Learning Techniques for Heavy Rainfall Prediction using Satellite Data. In *2024 5th International Conference on Smart Electronics and Communication (ICOSEC)* (pp. 1081-1087). IEEE.
24. Subrahmanyam, V., Sagar, M., Balram, G., Ramana, J. V., Tejaswi, S., & Mohammad, H. P. (2024, May). An Efficient Reliable Data Communication For Unmanned Air Vehicles (UAV) Enabled Industry Internet of Things (IIoT). In *2024 3rd International Conference on Artificial Intelligence For Internet of Things (AIIoT)* (pp. 1-4). IEEE.
25. KATIKA, R., & BALRAM, G. (2013). Video Multicasting Framework for Extended Wireless Mesh Networks Environment. *pp-427-434, IJSRET*, *2*(7).
26. Prasad, P. S., & Rao, S. K. M. (2017). HIASA: Hybrid improved artificial bee colony and simulated annealing based attack detection algorithm in mobile ad-hoc networks (MANETs). *Bonfring International Journal of Industrial Engineering and Management Science*, *7*(2), 01-12.
27. Prasad, P. S., & Rao, S. K. M. (2017). A Survey on Performance Analysis of ManetsUnder Security Attacks. *network*, *6*(7).
28. Reddy, P. R. S., & Ravindranath, K. (2024). Enhancing Secure and Reliable Data Transfer through Robust Integrity. *Journal of Electrical Systems*, *20*(1s), 900-910.
29. REDDY, P. R. S., & RAVINDRANATH, K. (2022). A HYBRID VERIFIED RE-ENCRYPTION INVOLVED PROXY SERVER TO ORGANIZE THE GROUP DYNAMICS: SHARING AND REVOCATION. *Journal of Theoretical and Applied Information Technology*, *100*(13).
30. Reddy, P. R. S., Ram, V. S. S., Greshma, V., & Kumar, K. S. Prediction of Heart Healthiness.
31. Reddy, P. R. S., Reddy, A. M., & Ujwala, B. IDENTITY PRESERVING IN DYNAMIC GROUPS FOR DATA SHARING AND AUDITING IN CLOUD.
32. Kovoor, M., Durairaj, M., Karyakarte, M. S., Hussain, M. Z., Ashraf, M., & Maguluri, L. P. (2024). Sensor-enhanced wearables and automated analytics for injury prevention in sports. *Measurement: Sensors*, *32*, 101054.
33. Rao, N. R., Kovoor, M., Kishor Kumar, G. N., & Parameswari, D. V. L. (2023). Security and privacy in smart farming: challenges and opportunities. *International Journal on Recent and Innovation Trends in Computing and Communication*, *11*(7 S).
34. Madhuri, K. (2023). Security Threats and Detection Mechanisms in Machine Learning. *Handbook of Artificial Intelligence*, 255.
35. Madhuri, K. (2022). A New Level Intrusion Detection System for Node Level Drop Attacks in Wireless Sensor Network. *Journal of Algebraic Statistics*, *13*(1), 159-168.
36. Yakoob, S., Krishna Reddy, V., & Dastagiraiah, C. (2017). Multi User Authentication in Reliable Data Storage in Cloud. In *Computer Communication, Networking and Internet Security: Proceedings of IC3T 2016* (pp. 531-539). Springer Singapore.
37. DASTAGIRAIAH, D. (2024). A SYSTEM FOR ANALYSING CALL DROP DYNAMICS IN THE TELECOM INDUSTRY USING MACHINE LEARNING AND FEATURE SELECTION. *Journal of Theoretical and Applied Information Technology*, *102*(22).
38. Sukhavasi, V., Kulkarni, S., Raghavendran, V., Dastagiraiah, C., Apat, S. K., & Reddy, P. C. S. (2024). Malignancy Detection in Lung and Colon Histopathology Images by Transfer Learning with Class Selective Image Processing.
39. Sudhakar, R. V., Dastagiraiah, C., Pattem, S., & Bhukya, S. (2024). Multi-Objective Reinforcement Learning Based Algorithm for Dynamic Workflow Scheduling in Cloud Computing. *Indonesian Journal of Electrical Engineering and Informatics (IJEEI)*, *12*(3), 640-649.
