International Journal for Modern Trends in Science and Technology
Volume 12, Special Issue 01, pages 1103-1109
ISSN: 2455-3778 online
Available online at: http://ijmtst.com/ICRCSET2026.html
DOI: https://doi.org/10.5281/zenodo.19613653

Wearable Reader for Visual impairment People with vibrational feedback

Lavanya Dalavai, B. Naga Venkata Suneel, M. Susmitha, G. Vijayasaradhi, G. Ijak

Department of CSE – Data Science, Chalapathi Institute of Technology, Guntur-522016, A.P, India

To Cite this Article
Lavanya Dalavai, B. Naga Venkata Suneel, M. Susmitha, G. Vijayasaradhi & G. Ijak (2026). Wearable Reader for Visual impairment People with vibrational feedback. International Journal for Modern Trends in Science and Technology, 12(SI01), 1103-1109. https://doi.org/10.5281/zenodo.19613653

Article Info
Received: 12 March 2026; Revised: 07 April 2026; Accepted: 10 April 2026.

KEYWORDS

Raspberry Pi, Assistive Technology, Visually Impaired, Optical Character Recognition (OCR), Text-to-Speech (TTS), Wearable Device.

ABSTRACT

The Raspberry Pi Based Wearable Reader for Visually Impaired People with Haptic Feedback is an assistive system designed to help visually impaired individuals read printed text independently. The system uses a camera to capture text, Optical Character Recognition (OCR) to extract it, and a Text-to-Speech (TTS) engine to convert it into audio output. Additionally, vibration motors provide haptic feedback to guide users and indicate system status. The device is portable, cost-effective, and suitable for real-time usage. This system enhances accessibility, independence, and usability for visually impaired individuals[1][2].

I. INTRODUCTION

Visual impairment significantly affects a person's ability to access printed information such as books, newspapers, and sign boards. Traditional assistive methods like Braille and screen readers have limitations, as Braille is not universally available and screen readers are restricted to digital content. Recent advancements in embedded systems and computer vision have enabled the development of portable assistive devices that can interpret printed text in real time.

The Raspberry Pi has emerged as powerful and affordable platform for such applications due to its flexibility and ability to interface with cameras and sensors. Researchers have previously developed OCR-based systems that convert printed text into speech for visually impaired users [1]. However, many of these systems lack portability and multi-sensory feedback. The proposed system addresses these limitations by integrating OCR, TTS, and haptic feedback into a wearble, device, thereby enhancing usability and independence [2][3].

The rapid advancement in embedded systems, computer vision, and artificial intelligence, new opportunities have merged to develop more efficient assistive technologies. The Raspberry Pi, a compact and affordable signal-board computer, provides an ideal perform for building such systems due to its ability to interface with cameras, sensors, and various peripherals. This project proposes a wearable reading device that utilizes Raspberry Pi to capture printed text, process it using OCR, and convert it into speech using TTS technology. Furthermore, the integration of haptic feedback enhances user interaction by providing vibration-based signals, making the system more effective even in noisy environment.

2. LITERATURE SURVEY

The development of assistive technologies for visually impaired individuals has gained significant attention in recent years, especially with advancements in computer vision, embedded systems, and artificial intelligence. One of the most widely used approaches in assistive reading devices is Optical Characte Recognition (OCR), which enables the extraction of text from images. According to Ray Smith [4], OCR systems such as Tesseract have demonstrated high accuracy in recognizing printed text and have been widely adopted in various applications, including assistive devices for the visually impaired. These systems form the backbone of moder text-reading technologies.

Several researchers have proposed systems that combine OCR with Text-to-Speech (TTS) technology to assist visually impaired users. Kaur and Kaur [1] developed a text recognition system that captures printed text using a camera and converts it into speech output. Their study highlighted that OCR combined with TTS can significantly improve accessibility by enabling users to access printed information independently. However, their system was primarily limited to basic text recognition and lacked portability and real-time performance.

With the emergence of embedded platforms, researchers have increasingly adopted devices like Rasberry Pi for assistive applications due to their low cost, compact size, and flexibility. Sharma et al. [2] proposed a Raspberry Pi-based assistive system that integrates a camer module and OCR software to read printe text. Their system demonstrated that Raspberry Pi is capable for handling image processing and speech synthesis takes efficiently. However, the system mainly relied on audio output, which may not be effective in noisy environments or situations where users require silent feedback.

