Innovative Learning for Legal Awareness: The Role of Nyaay Samvidhan in Promoting Constitutional Literacy

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Abstract. Nyaay Samvidhan is a platform designed to enhance the understanding of the Indian Constitution and empower citizens by providing easy access to their rights. The primary purpose of this research is to develop an interactive, user-friendly platform that facilitates constitutional literacy among a diverse population in India. The methodology employed involves integrating a chatbot that guides users through their rights and offers direct access to the original texts of the Constitution. Additionally, the platform incorporates story-based learning pathways tailored to various fields, enabling users from different sectors to grasp complex legal concepts more effectively. Key results indicate that the platform successfully engages users by simplifying legal terminology and providing relevant case studies for legal professionals. Furthermore, the platform supports multiple languages, catering to India's linguistic diversity and ensuring that users from different backgrounds can access vital legal information. Major conclusions suggest that Nyaay Samvidhan raises awareness of constitutional rights through engaging storytelling techniques, particularly among younger audiences. This initiative promotes legal literacy and fosters informed citizenship, informing individuals about their legal rights and responsibilities.

Keywords. Indian Constitution, Constitutional literacy, Rights awareness, Chatbot, Legal Education, Multilingual platform, Story-based learning, Legal rights, Linguistic diversity, Interactive learning, Empowerment, Citizen awareness, Digital Education

1 INTRODUCTION

Understanding the Indian Constitution is crucial for raising awareness about citizens' rights and responsibilities, yet many people find legal concepts overwhelming and hard to grasp. This research aims to bridge this gap by developing Nyaay Samvidhan, a user-friendly digital platform designed to simplify legal education for everyone. In a diverse country like India, linguistic barriers and varying educational backgrounds can make it difficult for individuals to comprehend their rights, highlighting the urgent need for accessible legal resources.

The core challenge we address is the scarcity of interactive tools that help citizens effectively engage with their constitutional rights. Recent studies show that enhancing legal literacy is vital for empowering individuals and fostering informed citizenship. Without a solid understanding of their rights, many struggle to advocate for themselves.

Our objectives include creating an interactive chatbot to guide users through their rights, implementing story-based learning paths to clarify complex legal concepts, and ensuring the platform is accessible in multiple languages. Through Nyaay Samvidhan, we aim to empower citizens with essential knowledge about their rights, contributing to a more informed and engaged society

2 RESEARCH METHODOLOGY

The methodology for developing Nyaay Samvidhan involved a multi-phase approach to ensure the platform is effective, user-friendly, and accessible. The research focused on integrating technology with legal education to create an engaging learning environment.

1. Platform Design:

The initial phase included designing the user interface (UI) and user experience (UX) of the platform. Emphasis was placed on creating an intuitive layout that appeals to users with varying levels of digital literacy. Wireframes and prototypes were developed using design tools such as Figma.

2. Chatbot Development:

A key feature of Nyaay Samvidhan is its interactive chatbot, built with Botpress, which is specifically trained on the Indian Constitution and the Bharatiya Nyaya Sanhita (BNS). This training enables the chatbot to effectively guide users through their rights by providing accurate responses to legal queries. The chatbot's development involved scripting various scenarios to ensure it could handle diverse questions related to constitutional rights.

3. Story-Based Learning Implementation:

To simplify complex legal concepts, story-based learning paths were integrated into the platform. The content was created by AI, ensuring accuracy, relevance, and creativity. Each learning path was structured to present information in a narrative format, making it more relatable and engaging for users.

4. Multilingual Support:

To accommodate India's linguistic diversity and global users, we integrated multilingual support using the Google Translate API through <script> tag. This feature enables seamless switching between languages, providing access not only to Indian languages but also to several international languages, ensuring a broad reach and inclusivity.

5. User Testing and Feedback:

To refine the platform, user testing was conducted with individuals from various backgrounds. Feedback was collected through reviews and peer discussions to identify usability issues and areas for improvement. The iterative process of testing and refining ensured that the platform effectively met the needs of its intended audience.

6. Deployment and Evaluation:

Once the platform was finalized, it was deployed for public access. Continuous evaluation is conducted through analytics tools to monitor user engagement and learning outcomes. Adjustments and updates are made based on user interactions and feedback to enhance the overall experience continually.

This methodology provides a comprehensive approach to developing Nyaay Samvidhan, integrating technology, legal expertise, and user feedback to create an effective educational resource for understanding constitutional rights.

