

DASHBOARD FOR REAL-TIME MONITORING OF ROAD CONSTRUCTION PROJECTS

K.Pravallika ¹, P.Samaya Sisira ², M.N.Suma Rishitha³, Dr.Pallam Ravi⁴

Department of Computer Science and Engineering, Anurag University

21eg105d30@anurag.edu.in

21eg105d45@anurag.edu.in

21eg105d63@anurag.edu.in

Abstract. Highway construction projects are often complicated and need careful management. This proposes the development of real time monitoring dashboard specially designed for highway road construction projects. The project is mainly useful for transportation planners, civil engineers, project managers, surveyors, constructors, government authorities, safety inspectors. Traditional monitoring methods often involve manual inspections and periodic reporting, which can lead to delays and inefficiencies. Existing approaches generally rely on static data collection and do not provide real-time insights into construction progress, resource allocation. The proposed solution integrates advanced technologies such as data analytics to provide an interactive platform. This dashboard will offer real-time visualization of construction progress, resource usage, expenses, facilitating immediate decision-making and management.

Keywords. Real-time Monitoring, Dashboard Technology, Project Management, Cost Tracking, Stakeholder Collaboration.

1. INTRODUCTION

1.1 Background

Road construction projects are complex undertakings that involve multiple stakeholders, including contractors, engineers, government agencies, and the public. The management of these projects is often hampered by a lack of real-time data, leading to inefficiencies and increased costs.

1.2 Objectives

It designed for tracking various details of road construction projects in real time. The dashboard provides a quick overview of key information like the number of projects, their start and end dates, locations, and work status. It displays statistics such as the average number of workers, average road length, and project distribution across different states. Additionally, it shows budget vs. expenses to monitor financial health, and resource allocation to see the materials and lengths of roads being worked on. The objective of this dashboard is to help project managers and stakeholders stay updated on progress, manage resources effectively, and ensure projects are completed on time and within budget.

2. RESEARCH METHODOLOGY

2.1 Challenges in Road Construction Projects

Several studies have identified common challenges in road construction, including delays due to weather, equipment failures, and miscommunication among teams.

2.2 Existing Solutions

Current solutions include project management software and traditional reporting methods, which often lack real-time capabilities and user-friendly interfaces.

2.3 The Role of Dashboards

Dashboards have emerged as effective tools for data visualization and real-time monitoring across various industries, yet their application in road construction remains limited.

3. THEORY AND CALCULATION

Research focuses on creating time-tracking dashboards for highway construction, solving problems such as delays, overspending, and inefficiency. Dashboards integrate data analytics to instantly monitor construction, resource allocation, and budgeting. Key topics include data collection, user roles, and technology stacks. Resources include planning tools, resource tracking, and public participation. Use a method to create dashboards with underlying models used to track progress, monitor spending, and manage resources in real time. The system was tested using simulated project data and feedback from real users to ensure functionality and usability. Dashboard performance is measured on efficiency, accuracy, and user satisfaction, with a focus on providing instant updates and improved decision-making processes. This formed the basis for the next step of the study. In contrast, the computational component represents a practical development from a theoretical perspective.

1. *Mathematical Expressions and Symbols*

Road construction cost per km:

Material Cost+Labour Cost+Equipment Cost+Overhead+Contingency It is further
calculated as:

Material Cost Calculation=Unit Cost of Material*Quality of the material
Labour Cost Calculation=Hourly wages*Number of hours of work
Equipment Cost Calculation=Equipment rental rate*No of equipment units*Duration

Overhead =Percentage% (Material Cost+Labour Cost+Equipment Cost)
Contingency=Percentage%(MaterialCost+LabourCost+EquipmentCost+Overhead)

4. RESULTS AND DISCUSSION

Using a real-time monitoring dashboard for highway construction improves performance management by providing stakeholders with real-time access to important information. This enables faster decision-making, reduces delays, and reduces cost overruns. Integrating web technologies such as React.js and Chart.js, the dashboard provides a user-friendly interface that allows project managers and contractors to view progress and arrive on time. The system also improves financial management, budget allocation, and real-time adjustments, allowing project managers to update time and resource plans. However, it has been shown that integrated data must be maintained to track data accuracy. Use diagrams to show team member interactions and responsibilities, minimizing miscommunication and overlapping roles. However, as construction projects become more complex,

future iterations will need to include more roles and interaction models. The event log shows system operation, including data loading, monitoring time, user interaction, and errors. Future enhancements include automated data collection processes and increased capacity for large projects.

Based on the Highway Road Construction Dashboard image provided, here are some key insights and a simple discussion of the various attributes:

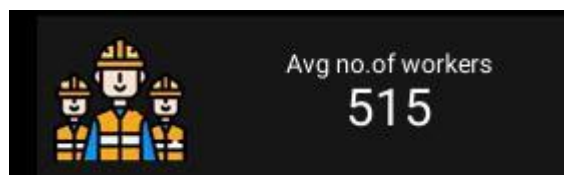
1. *Total Number of National Highways (NH):*

The dashboard shows a total of 2,000 national highways under monitoring. This gives an overview of the scale of the project and the number of highways being tracked for construction or maintenance.



2. *Average Number of Workers:*

An average of 515 workers are involved across projects, indicating the labor force commitment. This metric helps in understanding workforce allocation and planning additional labor resources if needed.