40. PushpaRani, K., Roja, G., Anusha, R., Dastagiraiah, C., Srilatha, B., & Manjusha, B. (2024, June). Geological Information Extraction from Satellite Imagery Using Deep Learning. In *2024 15th International Conference on Computing Communication and Networking Technologies (ICCCNT)* (pp. 1-7). IEEE.

41. Samya, B., Archana, M., Ramana, T. V., Raju, K. B., & Ramineni, K. (2024, February). Automated Student Assignment Evaluation Based on Information Retrieval and Statistical Techniques. In *Congress on Control, Robotics, and Mechatronics* (pp. 157-167). Singapore: Springer Nature Singapore.
42. Sravan, K., Rao, L. G., Ramineni, K., Rachapalli, A., & Mohmmad, S. (2024). Analyze the Quality of Wine Based on Machine Learning Approach Check for updates. *Data Science and Applications: Proceedings of ICDSA 2023, Volume 3*, *820*, 351.
43. Chandhar, K., Ramineni, K., Ramakrishna, E., Ramana, T. V., Sandeep, A., & Kalyan, K. (2023, December). Enhancing Crop Yield Prediction in India: A Comparative Analysis of Machine Learning Models. In *2023 3rd International Conference on Smart Generation Computing, Communication and Networking (SMART GENCON)* (pp. 1-4). IEEE.
44. Ramineni, K., Shankar, K., Shabana, Mahender, A., & Mohmmad, S. (2023, June). Detecting of Tree Cutting Sound in the Forest by Machine Learning Intelligence. In *International Conference on Power Engineering and Intelligent Systems (PEIS)* (pp. 303-314). Singapore: Springer Nature Singapore.
45. Sekhar, P. R., & Sujatha, B. (2020, July). A literature review on feature selection using evolutionary algorithms. In *2020 7th International Conference on Smart Structures and Systems (ICSSS)* (pp. 1-8). IEEE.
46. Sekhar, P. R., & Sujatha, B. (2023). Feature extraction and independent subset generation using genetic algorithm for improved classification. *Int. J. Intell. Syst. Appl. Eng*, *11*, 503-512.
47. Sekhar, P. R., & Goud, S. (2024). Collaborative Learning Techniques in Python Programming: A Case Study with CSE Students at Anurag University. *Journal of Engineering Education Transformations*, *38*(Special Issue 1).
48. Pesaramelli, R. S., & Sujatha, B. (2024, March). Principle correlated feature extraction using differential evolution for improved classification. In *AIP Conference Proceedings* (Vol. 2919, No. 1). AIP Publishing.
49. Amarnadh, V., & Moparthi, N. R. (2024). Range control-based class imbalance and optimized granular elastic net regression feature selection for credit risk assessment. *Knowledge and Information Systems*, 1-30.
50. Amarnadh, V., & Akhila, M. (2019, May). RETRACTED: Big Data Analytics in E-Commerce User Interest Patterns. In *Journal of Physics: Conference Series* (Vol. 1228, No. 1, p. 012052). IOP Publishing.
51. Amarnadh, V., & Moparthi, N. (2023). Data Science in Banking Sector: Comprehensive Review of Advanced Learning Methods for Credit Risk Assessment. *International Journal of Computing and Digital Systems*, *14*(1), 1-xx.
52. Rao, K. R., & Amarnadh, V. QoS Support for Cross-Layer Scheduling Algorithm in Wireless Networks.
53. Selvan, M. Arul, and S. Miruna Joe Amali. "RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE." (2024).
54. Selvan, M. Arul. "Fire Management System For Indutrial Safety Applications." (2023).
55. Selvan, M. A. (2023). A PBL REPORT FOR CONTAINMENT ZONE ALERTING APPLICATION.
56. Selvan, M. A. (2023). CONTAINMENT ZONE ALERTING APPLICATION A PROJECT BASED LEARNING REPORT.
57. Selvan, M. A. (2021). Robust Cyber Attack Detection with Support Vector Machines: Tackling Both Established and Novel Threats.