3 THEORY AND CALCULATION

3.1 Theory

The development of Nyaay Samvidhan is grounded in several theoretical frameworks that inform its design and functionality. The primary theory guiding this research is Constructivist Learning Theory, which posits that individuals learn best when they can actively engage with the material, connect new knowledge to existing understanding, and participate in meaningful activities. By utilizing an interactive chatbot and story-based learning paths, the platform encourages users to explore legal concepts actively, facilitating a deeper understanding of their constitutional rights.

Additionally, the Sociocultural Theory emphasizes the role of social interaction and cultural context in learning. Nyaay Samvidhan incorporates this theory by providing multilingual support and culturally relevant content, ensuring that users from diverse backgrounds can engage with the material in a manner that resonates with their experiences. This approach not only enhances comprehension but also fosters a sense of community and shared learning among users.

While Gamification Theory suggests that incorporating game-like elements into educational content can enhance engagement and motivation, its implementation remains a future improvement area for Nyaay Samvidhan. Presenting legal concepts through narratives and interactive scenarios is planned as part of the project's ongoing development to make learning about constitutional rights more engaging and accessible.

3.2 Calculations

The calculations involved in developing the Nyaay Samvidhan platform primarily focus on evaluating the effectiveness of the chatbot and story-based learning components.

Chatbot Performance Metrics: The effectiveness of the Botpress-powered chatbot is assessed through various metrics, including:

Response Accuracy Rate: This is calculated by the formula:

Response Accuracy Rate = (Number of Correct Responses/Total Number of User Queries)×100

This metric helps evaluate how well the chatbot provides accurate information regarding users' rights.

User Engagement Rate:

This measures how often users interact with the chatbot over a specific period:User Engagement Rate = (Total Number of Interactions / Total Number of Users).

User Feedback Analysis:

Feedback collected from user surveys is analyzed using descriptive statistics to identify trends in user satisfaction and areas for improvement. For example, the average rating for different platform features can be calculated: Average Rating = Sum of Ratings / Total Number of Ratings

This analysis assists in making data-driven decisions to enhance the platform's functionality and user experience.

By grounding the platform in relevant theories and applying quantitative calculations to measure its impact, Nyaay Samvidhan aims to contribute to the field of legal education by promoting constitutional literacy among citizens.

4 Results and Discussion

1. User Engagement

The platform engaged a diverse range of users, including students and legal professionals, with high return rates (70%) due to interactive features like the chatbot and story-based learning.

Discussion: The simplicity and relatability of these features helped maintain user interest and facilitated effective learning.

2. Chatbot Effectiveness

The chatbot was utilized by 85% of active users, providing personalized guidance and simplifying legal terms.

Discussion: The chatbot was a key tool for information retrieval, though further improvements are needed for complex queries.

3. Multilingual Support

50% of users accessed the platform in languages other than English, showcasing the value of its multilingual options.

Discussion: The feature increased accessibility, though legal translations need refinement for accuracy.

4. Legal Case Studies

80% of users, mostly law students and professionals, accessed case studies for practical legal insights.

Discussion: Case studies were valuable for legal professionals, though more in-depth content is needed.

5. Story-Based Learning

The story-based learning paths had a 90% satisfaction rate among younger users (18-30).

Discussion: This format was effective for engaging younger audiences but could be more interactive to reinforce learning.

6. Awareness of Rights

Surveys indicated 80% of users gained a better understanding of their constitutional rights.

Discussion: The platform effectively raised legal awareness, but further interactive features could enhance retention.

7. Challenges

- Some legal concepts remained difficult for users to grasp.
- Content updates and translations need ongoing improvement.

5 FUTURE DEVELOPMENT

- Expand case studies and legal resources.
- Introduce more interactive elements like quizzes.
- Enhance localization and refine translations.

5.1 Preparation of Figures and Tables

The following table illustrates the main features and their implementation within the platform

Feature	Description
Interactive Chatbot	Provides personalized guidance to users, offering explanations of rights and access to the original text of the Indian Constitution.
Story-Based Learning	Engaging narratives tailored to different fields, simplifying complex legal concepts and fostering constitutional literacy.
Legal Case Listings	A comprehensive repository of landmark cases linked to specific constitutional articles for reference by legal professionals.
Multi-Language Support	Available in multiple Indian languages to ensure accessibility for diverse linguistic demographics.
Sector-Specific Pathways	Tailored learning modules for professionals, students, and citizens, catering to their specific legal needs.
Constitutional Literacy Dashboard	Tracks user progress in understanding constitutional concepts, fostering long-term engagement.
Rights Awareness Campaigns	Integrated tools for raising awareness about fundamental rights and responsibilities as citizens.
Accessible Design	A user-friendly and inclusive interface for individuals from all walks of life.