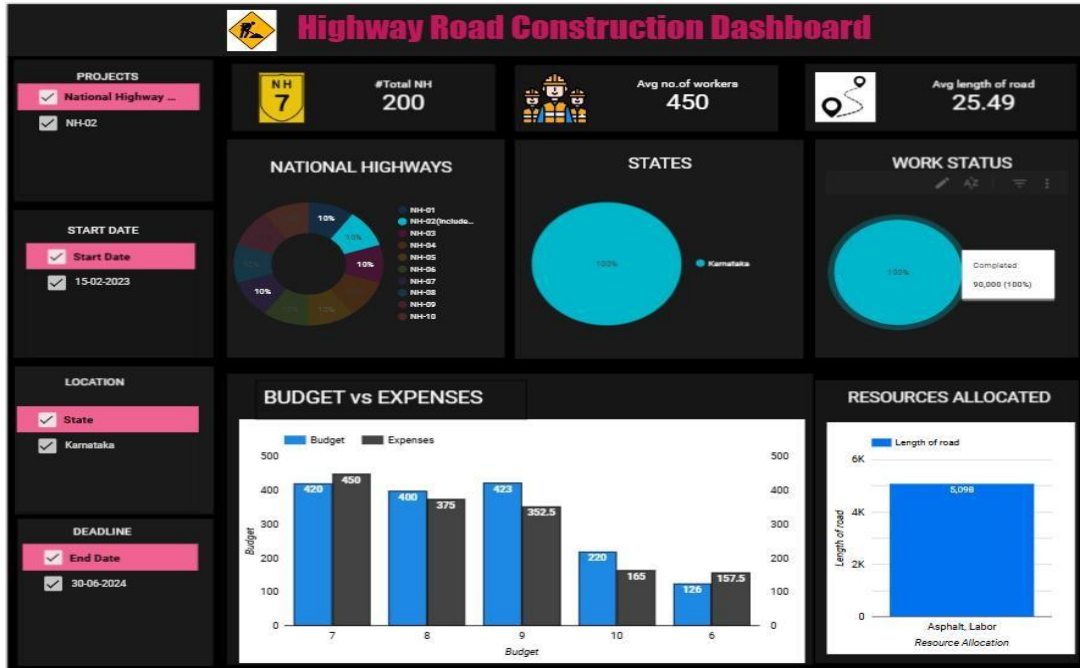
3. *Average Length of Road:*

The dashboard indicates an average road length of 25.66 km per project. This helps in estimating project scopes and setting targets for road construction length.



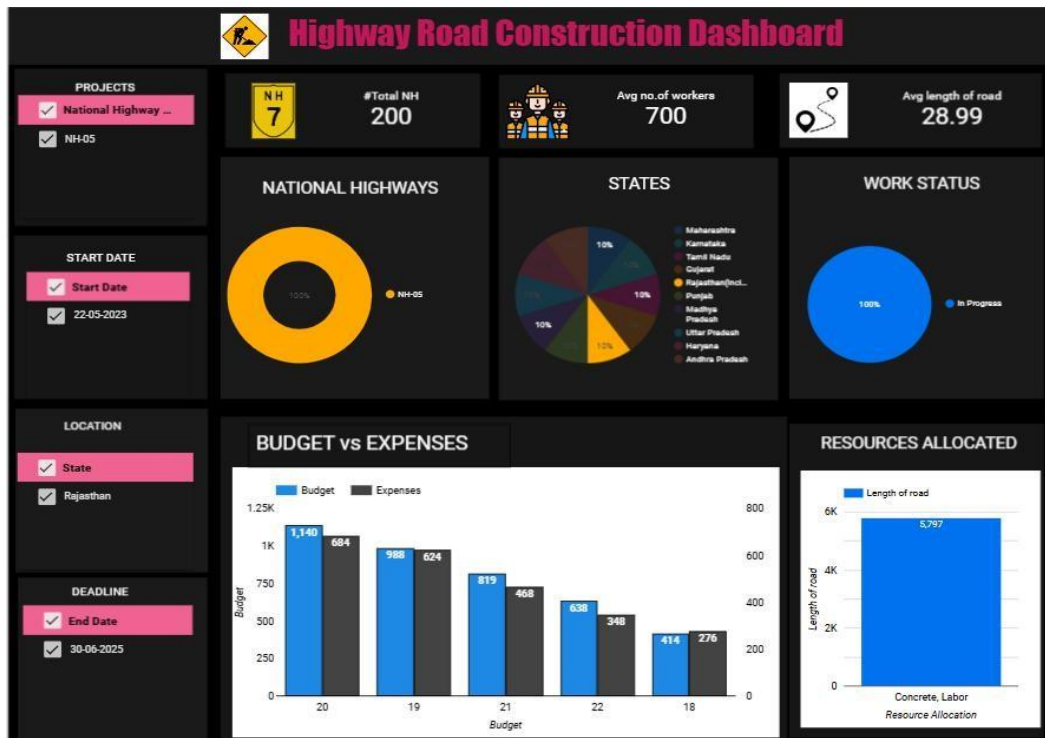
4. *Project Distribution by National Highway (NH):*

A pie chart shows the distribution of work across different national highways (NH-01 to NH- 10), with each highway representing an equal share (10%). This could indicate that the workload is balanced across these highways, or it could mean that resources are allocated equally among projects.



5. Project Distribution by State:

The projects are spread across multiple states, including Maharashtra, Karnataka, Tamil Nadu, and others. Each state has a roughly equal share (10%), suggesting a balanced approach to highway development across regions.



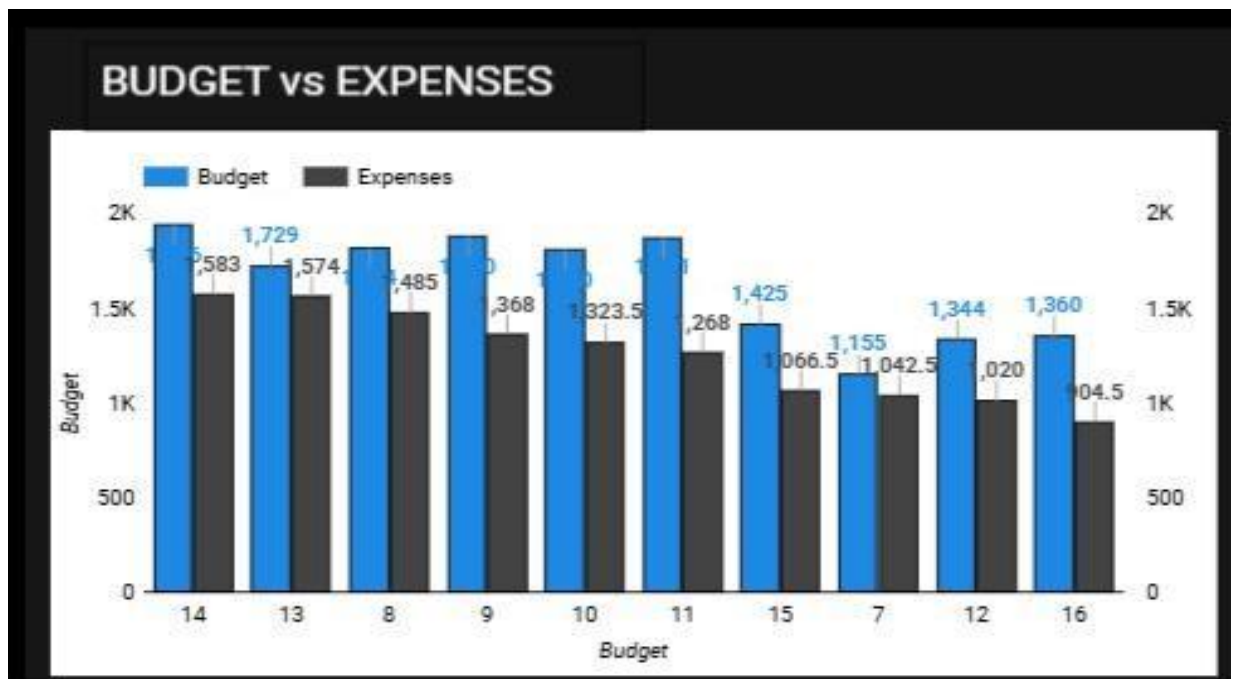
6. Work Status:

The "Work Status" section shows that 52.4% of projects are in progress, while 47.6% are completed. This metric helps to track overall project completion rates and can signal the need for intervention if progress is slower than expected.



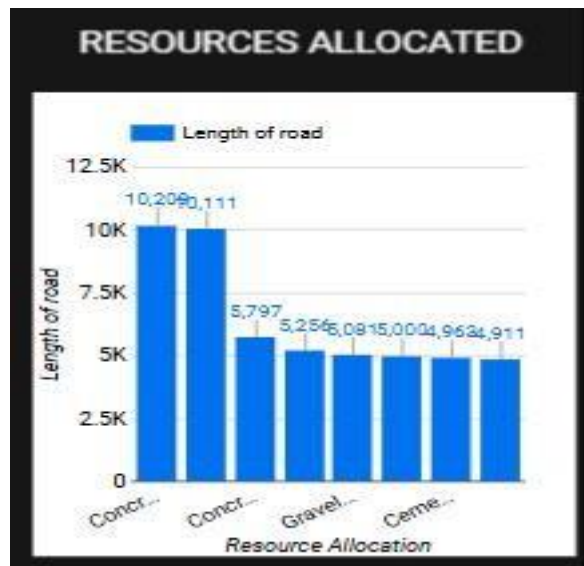
7. Budget vs. Expenses:

A bar chart compares the budget allocated with actual expenses across different projects. For most projects, expenses are close to or below the budget, with Project 14 being an exception where expenses exceed the budget. Monitoring this metric helps keep finances in check and ensures that projects are not overspending.



8. Resources Allocated:

This chart shows the resources allocated by material type, including concrete, gravel, and cement, along with the length of road being constructed with each resource. Concrete resources seem to be allocated the most, followed by gravel and cement, indicating the type of materials predominantly used in construction.



LITERATURE SURVEY:

Paper Name	Author(s)	Proposed System	Techniques/ Methods Used	Drawbacks
Estimating road user costs associated with highway construction projects: simplified method.	Daniels, Ginger, William R. Stockton and Robert Hundley.	Traffic Flow Impact Analysis, Cost Estimation, Simplification.	Traffic Volume, Delay Time, Accidental rates, Construction duration, Detour length.	Simplification vs Accuracy, Limited Geographic and temporal scope, Exclusion of environmental impacts, Accident cost limitations.
Causes of delay in road construction projects.	Mahamid, Ibrahim, Amund Bruland, and Nabil Dmaidi.	Data Collection, Categorization of Delay Factors, Statistical Analysis.	Project-Related Factors, Owner- Related Factors, External Factors, Consultant-Related Factors, Survey Responses, External Factors, Survey Responses.	Subjectivity in Data Collection, Limited Scope of Respondents, No Causal Relationships Established Focus on Broad Categories.

Forecasting final budget and duration of highway construction projects.	Pewdum, Wichan, Thammasak Rujiranyong, and Vanee Sooksatra.	Neural Network Application, Training with Historical Data, Validation.	Project Characteristics, Schedule and Progress Data, Resource Allocation, Financial Aspects, External Factors.	Dependence on Historical Data, Complexity of Neural Networks, Limited Generalizability, Sensitivity to Parameter Selection, No Real-Time Updates, Potential Overfitting.
Ecological effects of roads and traffic: a literature review.	Spellerberg, I. A. N.	Ecological impact assessment, Road and traffic effects, Environmental monitoring.	Literature review, Data synthesis, Ecological modeling, Comparative analysis.	Limited to existing studies, Generalizations across regions, Lack of primary data, Inconsistent methodologies in reviewed studies.
Critical Factors Influencing the Performance of Highway Projects.	Shumank Deep, Shankar Banerjee, Saurav Dixit and Nikolai Ivanovich Vatin.	Performance evaluation model, Key performance factors, Project success criteria, Risk management framework.	Empirical evaluation, Survey-based data collection, Statistical analysis (e.g., regression analysis), Factor analysis.	Limited geographical scope, Potential survey biases, Generalization of findings, Lack of real-time data integration.

Table 1 Literature Survey

5. CONCLUSIONS

In conclusion, the road construction project tracking dashboard is an innovative tool designed to streamline the monitoring and management of construction projects in real time. By providing a comprehensive overview of key project details, such as start and end dates, locations, and work status, it enables project managers and stakeholders to stay informed and make data-driven decisions. The inclusion of statistical insights, like the average number of workers, road lengths, and project distribution across states, offers a valuable snapshot of operational performance. The dashboard's financial tracking feature, comparing budgets to actual expenses, ensures better financial oversight and helps prevent budget overruns. Additionally, resource allocation insights, including materials used and road lengths under construction, support more efficient resource management. By offering real-time updates and actionable data, the tool empowers stakeholders to address potential issues promptly, enhancing project efficiency and timeliness.

Overall, this dashboard plays a critical role in optimizing construction processes, reducing delays, and ensuring project goals are met within the allocated time and budget. Its ability to consolidate and present critical metrics in a user-friendly format makes it a valuable asset for effective road construction project management.