58. Selvan, M. A. (2023). INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM.
59. Selvan, M. Arul. "PHISHING CONTENT CLASSIFICATION USING DYNAMIC WEIGHTING AND GENETIC RANKING OPTIMIZATION ALGORITHM." (2024).
60. Selvan, M. Arul. "Innovative Approaches in Cardiovascular Disease Prediction Through Machine Learning Optimization." (2024).
61. FELIX, ARUL SELVAN M. Mr D., and XAVIER DHAS Mr S. KALAIVANAN. "Averting Eavesdrop Intrusion in Industrial Wireless Sensor Networks."
62. Raj, R. S., & Raju, G. P. (2014, December). An approach for optimization of resource management in Hadoop. In *International Conference on Computing and Communication Technologies* (pp. 1-5). IEEE.
63. Reddy, P. R. S., Bhoga, U., Reddy, A. M., & Rao, P. R. (2017). OER: Open Educational Resources for Effective Content Management and Delivery. *Journal of Engineering Education Transformations*, *30*(3).
64. Reddy, A. V. B., & Ujwala, B. Answering Xml Query Using Tree Based Association Rules.
65. Reddy, P. R. S., Reddy, A. M., & Ujwala, B. IDENTITY PRESERVING IN DYNAMIC GROUPS FOR DATA SHARING AND AUDITING IN CLOUD.
66. Khadse, S. P., & Ingle, S. D. (2011, February). Hydrogeological framework and estimation of aquifer hydraulic parameters using geoelectrical data in the Bhuleshwari river basin, Amravati District, Maharashtra. In *National Conference on Geology and Mineral Resources of India, Aurangabad* (pp. 11-12).

67. Ingle, S. D. Monitoring and Modeling Approaches for Evaluating Managed Aquifer Recharge (MAR) Performance.
68. Kumar, T. V. (2024). A Comparison of SQL and NO-SQL Database Management Systems for Unstructured Data.
69. Kumar, T. V. (2024). A Comprehensive Empirical Study Determining Practitioners' Views on Docker Development Difficulties: Stack Overflow Analysis.
70. Tambi, V. K., & Singh, N. Evaluation of Web Services using Various Metrics for Mobile Environments and Multimedia Conferences based on SOAP and REST Principles.
71. Kumar, T. V. (2024). Developments and Uses of Generative Artificial Intelligence and Present Experimental Data on the Impact on Productivity Applying Artificial Intelligence that is Generative.
72. Kumar, T. V. (2024). A New Framework and Performance Assessment Method for Distributed Deep Neural NetworkBased Middleware for Cyberattack Detection in the Smart IoT Ecosystem.
73. Sharma, S., & Dutta, N. (2024). Examining ChatGPT's and Other Models' Potential to Improve the Security Environment using Generative AI for Cybersecurity.
74. Tambi, V. K., & Singh, N. Blockchain Technology and Cybersecurity Utilisation in New Smart City Applications.
75. Tambi, V. K., & Singh, N. New Smart City Applications using Blockchain Technology and Cybersecurity Utilisation.
76. Kumar, T. V. (2018). Project Risk Management System Development Based on Industry 4.0 Technology and its Practical Implications.
77. Arora, P., & Bhardwaj, S. Using Knowledge Discovery and Data Mining Techniques in Cloud Computing to Advance Security.
78. Arora, P., & Bhardwaj, S. (2021). Methods for Threat and Risk Assessment and Mitigation to Improve Security in the Automotive Sector. *Methods*, *8*(2).
79. Arora, P., & Bhardwaj, S. A Thorough Examination of Privacy Issues using Self-Service Paradigms in the Cloud Computing Context.
80. Arora, P., & Bhardwaj, S. (2020). Research on Cybersecurity Issues and Solutions for Intelligent Transportation Systems.
81. Arora, P., & Bhardwaj, S. (2019). The Suitability of Different Cybersecurity Services to Stop Smart Home Attacks.
82. Arora, P., & Bhardwaj, S. (2019). Safe and Dependable Intrusion Detection Method Designs Created with Artificial Intelligence Techniques. *machine learning*, *8*(7).
83. Arora, Pankit, and Sachin Bhardwaj. "A Very Effective and Safe Method for Preserving Privacy in Cloud Data Storage Settings."