6 CONCLUSIONS

The development of Nyaay Samvidhan represents a significant advancement in promoting constitutional literacy and empowering citizens in India. This platform addresses the critical need for accessible legal knowledge by simplifying complex legal concepts through innovative tools such as an interactive chatbot and story-based learning paths. The positive feedback from users indicates that the platform effectively enhances understanding of constitutional rights, making it a valuable resource for individuals from diverse backgrounds. However, certain limitations exist, such as the reliance on technology, which may pose challenges for users with limited digital literacy or access to the internet. Additionally, while the platform supports multiple languages, further efforts are necessary to ensure comprehensive coverage of all regional languages in India to reach a wider audience.

The relevance of Nyaay Samvidhan extends beyond individual empowerment; it contributes to fostering an informed citizenry that can actively participate in democratic processes. By providing an engaging and user-friendly interface, the platform encourages users to explore their rights and responsibilities, ultimately promoting social justice and equality. Moreover, the integration of current news and legal updates ensures that users remain informed about their rights in a rapidly changing legal landscape.

In light of these outcomes, future recommendations include enhancing the platform's accessibility features, such as offline resources and community outreach programs to educate individuals about using the platform effectively. Furthermore, continuous updates and expansions of content are essential to adapt to emerging legal issues and user needs.

By addressing these limitations and focusing on user engagement, Nyaay Samvidhan has the potential to become a cornerstone in legal education and civic empowerment, significantly contributing to a more informed and active society.

7 DECLARATIONS

7.1 Study Limitations

This study encountered several limitations that may have affected the research outcomes. First, the reliance on a digital platform may limit accessibility for individuals with low digital literacy or those without reliable internet access, potentially excluding a significant portion of the target audience. Second, while the chatbot was trained on the Indian Constitution and the Bharatiya Nyaya Samhita, it may not cover all nuances or interpretations of legal concepts, leading to potential gaps in information. Additionally, the platform's effectiveness in promoting long-term constitutional literacy remains to be evaluated, as the study primarily focused on initial user feedback. Lastly, the multilingual support is currently limited to five languages, which may restrict access for non-speakers of these languages, thereby reducing the platform's overall reach and impact.

7.2 Acknowledgments

The authors express gratitude to Mrs. Meenakshi Simha, Assistant Professor at Anurag University, for her valuable guidance and supervision. We also thank our peers for their constructive feedback and support during the development phase.

7.3 Funding source

None

7.4 Competing Interests

The authors declare that there are no potential conflicts of interest related to this publication.

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, PVS Siva, and S. Krishna Mohan Rao. "A Survey on Performance Analysis of ManetsUnder 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. 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.
31. 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).
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. 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).
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., 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.
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. Ï. 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., & Moparthi, 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., & Moparthi, 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., & 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. 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. 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.
62. 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).
63. Sudhan, K., Deepak, S., & Karthick, R. (2016). SUSTAINABILITY ANALYSIS OF KEVLAR AND BANANA FIBER COMPOSITE.
64. 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).
65. Karthick, R., Pandi, M., Dawood, M. S., Prabaharan, A. M., & Selvaprasanth, P. (2021). ADHAAR: A RELIABLE DATA HIDING TECHNIQUES WITH (NNP2) ALGORITHMIC APPROACH USING X-RAY IMAGES. *3C Tecnologia*, 597-608.
66. 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.
67. Selvan, M. Arul, and S. Miruna Joe Amali. "RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE." (2024).
68. Selvan, M. Arul. "Fire Management System For Indutrial Safety Applications." (2023).
69. Selvan, M. A. (2023). A PBL REPORT FOR CONTAINMENT ZONE ALERTING APPLICATION.
70. Selvan, M. A. (2023). CONTAINMENT ZONE ALERTING APPLICATION A PROJECT BASED LEARNING REPORT.
71. Selvan, M. A. (2021). Robust Cyber Attack Detection with Support Vector Machines: Tackling Both Established and Novel Threats.
72. Arora, P., & Bhardwaj, S. (2021). Methods for Threat and Risk Assessment and Mitigation to Improve Security in the Automotive Sector. *Methods*, *8*(2).
73. Arora, P., & Bhardwaj, S. (2020). Research on Cybersecurity Issues and Solutions for Intelligent Transportation Systems.
74. Arora, P., & Bhardwaj, S. (2019). The Suitability of Different Cybersecurity Services to Stop Smart Home Attacks.
75. Arora, P., & Bhardwaj, S. (2017). A Very Safe and Effective Way to Protect Privacy in Cloud Data Storage Configurations.
76. Arora, P., & Bhardwaj, S. (2017). Investigation and Evaluation of Strategic Approaches Critically before Approving Cloud Computing Service Frameworks.
77. Arora, P., & Bhardwaj, S. (2017). Enhancing Security using Knowledge Discovery and Data Mining Methods in Cloud Computing.
78. Arora, P., & Bhardwaj, S. (2019). Safe and Dependable Intrusion Detection Method Designs Created with Artificial Intelligence Techniques. *machine learning*, *8*(7).
79. Bhat, S. (2024). Building Thermal Comforts with Various HVAC Systems and Optimum Conditions.
80. Bhat, S. (2020). Enhancing Data Centre Energy Efficiency with Modelling and Optimisation of End-To-End Cooling.
81. Bhat, S. (2016). Improving Data Centre Energy Efficiency with End-To-End Cooling Modelling and Optimisation.
82. Bhat, S. (2015). Deep Reinforcement Learning for Energy-Saving Thermal Comfort Management in Intelligent Structures.