6. DECLARATIONS

6.1 Study Limitations

The study has several limitations, including a small sample size, geographical constraints, restricted time frame, limited data, subjective methods, and the absence of a control group. The findings may not be applicable to all construction projects or industries, and the methodological limitations may affect the robustness of the results. External factors like weather conditions, economic factors, and regulatory changes were not considered, and human factors like motivation, communication, and teamwork were not adequately considered. The use case diagram's narrow focus, restricted actor representation, and limited relationship mapping may oversimplify the complexity of the construction project. The real-time monitoring system may face technical challenges, data quality concerns, coverage limitations, and integration issues, potentially reducing its effectiveness should be included in a separate section before the references and may include list of peoples who contributed to the work in the manuscript but not listed in the author list.

7. ACKNOWLEDGMENTS

We would like to express our sincere gratitude to all those who contributed to the successful completion of the project. Special thanks to our project Advisor [Dr.Pallam Ravi], for their valuable guidance, support and encouragement throughout the research process. Finally, we acknowledge that this work would not have been possible without the collective efforts and contributions of all those mentioned above.

8. COMPETING INTERESTS

Time vs. Quality: The project manager may have to balance the need to complete the project on time with the need to ensure that the work is of high quality.

Budget vs. Scope: The project manager may have to balance the need to stay within budget with the need to deliver the project's scope.

Stakeholder Expectations: The project manager may have to balance the expectations of different stakeholders, such as the client, team members, and balance the expectations of the client with the interests of the contractors. Project Manager's Competing Interests.

Safety vs. Productivity: The site engineer may have to balance the need to ensure the safety of the workers with the need to maintain productivity.

Quality vs. Cost: The site engineer may have to balance the need to ensure that the work is of high quality with the need to stay within budget.

Client Expectations vs. Contractor Interests: The site engineer may have to balance the expectations of the client with the interests of the contractors.

9. HUMAN AND ANIMAL RELATED STUDY

If the work involves the use of human/animal subjects, each manuscript should contain the following subheadings under the declarations section.

9.1 ETHICAL APPROVAL

This study did not require any ethical approval, as it did not involve human or animal subjects. An ethical exemption letter has been obtained, indicating that ethical review is not required for the research. A scanned copy of the exemption letter is available and can be provided upon request.

9.2 Informed Consent

Informed consent was not applicable for this study, as it did not involve direct interaction with human subjects. If needed, a statement regarding user consent for the use of data can be provided.

REFERENCES

1. Mukiri, R. R., Kumar, B. S., & Prasad, B. V. V. (2019, February). Effective Data Collaborative Strain Using RecTree Algorithm. In *Proceedings of International Conference on Sustainable Computing in Science, Technology and Management (SUSCOM), Amity University Rajasthan, Jaipur-India*.
2. Rao, B. T., Prasad, B. V. V. S., & Peram, S. R. (2019). Elegant Energy Competent Lighting in Green Buildings Based on Energetic Power Control Using IoT Design. In *Smart Intelligent Computing and Applications: Proceedings of the Second International Conference on SCI 2018, Volume 1* (pp. 247-257). Springer Singapore.
3. Someswar, G. M., & Prasad, B. V. V. S. (2017, October). USVGM protocol with two layer architecture for efficient network management in MANET'S. In *2017 2nd International Conference on Communication and Electronics Systems (ICCES)* (pp. 738-741). IEEE.
4. Alapati, N., Prasad, B. V. V. S., Sharma, A., Kumari, G. R. P., Veeneetha, S. V., Srivalli, N., ... & Sahitya, D. (2022, November). Prediction of Flight-fare using machine learning. In *2022 International Conference on Fourth Industrial Revolution Based Technology and Practices (ICFIRTP)* (pp. 134-138). IEEE.
5. Alapati, N., Prasad, B. V. V. S., Sharma, A., Kumari, G. R. P., Bhargavi, P. J., Alekhya, A., ... & Nandini, K. (2022, November). Cardiovascular Disease Prediction using machine learning. In *2022 International Conference on Fourth Industrial Revolution Based Technology and Practices (ICFIRTP)* (pp. 60-66). IEEE.
6. Narayana, M. S., Babu, N., Prasad, B. V. V. S., & Kumar, B. S. (2011). Clustering Categorical Data--Study of Mining Tools for Data Labeling. *International Journal of Advanced Research in Computer Science*, 2(4).
7. Shankar, G. S., Onyema, E. M., Kavin, B. P., Gude, V., & Prasad, B. S. (2024). Breast Cancer Diagnosis Using Virtualization and Extreme Learning Algorithm Based on Deep Feed Forward Networks. *Biomedical Engineering and Computational Biology*, 15, 11795972241278907.
8. Kulkarni, R., & Prasad, B. S. (2022). Predictive Modeling Of Heart Disease Using Artificial Intelligence. *Journal of Survey in Fisheries Sciences*, 791-801.
9. 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.
10. 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.
11. 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.

12. 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.
13. 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.
14. 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.
15. 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).
16. 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.
17. 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.
18. Balram, G., & Kumar, K. K. (2022). Crop field monitoring and disease detection of plants in smart agriculture using internet of things. *International Journal of Advanced Computer Science and Applications*, 13(7).
19. Balram, G., & Kumar, K. K. (2018). Smart farming: Disease detection in crops. *Int. J. Eng. Technol*, 7(2.7), 33-36.
20. Balram, G., Rani, G. R., Mansour, S. Y., & Jafar, A. M. (2001). Medical management of otitis media with effusion. *Kuwait Medical Journal*, 33(4), 317-319.
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. 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.
24. Prasad, P. S., Siva, P. V., & Krishna Mohan Rao, S. "A Survey on Performance Analysis of Manets Under Security Attacks." *network* 6, no. 7 (2017).
25. Reddy, B. A., & Reddy, P. R. S. (2012). Effective data distribution techniques for multi-cloud storage in cloud computing. *CSE, Anurag Group of Institutions, Hyderabad, AP, India*.
26. Srilatha, P., Murthy, G. V., & Reddy, P. R. S. (2020). Integration of Assessment and Learning Platform in a Traditional Class Room Based Programming Course. *Journal of Engineering Education Transformations*, 33(Special Issue).
27. Reddy, P. R. S., & Ravindranadh, K. (2019). An exploration on privacy concerned secured data sharing techniques in cloud. *International Journal of Innovative Technology and Exploring Engineering*, 9(1), 1190-1198.
28. 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).
29. Madhuri, K., Viswanath, N. K., & Gayatri, P. U. (2016, November). Performance evaluation of AODV under Black hole attack in MANET using NS2. In *2016 international conference on ICT in Business Industry & Government (ICTBIG)* (pp. 1-3). IEEE.
30. Kooor, 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.