The proposed system builds upon these research efforts by integrating OCR, TTS, and haptic feedback into a single wearable device using Raspberry Pi. By combining these technologies, the system aims to overcome the limitations of existing solutions and provide a cost-effective, portable, and uer-friendly assistive device thatr enhances independence for visually impaired individuals

3. EXISTING METHOD

The existing system for assisting visually impaired individuals using a Raspberry Pi is primarily based on image processing and audio output technologies. In these systems, a camera module captures an image of the printed text, which is then processed using Optical Character Recognition (OCR) software such as Tesseract OCR engine to extract the textual content. The extracted text is subsequently converted into speech using Text-to-Speech (TTS) engines like eSpeak TTS engine, allowing the user to listen to the content through headphones or speakers. Most existing solutions rely on the Raspberry Pi 4 Model B as the central processing unit due to its affordability and capability to handle image processing tasks. However, these systems are often limited in functionality, as they mainly provide audio output without additional feedback mechanisms such as haptic alerts. Furthermore, many of them are either stationary or only partially portable, requiring the user to manually position the camera, and they may suffer from reduced accuracy under poor lighting conditions or with complex fonts. Processing delays and lack of real-time interaction also affect their efficiency. Hence, while existing systems provide a basic and cost-effective solution for text reading, they still lack advanced features like wearable convenience, fast processing, and multi-sensory feedback.

4. PROPOSED METHODOLOGY

The proposed system is designed as a wearable ssistive device that helps visually impaired individuals read printed text using image processing, speech synthesis, and haptic feedback. The system uses a Raspberry Pi as the main processing unit, which is connected tp a camera module for capturing images of printed text. When the user activates the device, the cameras captures an image, which is then processed using Optical Character Recognition (OCR) to extract textual information. OCR plays a vital role in converting image-based text into a digital format and has been widely used in assistive technologies fpor visually impaired users [1][4].

After extracting the text, the system converts it into speecg using Text-to-Speech (TTS) engine. The generated audio is delivered through a speaker or headphones, allowing the user to listen to the content easily. Studies have shown that combining OCR and TTS provides an effective solution for accessing printed materials independently[1][2].

To enhance user interaction, the system also incorporates haptic feedback using vibration motors. These motors provide simple tactile signals to indicate system status, such as successful image capture or errors. This feature is particularly usefull in noisy environments where audio feedback alone may not be sufficient [3].

The entire system is designed to be portable and wearable, enabling hands-freee operation it runs on a Python-based environment using the Raspbian operating system and is capable pf real-time processing without requiring internet connectivity. By integrating OCR, TTS and haptic feedback into single device, the system provides a cost-effective and user-friendly solution that improves accessibility and independence for visually impaired individuals.

5. WORKING PRINCIPLE

The working principle of a Raspberry Pi-based wearable reader for visually impaired people is based on capturing printed text, processing it, and converting it into audio output. Initially, the user activates the device using a button or voice command, which triggers the camera module to capture an image of the text. This image is then sent to the processing unit, typically the Raspberry Pi 4 Model B, where it undergoes image preprocessing to improve clarity. The processed image is passed to an Optical Character Recognition (OCR) system such as the Tesseract OCR engine, which extracts the textual information from the image. Once the text is obtained, it is forwarded to a Text-to-Speech (TTS) engine like eSpeak TTS engine, which converts the text into spoken words. The audio output is then delivered to the user through earphones or a speaker, enabling them to understand the content. In systems with haptic feedback, a vibration motor is also activated to provide tactile signals, such as confirming that the text has been successfully captured or alerting the user during operation. This integrated process allows visually impaired users to access printed information independently in a simple and efficient manner.

BLOCK DIAGRAM

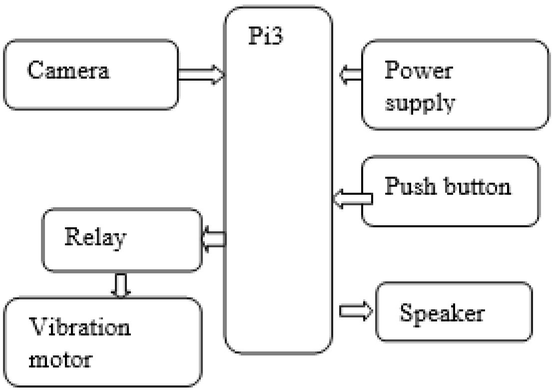

Fig. 4.1. Block Diagram

6. RESULTS AND OUTCOMES

The propose Raspberry Pi-based wearabke reader system was successfully designed and implemented to assist visually impaired individualas in reading printed text. The system was able to capture images using the camera module and accurately extract textual information using Optical Charater Recognition (OCR). The extracted text was then converted into speech using a Text-to-Speech (TTS) engine, providing clear and understandable audio output to the user. The performance of OCR and TTS integration in assistive systems has been proven effective in similar studies [1][2].