84. Arora, P., & Bhardwaj, S. (2017). A Very Safe and Effective Way to Protect Privacy in Cloud Data Storage Configurations.
85. Arora, P., & Bhardwaj, S. The Applicability of Various Cybersecurity Services to Prevent Attacks on Smart Homes.
86. Arora, P., & Bhardwaj, S. Designs for Secure and Reliable Intrusion Detection Systems using Artificial Intelligence Techniques.
87. Khan, A. (2020). Formulation and Evaluation of Flurbiprofen Solid Dispersions using Novel Carriers for Enhancement of Solubility. *Asian Journal of Pharmaceutics (AJP)*, *14*(03).
88. Jindal, S., Singh, M., & Chauhan, J. (2024). Effect and Optimization of Welding Parameters and Flux Baking on Weld Bead Properties and Tensile Strength in Submerged Arc Welding of HSLA 100 Steel. *Transactions of the Indian Institute of Metals*, *77*(3), 747-766.
89. Chauhan, M. J. (2017). Optimization Of Parameters For Gas Metal Arc Welding Of Mild Steel Using Taguchi's.
90. Singh, S., Kumar, M., Singh, J., Meena, M. L., Dangayach, G. S., & Shukla, D. K. (2023). Investigating the Influence of ASAW Process Parameters on Chemical Composition, Mechanical Properties and Corrosion Rate of HSLA Steel Weldments. *Transactions of the Indian Institute of Metals*, *76*(10), 2791-2806.
91. Monika, J. C. A REVIEW PAPER ON GAS METAL ARC WELDING (GMAW) OF MILD STEEL 1018 BY USING TAGUCHI. *Carbon*, *100*, 0-14.
92. Sharma, S., & Dutta, N. A Large-Scale Empirical Study Identifying Practitioners' Perspectives on Challenges in Docker Development: Analysis using Stack Overflow.
93. Sharma, S., & Dutta, N. (2024). Examining ChatGPT's and Other Models' Potential to Improve the Security Environment using Generative AI for Cybersecurity.

94. Sharma, S., & Dutta, N. Assessment of Web Services based on SOAP and REST Principles using Different Metrics for Mobile Environment and Multimedia Conference.
95. Sharma, S., & Dutta, N. Design and Implementation of a Pattern-based J2EE Application Development Environment.
96. Sharma, S., & Dutta, N. Evaluation of Potential REST Web Service Description for Graph-based Service Discovery Focused on Hypermedia.
97. Sharma, S., & Dutta, N. A Comparative Exploration of Unstructured Data with SQL and NO-SQL Database Management Systems.
98. Sharma, S., & Dutta, N. Examination of Anomaly Process Detection Using Negative Selection Algorithm and Classification Techniques.
99. Sharma, S., & Dutta, N. Utilization of Blockchain Technology with Cybersecurity in Emerging Smart City Applications.
100. Sharma, S., & Dutta, N. Practical Implications and Development of Project Risk Management Framework based on Industry 4.0 Technologies.
101. Sharma, S., & Dutta, N. Design and Development of Project Risk Management System using Industry 4.0 Technology and Its Practical Implications.
102. Davuluri, S. K., Alvi, S. A. M., Aeri, M., Agarwal, A., Serajuddin, M., & Hasan, Z. (2023, April). A Security Model for Perceptive 5G-Powered BC IoT Associated Deep Learning. In *2023 International Conference on Inventive Computation Technologies (ICICT)* (pp. 118-125). IEEE.
103. Rathod, C. H. A. N. D. A. R., & Reddy, G. K. (2016). Experimental investigation of angular distortion and transverse shrinkage in CO2 arc welding process. *International Journal of Mechanical Engineering*, *5*, 21-28.
104. Rao, G. V., Reddy, G. K., Jagadish Babu, G., & Rao, V. V. S. (2012). Prediction of thermal post buckling and deduction of large amplitude vibration behavior of spring–hinged beams. *Forschung im Ingenieurwesen*, *76*, 51-58.