31. Rao, N. R., Koor, 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).
32. Madhuri, K. (2023). Security Threats and Detection Mechanisms in Machine Learning. *Handbook of Artificial Intelligence*, 255.
33. 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.
34. DASTAGIRIAH, 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).
35. 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.
36. Sudhakar, R. V., Dastagiraiah, C., Patten, S., & Bhukya, S. (2024). Multi-Objective Reinforcement Learning Based Algorithm for Dynamic Workflow Scheduling in Cloud Computing. *Indonesian Journal of Electrical Engineering and Informatics (IJEI)*, 12(3), 640-649.
37. 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.
38. Rani, K. P., Reddy, Y. S., Sreedevi, P., Dastagiraiah, C., Shekar, K., & Rao, K. S. (2024, June). Tracking The Impact of PM Poshan on Child's Nutritional Status. In *2024 15th International Conference on Computing Communication and Networking Technologies (ICCCNT)* (pp. 1-4). IEEE.
39. Sravan, K., Gunakar Rao, L., Ramineni, K., Rachapalli, A., & Mohmmad, S. (2023, July). Analyze the Quality of Wine Based on Machine Learning Approach. In *International Conference on Data Science and Applications* (pp. 351-360). Singapore: Springer Nature Singapore.
40. LAASSIRI, J., EL HAJJI, S. A. İ. D., BOUHDADI, M., AOUDE, M. A., JAGADISH, H. P., LOHIT, M. K., ... & KHOLLADI, M. (2010). Specifying Behavioral Concepts by engineering language of RM-ODP. *Journal of Theoretical and Applied Information Technology*, 15(1).
41. Ramineni, K., Harshith Reddy, K., Sai Thrikoteshwara Chary, L., Nikhil, L., & Akanksha, P. (2024, February). Designing an Intelligent Chatbot with Deep Learning: Leveraging FNN Algorithm for Conversational Agents to Improve the Chatbot Performance. In *World Conference on Artificial Intelligence: Advances and Applications* (pp. 143-151). Singapore: Springer Nature Singapore.
42. 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.
43. 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.
44. 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.
45. 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).
46. 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.
47. Amarnadh, V., & Moparthy, N. R. (2023). Comprehensive review of different artificial intelligence-based methods for credit risk assessment in data science. *Intelligent Decision Technologies*, 17(4), 1265-1282.
48. Amarnadh, V., & Moparthy, N. R. (2024). Prediction and assessment of credit risk using an adaptive Binarized spiking marine predators' neural network in financial sector. *Multimedia Tools and Applications*, 83(16), 48761-48797.
49. Amarnadh, V., & Moparthy, 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. Ravinder Reddy, B., & Anil Kumar, A. (2020). Survey on access control mechanisms in cloud environments. In *Advances in Computational Intelligence and Informatics: Proceedings of ICACII 2019* (pp. 141-149). Springer Singapore.
52. Reddy, M. B. R., Nandini, J., & Sathwik, P. S. Y. (2019). Handwritten text recognition and digital text conversion. *International Journal of Trend in Research and Development*, 3(3), 1826-1827.
53. Reddy, B. R., & Adilakshmi, T. (2023). Proof-of-Work for Merkle based Access Tree in Patient Centric Data. *structure*, 14(1).
54. Reddy, B. R., Adilakshmi, T., & Kumar, C. P. (2020). Access Control Methods in Cloud Enabledthe Cloud-Enabled Internet of Things. In *Managing Security Services in Heterogenous Networks* (pp. 1-17). CRC Press.
55. Reddy, M. B. R., Akhil, V., Preetham, G. S., & Poojitha, P. S. (2019). Profile Identification through Face Recognition.
56. Dutta, P. K., & Mitra, S. (2021). Application of agricultural drones and IoT to understand food supply chain during post COVID-19. *Agricultural informatics: automation using the IoT and machine learning*, 67-87.
57. Matuka, A., Asafo, S. S., Eweke, G. O., Mishra, P., Ray, S., Abotaleb, M., ... & Chowdhury, S. (2022, December). Analysing the impact of COVID-19 outbreak and economic policy uncertainty on stock markets in major affected economies. In *6th Smart Cities Symposium (SCS 2022)* (Vol. 2022, pp. 372-378). IET.
58. Saber, M., & Dutta, P. K. (2022). Uniform and Nonuniform Filter Banks Design Based on Fusion Optimization. *Fusion: Practice and Applications*, 9(1), 29-37.
59. Mensah, G. B., & Dutta, P. K. (2024). Evaluating if Ghana's Health Institutions and Facilities Act 2011 (Act 829) Sufficiently Addresses Medical Negligence Risks from Integration of Artificial Intelligence Systems. *Mesopotamian Journal of Artificial Intelligence in Healthcare*, 2024, 35-41.
60. Aydın, Ö., Karaarslan, E., & Gökçe Narin, N. (2023). Artificial intelligence, vr, ar and metaverse technologies for human resources management. *VR, AR and Metaverse Technologies for Human Resources Management (June 15, 2023)*.
61. Thamma, S. R. (2025). Transforming E-Commerce with Pragmatic Advertising Using Machine Learning Techniques.
62. Thamma, S. R. T. S. R. (2024). Optimization of Generative AI Costs in Multi-Agent and Multi-Cloud Systems.
63. Thamma, S. R. T. S. R. (2024). Revolutionizing Healthcare: Spatial Computing Meets Generative AI.
64. Thamma, S. R. T. S. R. (2024). Cardiovascular image analysis: AI can analyze heart images to assess cardiovascular health and identify potential risks.
65. Thamma, S. R. T. S. R. (2024). Generative AI in Graph-Based Spatial Computing: Techniques and Use Cases.
66. 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).
67. 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.
68. 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).
69. 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.
70. Moreb, M., Mohammed, T. A., & Bayat, O. (2020). A novel software engineering approach toward using machine learning for improving the efficiency of health systems. *IEEE Access*, 8, 23169-23178.