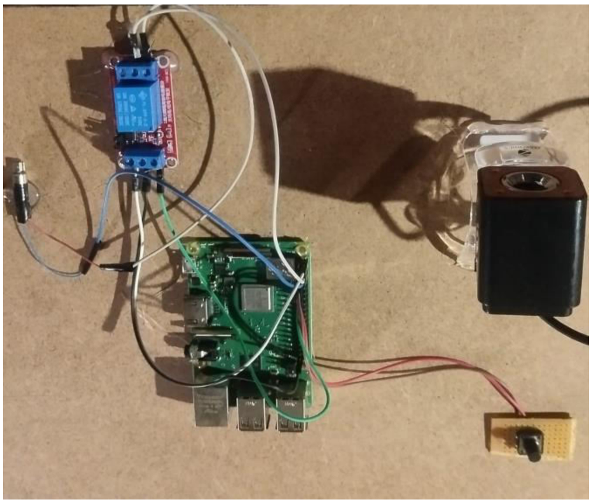

Fig. 5.1. Output 1

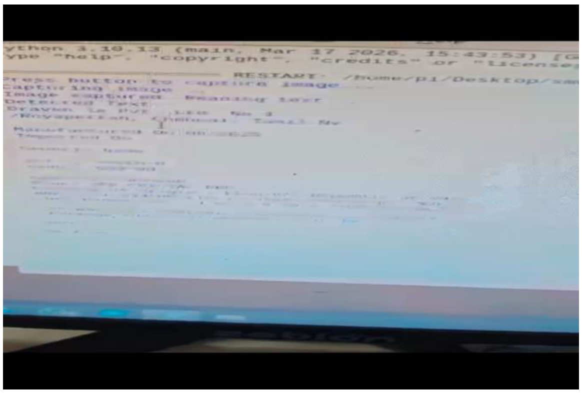

Fig. 5.2. Output 2

The system demonstarted reliable real-time performance under normal lighting conditions, with acceptable accuracy in recognizing printed text from books, labels, and signboards. The addition of hapic feedback through vibration motors provided useful tactile signals,, helping users understand system status such as successful image capture or errors. This multi-sensory approach improved usability, especially in environments where audio feedback alone was not sufficient, as supported by previous research [3].

The system consists of hardware and software components working together to provide a seamlesss experience. The hardware includes a Raspberry Pi, camera module, speaker, vibration motor, and power supply. The Raspberry Pi process the captured images using OCR software such as Tesseract and converts the extracted text into speech using TTS engines. The software is implemented using Python on the Raspbian operating system. Previous research has demonstrated that embedde systems like Raspberry Pi can efficiently handle image processing and speech synthesis tasks for assistive applications [2]. The intergration of these technologies ensures real-time performance and reliability.

The device waas found to be portable, user-friendlym and cost-effective, making it suitable for everyday use. It operates without requiring internet connectivity, which increases its reliability in differet environments. Overall, the system achieved its objective of enhancing accessibility and independence for visually impaired individuals by providing and efficient and pratical assistive solution

7. CONCLUSION

The Raspberry Pi based wearable reader with haptic feed back presents an effectibe and innovative solution for assisting visually impaired individuals in accessing printed information independently. The system successful integrates Optical Character Recognition (OCR), Text-to-Speech (TTS), and haptic feedback technologies into a single compact device. The experimental results show that the system can accurately capture printed text, process it efficiently, and convert it into clear audio output in real time. This enables users to readbooks, labels, and signboards without external assistance. Similar assistive systems based on OCR and TTS have demonstrated significant improvements in accessibility and user independence [1][2].

Furthermore, the inclusion of haptic feedback ehnaces the usability of the system by providing additional tactile cues that indicate system status, such as successful image capture or processing errors. This feature is particularly beneficial in noisy environments where audio feedback alone may not be sufficient, as supported by earlier research on multi-sensory assistive technologies [3]. The wearble design of the device ensures portability and allows hands-free operation, making it suitable for everyday use.