105. Reddy, E. J., Reddy, G. K., & Rajendra, D. (2021). Design of lifting tackle for armor plate of sinter machine. *International Journal on Technical and Physical Problems of Engineering*, *13*, 23-28.
106. Reddy, G. K., & Sravanthhi, B. (2019). Design and analysis of a propeller blade used for marine engine. *International Journal of Scientific Research in Science, Engineering and Technology*, *6*(1), 440-445.
107. Reddy, H., Reddy, G., Phanindra, G., & Kumar, K. (2018). Design and Analysis of Condenser Using 3D Modelling Software. *International Journal of Research in Engineering and Technology*, *7*, 2319-1168.
108. Reddy, E. J., & Sridhar, C. N. V., Rangadu VP (2015) Knowledge Based Engineering: Notion, Approaches and Future Trends. *Am J Intell Syst*, *5*, 1-17.
109. Reddy, E. J., & Rangadu, V. P. (2018). Development of knowledge based parametric CAD modeling system for spur gear: An approach. *Alexandria engineering journal*, *57*(4), 3139-3149.
110. Jayakiran Reddy, E., Sridhar, C. N. V., & Pandu Rangadu, V. (2016). Research and development of knowledge based intelligent design system for bearings library construction using solidworks API. In *Intelligent Systems Technologies and Applications: Volume 2* (pp. 311-319). Springer International Publishing.
111. Reddy, E. J., Venkatachalapathi, N., & Rangadu, V. P. (2018). Development of an approach for Knowledge-Based System for CAD modelling. *Materials Today: Proceedings*, *5*(5), 13375-13382.
112. Reddy, E., Kumar, S., Rollings, N., & Chandra, R. (2015). Mobile application for dengue fever monitoring and tracking via GPS: case study for fiji. *arXiv preprint arXiv:1503.00814*.
113. Parthiban, K. G., & Vijayachitra, S. (2015). Spike detection from electroencephalogram signals with aid of hybrid genetic algorithm-particle swarm optimization. *Journal of Medical Imaging and Health Informatics*, *5*(5), 936-944.
114. Mathew, O. C., Dhanapal, R., Visalakshi, P., Parthiban, K. G., & Karthik, S. (2020). Distributed security model for remote healthcare (dsm-rh) services in internet of things environment. *Journal of Medical Imaging and Health Informatics*, *10*(1), 185-193.
115. Parthiban, K. G., Vijayachitra, S., & Dhanapal, R. (2019). Hybrid dragonfly optimization-based artificial neural network for the recognition of epilepsy. *International Journal of Computational Intelligence Systems*, *12*(2), 1261-1269.
116. Bhat, S. (2024). Building Thermal Comforts with Various HVAC Systems and Optimum Conditions.
117. Bhat, S. Automobile Cabin Pre-Conditioning Method Driven by Environmental Conditions with Multi-Satisfaction Goals.
118. Bhat, S. Thermal Comfort Models' Applicability to Automobile Cabin Environments.

119. Bhat, S. Discovering the Attractiveness of Hydrogen-Fuelled Gas Turbines in Future Energy Systems.
120. Bhat, S. Increasing the Cooling Efficiency of Data Centre Servers with Heat Pipes Based on Liquid Cooling.
121. Bhat, S. Deep Reinforcement Learning for Energy-Efficient Thermal Comfort Control in Smart Buildings.
122. Bhat, S. (2020). Enhancing Data Centre Energy Efficiency with Modelling and Optimisation of End-To-End Cooling.
123. Bhat, S. (2015). Design and Function of a Gas Turbine Range Extender for Hybrid Vehicles.
124. Bhat, S. (2015). Deep Reinforcement Learning for Energy-Saving Thermal Comfort Management in Intelligent Structures.
125. Bhat, S. (2016). Improving Data Centre Energy Efficiency with End-To-End Cooling Modelling and Optimisation.
126. Tayal, S., Upadhyay, A. K., Kumar, D., & Rahi, S. B. (Eds.). (2022). *Emerging low-power semiconductor devices: Applications for future technology nodes*. CRC Press.
127. Kumar, T. V., & Balamurugan, N. B. (2018). Analytical modeling of InSb/AlInSb heterostructure dual gate high electron mobility transistors. *AEU-International Journal of Electronics and Communications*, *94*, 19-25.