71. Ravi, P., Batta, G. S. H. N., & Yaseen, S. (2019). Toxic comment classification. *International Journal of Trend in Scientific Research and Development (IJTSRD)*.
72. Pallam, R., Konda, S. P., Manthripragada, L., & Noone, R. A. (2021). Detection of Web Attacks using Ensemble Learning. *learning*, 3(4), 5.
73. Reddy, P. V., Ravi, P., Ganesh, D., Naidu, P. M. K., Vineeth, N., & Sameer, S. (2023, July). Detection and Evaluation of Cervical Cancer by Multiple Instance Learning. In *2023 2nd International Conference on Edge Computing and Applications (ICECAA)* (pp. 627-633). IEEE.
74. Ravi, P., Haritha, D., & Niranjana, P. (2018). A Survey: Computing Iceberg Queries. *International Journal of Engineering & Technology*, 7(2.7), 791-793.
75. Chidambaram, R., Balamurugan, M., Senthilkumar, R., Srinivasan, T., Rajmohan, M., Karthick, R., & Abraham, S. (2013). Combining AIET with chemotherapy—lessons learnt from our experience. *J Stem Cells Regen Med*, 9(2), 42-43.
76. Karthick, R., & Sundhararajan, M. (2014). Hardware Evaluation of Second Round SHA-3 Candidates Using FPGA. *International Journal of Advanced Research in Computer Science & Technology (IJARCST 2014)*, 2(2).
77. Sudhan, K., Deepak, S., & Karthick, R. (2016). SUSTAINABILITY ANALYSIS OF KEVLAR AND BANANA FIBER COMPOSITE.
78. Karthick, R., Gopalakrishnan, S., & Ramesh, C. (2020). Mechanical Properties and Characterization of Palmyra Fiber and Polyester Resins Composite. *International Journal of Emerging Trends in Science & Technology*, 6(2).
79. Karthick, R., Pandi, M., Dawood, M. S., Prabakaran, A. M., & Selvaprassanth, P. (2021). ADHAAR: A RELIABLE DATA HIDING TECHNIQUES WITH (NNP2) ALGORITHMIC APPROACH USING X-RAY IMAGES. *3C Tecnologia*, 597-608.
80. Deepa, R., Karthick, R., Velusamy, J., & Senthilkumar, R. (2025). Performance analysis of multiple-input multiple-output orthogonal frequency division multiplexing system using arithmetic optimization algorithm. *Computer Standards & Interfaces*, 92, 103934.
81. Selvan, M. Arul, and S. Miruna Joe Amali. "RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE." (2024).
82. Selvan, M. Arul. "Fire Management System For Industrial Safety Applications." (2023).
83. Selvan, M. A. (2023). A PBL REPORT FOR CONTAINMENT ZONE ALERTING APPLICATION.
84. Selvan, M. A. (2023). CONTAINMENT ZONE ALERTING APPLICATION A PROJECT BASED LEARNING REPORT.
85. Selvan, M. A. (2021). Robust Cyber Attack Detection with Support Vector Machines: Tackling Both Established and Novel Threats.
86. Reddy, A. S., Prathap, P., Subbaiah, Y. V., Reddy, K. R., & Yi, J. (2008). Growth and physical behaviour of Zn1– xMgxO films. *Thin Solid Films*, 516(20), 7084-7087.
87. Ambujam, S., Audhya, M., Reddy, A., & Roy, S. (2013). Cutaneous angiosarcoma of the head, neck, and face of the elderly in type 5 skin. *Journal of Cutaneous and Aesthetic Surgery*, 6(1), 45-47.
88. Reddy, K. R., Prathap, P., Revathi, N., Reddy, A. S. N., & Miles, R. W. (2009). Mg-composition induced effects on the physical behavior of sprayed Zn1– xMgxO films. *Thin Solid Films*, 518(4), 1275-1278.
89. Prathap, P., Reddy, A. S., Reddy, G. R., Miles, R. W., & Reddy, K. R. (2010). Characterization of novel sprayed Zn1– xMgxO films for photovoltaic application. *Solar energy materials and solar cells*, 94(9), 1434-1436.
90. Babbar, R., Kaur, A., Vanya, Arora, R., Gupta, J. K., Wal, P., ... & Behl, T. (2024). Impact of Bioactive Compounds in the Management of Various Inflammatory Diseases. *Current Pharmaceutical Design*, 30(24), 1880-1893.
91. Lokhande, M., Kalpanadevi, D., Kate, V., Tripathi, A. K., & Bethapudi, P. (2023). Study of Computer Vision Applications in Healthcare Industry 4.0. In *Healthcare Industry 4.0* (pp. 151-166). CRC Press.
92. Parganiha, R., Tripathi, A., Prathyusha, S., Baghel, P., Lanjhiyana, S., Lanjhiyana, S., ... & Sarkar, D. (2022). A review of plants for hepatic disorders. *J. Complement. Med. Res*, 13(46), 10-5455.