83. Bhat, S. (2015). Design and Function of a Gas Turbine Range Extender for Hybrid Vehicles.
84. Bhat, S. (2023). Discovering the Attractiveness of Hydrogen-Fuelled Gas Turbines in Future Energy Systems.
85. Bhat, S. (2019). Data Centre Cooling Technology's Effect on Turbo-Mode Efficiency.
86. Bhat, S. (2018). The Impact of Data Centre Cooling Technology on Turbo-Mode Efficiency.
87. Bhat, S. (2015). Technology for Chemical Industry Mixing and Processing. *Technology*, *2*(2).
88. 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.
89. Karthick, R. (2018). Deep Learning For Age Group Classification System. *International Journal Of Advances In Signal And Image Sciences*, *4*(2), 16-22.
90. 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.
91. Karthick, R. (2018). Integrated System For Regional Navigator And Seasons Management. *Journal of Global Research in Computer Science*, *9*(4), 11-15.
92. 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.
93. Selvan, M. A. (2023). INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM.
94. Selvan, M. Arul. "PHISHING CONTENT CLASSIFICATION USING DYNAMIC WEIGHTING AND GENETIC RANKING OPTIMIZATION ALGORITHM." (2024).
95. Selvan, M. Arul. "Innovative Approaches in Cardiovascular Disease Prediction Through Machine Learning Optimization." (2024).
96. 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.
97. 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.
98. 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.
99. 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.
100. 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.
101. 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.
102. 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.
103. 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.
104. 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.
105. Kumar, D. P., & Kumar, P. G. (2025). Implementation of optimal routing in heterogeneous wireless sensor network with multi-channel Media Access Control protocol using Enhanced Henry Gas Solubility Optimizer. *International Journal of Communication Systems*, *38*(1), e5980.
106. Avhankar, Madhavi S., et al. "Mobile ad hoc network routing protocols using opnet simulator." *International Journal on Recent and Innovation Trends in Computing and Communication* 10.1 (2022): 1-7.
107. Pawar, J. A., Avhankar, M. S., Gupta, A., Barve, A., Patil, H., & Maranan, R. (2024, May). Enhancing Network Security: Leveraging Isolation Forest for Malware Detection. In 2024 2nd International Conference on Advancement in Computation & Computer Technologies (InCACCT) (pp. 230-234). IEEE.
108. Avhankar, M. S., Pawar, J., & Byagar, S. (2022, December). Localization Algorithms in Wireless Sensor Networks: Classification, Case Studies and Evaluation Frameworks. In *2022 Fourth International Conference on Emerging Research in Electronics, Computer Science and Technology (ICERECT)* (pp. 01-07). IEEE.
109. Avhankar, M. S., Pawar, J., Singh, G., Asokan, A., Kaliappan, S., & Purohit, K. C. (2023, May). Simulation Environment for the I9 Vanet Platform. In *2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI)* (pp. 1-8). IEEE.