128. Karthick, R., Rinoj, B., Kumar, T. V., Prabaharan, A. M., & Selvaprasanth, P. (2019). Automated Health Monitoring System for Premature Fetus. *Asian Journal of Applied Science and Technology (AJAST)(Peer Reviewed Quarterly International Journal) Volume*, *3*, 17-23.
129. Venish Kumar, T., & Balamurugan, N. B. (2020). Three-dimensional analytical modeling for small-geometry AlInSb/AlSb/InSb double-gate high-electron-mobility transistors (DG-HEMTs). *Journal of Computational Electronics*, *19*, 1107-1115.
130. Tejani, A. (2021). Integrating energy-efficient HVAC systems into historical buildings: Challenges and solutions for balancing preservation and modernization. *ESP Journal of Engineering & Technology Advancements*, *1*(1), 83-97.
131. Tejani, A., Yadav, J., Toshniwal, V., & Gajjar, H. (2022). Achieving net-zero energy buildings: The strategic role of HVAC systems in design and implementation. *ESP Journal of Engineering & Technology Advancements*, *2*(1), 39-55.
132. Govindaraj, V. (2024). The Future of Mainframe IDMS: Leveraging Artificial Intelligence for Modernization and Efficiency. *International Journal of Advanced Computer Science & Applications*, *15*(11).
133. Jayasingh, S. K., Mishra, R. K., Swain, S., & Sahoo, A. K. SENTIMENT ANALYSIS TO HANDLE COMPLEX LINGUISTIC STRUCTURES: A REVIEW ON EXISTING METHODOLOGIES.
134. Bandi, M., Masimukku, A. K., Vemula, R., & Vallu, S. (2024). Predictive Analytics in Healthcare: Enhancing Patient Outcomes through Data-Driven Forecasting and Decision-Making. *International Numeric Journal of Machine Learning and Robots*, *8*(8), 1-20.
135. Harinath, D., Bandi, M., Patil, A., Murthy, M. R., & Raju, A. V. S. (2024). Enhanced Data Security and Privacy in IoT devices using Blockchain Technology and Quantum Cryptography. *Journal of Systems Engineering and Electronics (ISSN NO: 1671-1793)*, *34*(6).
136. Harinath, D., Patil, A., Bandi, M., Raju, A. V. S., Murthy, M. R., & Spandana, D. (2024). Smart Farming System–An Efficient technique by Predicting Agriculture Yields Based on Machine Learning. *Technische Sicherheit (Technical Security) Journal*, *24*(5), 82-88.
137. Masimukku, A. K., Bandi, M., Vallu, S., Patil, A., Vasundhara, K. L., & Murthy, M. R. (2025). Innovative Approaches in Diabetes Management: Leveraging Technology for Improved Healthcare Outcomes. *International Meridian Journal*, *7*(7).
138. Harinath, D., Patil, A., Ramadevi, G. R., Bandi, M., Murthy, M. R., & Reddy, K. S. Enhancing Routing Efficiency and Performance in Mobile Ad-Hoc Networks Using Deep Learning Techniques.
139. Thamma, S. R. (2024). A Comprehensive Evaluation and Methodology on Enhancing Computational Efficiency through Accelerated Computing.
140. Thamma, S. R. (2024). An Experimental Analysis of Revolutionizing Banking and Healthcare with Generative AI.
141. Thamma, S. R. (2024). A Case Study on Transforming Legacy Databases Seamless Migration to Snowflake.
142. Vadisetty, R. (2020). Privacy-Preserving Machine Learning Techniques for Data in Multi Cloud Environments. *Corrosion Management ISSN: 1355-5243*, *30*(1), 57-74.
143. Vadisetty, R. (2024, November). Multi Layered Cloud Technologies to achieve Interoperability in AI. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1-5). IEEE.

144. Vadisetty, R. (2024, November). The Effects of Cyber Security Attacks on Data Integrity in AI. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1-6). IEEE.
145. Vadisetty, R. (2024, November). Efficient Large-Scale Data based on Cloud Framework using Critical Influences on Financial Landscape. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1-6). IEEE.