93. Tripathi, A. K., Soni, R., & Verma, S. (2022). A review on ethnopharmacological applications, pharmacological activities, and bioactive compounds of *Mimosa pudica* (linn.). *Research Journal of Pharmacy and Technology*, 15(9), 4293-4299.
94. Tripathi, A. K., Dwivedi, C. P., Bansal, P., Pradhan, D. K., Parganiha, R., & Sahu, D. An Ethnoveterinary Important Plant Terminalia Arjuna. *International Journal of Health Sciences*, (II), 10601-10607.
95. Mishra, S., Grewal, J., Wal, P., Bhivshet, G. U., Tripathi, A. K., & Walia, V. (2024). Therapeutic potential of vasopressin in the treatment of neurological disorders. *Peptides*, 174, 171166.
96. Koliqi, R., Fathima, A., Tripathi, A. K., Sohi, N., Jesudasan, R. E., & Mahapatra, C. (2023). Innovative and Effective Machine Learning-Based Method to Analyze Alcoholic Brain Activity with Nonlinear Dynamics and Electroencephalography Data. *SN Computer Science*, 5(1), 113.
97. Tripathi, A. K., Diwedi, P., Kumar, N., Yadav, B. K., & Rathod, D. (2022). Trigonella Foenum Grecum L. Seed (Fenugreek) Pharmacological Effects on Cardiovascular and Stress Associated Disease. *NeuroQuantology*, 20(8), 4599.
98. Sahu, P., Sharma, G., Verma, V. S., Mishra, A., Deshmukh, N., Pandey, A., ... & Chauhan, P. (2022). Statistical optimization of microwave assisted acrylamide grafting of *Linum usitatissimum* Gum. *NeuroQuantology*, 20(11), 4008.
99. Biswas, D., Sharma, G., Pandey, A., Tripathi, A. K., Pandey, A., Sahu, P., ... & Chauhan, P. (2022). Magnetic Nanosphere: Promising approach to deliver the drug to the site of action. *NeuroQuantology*, 20(11), 4038.
100. Ramya, S., Devi, R. S., Pandian, P. S., Suguna, G., Suganya, R., & Manimozhi, N. (2023). Analyzing Big Data challenges and security issues in data privacy. *International Research Journal of Modernization in Engineering Technology and Science*, 5(2023), 421-428.
101. Pandian, P. S., & Srinivasan, S. (2016). A Unified Model for Preprocessing and Clustering Technique for Web Usage Mining. *Journal of Multiple-Valued Logic & Soft Computing*, 26.
102. Muthukumar, K. K. M., & Pandian, S. Analyzing and Improving the Performance of Decision Database with Enhanced Momentous Data Types. *Asia Journal of Information Technology*, 16(9), 699-705.
103. Pandian, P. S. (2023). RETRACTED: Adopting security checks in business transactions using formal-oriented analysis processes for entrepreneurial students. *International Journal of Electrical Engineering & Education*, 60(1_suppl), 1357-1365.
104. Karthick, R., & Pragasam, J. (2019). D "Design of Low Power MPSoC Architecture using DR Method" Asian Journal of Applied Science and Technology (AJAST) Volume 3, Issue 2.
105. Karthick, R. (2018). Deep Learning For Age Group Classification System. *International Journal Of Advances In Signal And Image Sciences*, 4(2), 16-22.
106. Karthick, R., Akram, M., & Selvaprasanth, P. (2020). A Geographical Review: Novel Coronavirus (COVID-19) Pandemic. *A Geographical Review: Novel Coronavirus (COVID-19) Pandemic (October 16, 2020). Asian Journal of Applied Science and Technology (AJAST)(Quarterly International Journal) Volume, 4, 44-50.*
107. Karthick, R. (2018). Integrated System For Regional Navigator And Seasons Management. *Journal of Global Research in Computer Science*, 9(4), 11-15.
108. Kavitha, N., Soundar, K. R., Karthick, R., & Kohila, J. (2024). Automatic video captioning using tree hierarchical deep convolutional neural network and ASRNN-bi-directional LSTM. *Computing*, 106(11), 3691-3709.
109. Selvan, M. A. (2023). INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM.
110. Selvan, M. Arul. "PHISHING CONTENT CLASSIFICATION USING DYNAMIC WEIGHTING AND GENETIC RANKING OPTIMIZATION ALGORITHM." (2024).
111. Selvan, M. Arul. "Innovative Approaches in Cardiovascular Disease Prediction Through Machine Learning Optimization." (2024).
112. Kumar, T. V. (2024). A Comparison of SQL and NO-SQL Database Management Systems for Unstructured Data.
113. Kumar, T. V. (2024). A Comprehensive Empirical Study Determining Practitioners' Views on Docker Development Difficulties: Stack Overflow Analysis.

114. 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.
115. 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.
116. Sharma, S., & Dutta, N. (2024). Examining ChatGPT's and Other Models' Potential to Improve the Security Environment using Generative AI for Cybersecurity.
117. Sharma, S., & Dutta, N. (2016). Analysing Anomaly Process Detection using Classification Methods and Negative Selection Algorithms.
118. Sakshi, S. (2023). Development of a Project Risk Management System based on Industry 4.0 Technology and its Practical Implications.
119. Arora, P., & Bhardwaj, S. (2021). Methods for Threat and Risk Assessment and Mitigation to Improve Security in the Automotive Sector. *Methods*, 8(2).
120. Arora, P., & Bhardwaj, S. (2020). Research on Cybersecurity Issues and Solutions for Intelligent Transportation Systems.
121. Arora, P., & Bhardwaj, S. (2019). The Suitability of Different Cybersecurity Services to Stop Smart Home Attacks.
122. Arora, P., & Bhardwaj, S. (2017). A Very Safe and Effective Way to Protect Privacy in Cloud Data Storage Configurations.
123. Arora, P., & Bhardwaj, S. (2017). Investigation and Evaluation of Strategic Approaches Critically before Approving Cloud Computing Service Frameworks.
124. Arora, P., & Bhardwaj, S. (2017). Enhancing Security using Knowledge Discovery and Data Mining Methods in Cloud Computing.
125. Arora, P., & Bhardwaj, S. (2019). Safe and Dependable Intrusion Detection Method Designs Created with Artificial Intelligence Techniques. *machine learning*, 8(7).
126. Sharma, S., & Dutta, N. (2024). Examining ChatGPT's and Other Models' Potential to Improve the Security Environment using Generative AI for Cybersecurity.
127. Sakshi, S. (2023). Development of a Project Risk Management System based on Industry 4.0 Technology and its Practical Implications.
128. Sharma, S., & Dutta, N. (2018). Development of New Smart City Applications using Blockchain Technology and Cybersecurity Utilisation. *Development*, 7(11).
129. Sharma, S., & Dutta, N. (2017). Classification and Feature Extraction in Artificial Intelligence-based Threat Detection using Analysing Methods.
130. Sharma, S., & Dutta, N. (2017). Development of Attractive Protection through Cyberattack Moderation and Traffic Impact Analysis for Connected Automated Vehicles. *Development*, 4(2).
131. Sharma, S., & Dutta, N. (2016). Analysing Anomaly Process Detection using Classification Methods and Negative Selection Algorithms.
132. Sharma, S., & Dutta, N. (2015). Evaluation of REST Web Service Descriptions for Graph-based Service Discovery with a Hypermedia Focus. *Evaluation*, 2(5).
133. Sharma, S., & Dutta, N. (2015). Cybersecurity Vulnerability Management using Novel Artificial Intelligence and Machine Learning Techniques.
134. Sharma, S., & Dutta, N. (2015). Distributed DNN-based Middleware for Cyberattack Detection in the Smart IOT Ecosystem: A Novel Framework and Performance Evaluation Technique.
135. Sakshi, S. (2024). A Large-Scale Empirical Study Identifying Practitioners' Perspectives on Challenges in Docker Development: Analysis using Stack Overflow.
136. Sakshi, S. (2023). Advancements and Applications of Generative Artificial Intelligence and show the Experimental Evidence on the Productivity Effects using Generative Artificial Intelligence.
137. Bhat, S. (2024). Building Thermal Comforts with Various HVAC Systems and Optimum Conditions.
138. Bhat, S. (2020). Enhancing Data Centre Energy Efficiency with Modelling and Optimisation of End-To-End Cooling.
139. Bhat, S. (2016). Improving Data Centre Energy Efficiency with End-To-End Cooling Modelling and Optimisation.