In addition to its functionality, the system is designed to be cost-effective and energy-efficent, which makes it accessible to a larger population. The ability to operate without internet connectivity further increases its reliability in different real-world conditions. Overall, the proposed system meets its primary objective of improving accessibility and ehnacing the independence of visually impaired individuals.

Theproject also provides a strong foundation for future advancements. Features such as multilingual text recognition, real-time continuous reading, artificial intelligence-based object detection, and integration with mobile applications can further enhance the system’s capabilities. With these improvements, the device can evolve into a more comprehensive assistive solution that supports navigation and envirionmental awareness, thereby significantly improving the quality of life for visually impaired users.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] K. K. . Kommineni and A. . Prasad, "A Review on Privacy and Security Improvement Mechanisms in MANETs", Int J Intell Syst Appl Eng, vol. 12, no. 2, pp. 90–99, Dec. 2023.

[2] Kommineni, K.K., Prasad, A. Enhancing Data Security and Privacy in SDN-Enabled MANETs Through Improved Data Aggregation Protection and Secrecy. Wireless Pers Commun 139, 855–882 (2024). https://doi.org/10.1007/s11277-024-11635-w

[3] "Blockchain-Enabled Secure Data Aggregation for SDN-Enabled Ad-Hoc Networks," International Journal of Intelligent Engineering and Systems, vol. 18, no. 5, pp. 704–717, Jun. 2025, doi: https://doi.org/10.22266/ijies2025.0630.49.

[4] K. K. Kommineni, P. Ande, "Blockchain-driven key management and privacy-preserving data Aggregation Scheme for SDN-enabled MANETs," International Journal of Intelligent Engineering and Systems, vol. 18–18, no. 9, pp. 601–615, 2025, doi: 10.22266/ijies2025.1031.39.

[5] Kumar, K. K., Kumar, S. G. B., Rao, S. G. R., & Sydulu, S. S. J. (2017, November). Safe and high secured ranked keyword searchover an outsourced cloud data. In 2017 International Conference on Inventive Computing and Informatics (ICICI) (pp. 20-25). IEEE.

[6] K. K. Kommineni, S. J. Basha, M. Sandeep, P. S. Vadana, T. S. R. Sai and D. S. Kumar, "A Review on IoT-based Defensive Devices for Women Security," 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2023, pp. 99-104, doi: 10.1109/ICACCS57279.2023.10113015.

[7] Vellela, S. S., & Balamanigandan, R. (2024). Optimized clustering routing framework to maintain the optimal energy status in the wsn mobile cloud environment. Multimedia Tools and Applications, 83(3), 7919-7938.

[8] Vellela, S. S., & Balamanigandan, R. (2023). An intelligent sleep-awake energy management system for wireless sensor network. Peer-to-Peer Networking and Applications, 16(6), 2714-2731.

[9] Vellela, S. S., & Balamanigandan, R. (2022, December). Design of Hybrid Authentication Protocol for High Secure Applications in Cloud Environments. In 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS) (pp. 408-414). IEEE.

[10] Vellela, S. S., Balamanigandan, R., & Praveen, S. P. (2022). Strategic survey on security and privacy methods of cloud computing environment. Journal of Next Generation Technology, 2(1).

[11] Reddy, N. V. R. S., Chitteti, C., Yesupadam, S., Desanamukula, V. S., Vellela, S. S., & Bommagani, N. J. (2023). Enhanced Speckle Noise Reduction in Breast Cancer Ultrasound Imagery Using a Hybrid Deep Learning Model. Ingenierie des Systemes d'Information, 28(4), 1063.

[12] Vellela, S. S., & Balamanigandan, R. (2024). An efficient attack detection and prevention approach for secure WSN mobile cloud environment. Soft Computing, 28(19), 11279-11293.

[13] Polasi, P. K., Vellela, S. S., Narayana, J. L., Simon, J., Kapileswar, N., Prabu, R. T., & Rashed, A. N. Z. (2026). Data rates transmission, operation performance speed and figure of merit signature for various quadurature light sources under spectral and thermal effects. Journal of Optics, 55(1), 633-643.

[14] Vellela, S. S., & Krishna, A. M. (2020). On Board Artificial Intelligence With Service Aggregation for Edge Computing in Industrial Applications. Journal of Critical Reviews, 7(07).