140. Bhat, S. (2015). Deep Reinforcement Learning for Energy-Saving Thermal Comfort Management in Intelligent Structures.
141. Bhat, S. (2015). Design and Function of a Gas Turbine Range Extender for Hybrid Vehicles.
142. Bhat, S. (2023). Discovering the Attractiveness of Hydrogen-Fuelled Gas Turbines in Future Energy Systems.
143. Bhat, S. (2019). Data Centre Cooling Technology's Effect on Turbo-Mode Efficiency.
144. Bhat, S. (2018). The Impact of Data Centre Cooling Technology on Turbo-Mode Efficiency.
145. Bhat, S. (2015). Technology for Chemical Industry Mixing and Processing. *Technology*, 2(2).
146. Bauri, K. P., & Sarkar, A. (2016). Flow and scour around vertical submerged structures. *Sādhanā*, 41, 1039-1053.
147. Bauri, K. P., & Sarkar, A. (2020). Turbulent bursting events within equilibrium scour holes around aligned submerged cylinder. *Journal of Turbulence*, 21(2), 53-83.
148. Bauri, K. P., & Sarkar, A. (2019). Turbulent burst-sweep events around fully submerged vertical square cylinder over plane bed. *Environmental Fluid Mechanics*, 19, 645-666.
149. Bauri, K. P. (2022). Coherent structures around submerged circular and square cylinders due to change of orientation angle in steady current over plane bed. *Acta Geophysica*, 70(5), 2223-2250.
150. Polamarasetti, A. (2024, November). Research developments, trends and challenges on the rise of machine learning for detection and classification of malware. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1-5). IEEE.
151. Polamarasetti, A. (2024, November). Machine learning techniques analysis to Efficient resource provisioning for elastic cloud services. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1-6). IEEE.
152. Polamarasetti, A. (2024, November). Role of Artificial Intelligence and Machine Learning to Enhancing Cloud Security. In *2024 International Conference on Intelligent Computing and Emerging Communication Technologies (ICEC)* (pp. 1-6). IEEE.
153. Gollangi, H. K., Bauskar, S. R., Madhavaram, C. R., Galla, E. P., Sunkara, J. R., & Reddy, M. S. (2020). Echoes in Pixels: The intersection of Image Processing and Sound detection through the lens of AI and ML. *International Journal of Development Research*, 10(08), 39735-39743.
154. Reddy, M. S., Sarisa, M., Konkimalla, S., Bauskar, S. R., Gollangi, H. K., Galla, E. P., & Rajaram, S. K. (2021). Predicting tomorrow's Ailments: How AI/ML Is Transforming Disease Forecasting. *ESP Journal of Engineering & Technology Advancements*, 1(2), 188-200.
155. Boddapati, V. N., Sarisa, M., Reddy, M. S., Sunkara, J. R., Rajaram, S. K., Bauskar, S. R., & Polimetla, K. (2022). Data migration in the cloud database: A review of vendor solutions and challenges. *Available at SSRN 4977121*.
156. Boddapati, V. N., Sarisa, M., Reddy, M. S., Sunkara, J. R., Rajaram, S. K., Bauskar, S. R., & Polimetla, K. (2022). Data migration in the cloud database: A review of vendor solutions and challenges. *Available at SSRN 4977121*.
157. Patra, G. K., Rajaram, S. K., Boddapati, V. N., Kuraku, C., & Gollangi, H. K. (2022). Advancing Digital Payment Systems: Combining AI, Big Data, and Biometric Authentication for Enhanced Security. *International Journal of Engineering and Computer Science*, 11(08), 10-18535.
158. Patra, G. K., Rajaram, S. K., & Boddapati, V. N. (2019). Ai And Big Data In Digital Payments: A Comprehensive Model For Secure Biometric Authentication. *Educational Administration: Theory and Practice*.
159. Boddapati, V. N., Galla, E. P., Sunkara, J. R., Bauskar, S., Patra, G. K., Kuraku, C., & Madhavaram, C. R. (2021). Harnessing the Power of Big Data: The Evolution of AI and Machine Learning in Modern Times. *ESP Journal of Engineering & Technology Advancements*, 1(2), 134-146.
160. Singh, K., & Neeru, N. (2023). A COMPREHENSIVE STUDY OF THE IOT ATTACKS ON DIFFERENT LAYERS. *Journal Punjab Academy of Sciences*, 23, 140-155.
161. Singh, K., & Neeru, N. (2023). A COMPREHENSIVE STUDY OF THE IOT ATTACKS ON DIFFERENT LAYERS. *Journal Punjab Academy of Sciences*, 23, 140-155.

162. Ravi, P., Haritha, D., & Obulesh, A. (2022). Average Iceberg Queries Computation Using Bitmap Indexes On Health Care Data. *Journal of Pharmaceutical Negative Results*, 3724-3731.
163. Singh, V., Sharma, M. P., Jayapriya, K., Kumar, B. K., Chander, M. A. R. N., & Kumar, B. R. (2023). Service quality, customer satisfaction and customer loyalty: A comprehensive literature review. *Journal of Survey in Fisheries Sciences*, 10(4S), 3457-3464.