[15] Vellela, S. S., Rao, M. V., Mantena, S. V., Reddy, M. J., Vatambeti, R., & Rahman, S. Z. (2024). Evaluation of Tennis Teaching Effect Using Optimized DL Model with Cloud Computing System. International Journal of Modern Education and Computer Science (IJMECS), 16(2), 16-28.

[16] Biyyapu, N., Veerapaneni, E. J., Surapaneni, P. P., Vellela, S. S., & Vatambeti, R. (2024). Designing a modified feature aggregation model with hybrid sampling techniques for network intrusion detection. Cluster Computing, 27(5), 5913-5931.

[17] Vuyyuru, L. R., Purimetla, N. R., Reddy, K. Y., Vellela, S. S., Basha, S. K., & Vatambeti, R. (2025). Advancing automated street crime detection: a drone-based system integrating CNN models and enhanced feature selection techniques. International Journal of Machine Learning and Cybernetics, 16(2), 959-981.

[18] Praveen, S. P., Vellela, S. S., & Balamanigandan, R. (2024). SmartIris ML: harnessing machine learning for enhanced multi-biometric authentication. Journal of Next Generation Technology (ISSN: 2583-021X), 4(1).

[19] Vellela, S. S., Roja, D., Purimetla, N. R., Thalakola, S., Vuyyuru, L. R., & Vatambeti, R. (2025). Cyber threat detection in industry 4.0: Leveraging GloVe and self-attention mechanisms in BiLSTM for enhanced intrusion detection. Computers and Electrical Engineering, 124, 110368.

[20] Vellela, S. S., Varshini, K., Jeevana, M., Kadheer, S. K., & Kumar, T. P. (2024). Iot based smart irrigation and controlling system. IoT Based Smart Irrigation and Controlling System, International Journal for Modern Trends in Science and Technology, 10(02), 77-85.

[21] Vellela, S. S., Manne, V. K., Trividha, G., Chaithanya, L., & Shaik, A. (2025). Intelligent transportation systems ai and iot for sustainable urban traffic management. Available at SSRN 5250812.

[22] Vindhya, A. S., Vellela, S. S., Malathi, N., Vullam, N. R., Vuyyuru, L. R., & Rao, T. (2025, September). Integrating Quantum Computing with Genomic Data Analysis: A Next-Generation Approach for Predicting Disease Susceptibility. In 2025 4th International Conference on Innovative Mechanisms for Industry Applications (ICIMIA) (pp. 1168-1173). IEEE.

[23] Vellela, S. S., Rao, M. V., Krishna, C. V. M., Rao, T. S., & Dasthavejula, R. (2026). Piezoelectric and Shape-Memory Materials for Actuators and Energy Harvesting in Mechanical, Electronics, and Biomedical Engineering Using AI-Based Design. In Advanced Materials for Biomedical Devices (pp. 195-206). CRC Press.

[24] Vellela, S. S., Malathi, N., Vuyyuru, L. R., Javvadi, S., Rao, T. S., Bindu, M. N. H., & Rao, K. N. (2025, August). Improving Medical Image Analysis with Convolutional Neural Networks (Cnns). In 2025 International Conference on Intelligent and Secure Engineering Solutions (CISES) (pp. 579-584). IEEE.

[25] Roja, D., Jidugu, S. K., Rao, T. S., Vuyyuru, L. R., Vellela, S. S., & Ranjani, B. S. (2025, December). High-Fidelity Image Synthesis using Enhanced Generative Adversarial Networks with Attention Mechanisms. In 2025 International Conference on NexGen Networks and Cybernetics (IC2NC) (pp. 885-890). IEEE.

[26] Pakalapati, S., Rani, C. J., Vellela, S. S., Thanuja, N., & Bindu, M. N. H. (2025, November). Progressive GAN-based Framework for Realistic Image Generation and Style Transfer. In 2025 5th International Conference on Evolutionary Computing and Mobile Sustainable Networks (ICECMSN) (pp. 474-479). IEEE.

[27] Yanamadala, N., & Vellela, S. S. (2025, June). Ensuring Authenticity and Confidentiality in Images using SHA-ECC Fusion. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 684-689). IEEE.

[28] Rao, M. V., Sreeraman, Y., Mantena, S. V., Gundu, V., Roja, D., & Vatambeti, R. (2024). Brinjal Crop yield prediction using Shuffled shepherd optimization algorithm based ACNN-OBDLSTM model

in Smart Agriculture. Journal of Integrated Science and Technology, 12(1), 710-710.

[29] Reddy, B. V., Kumar, A. H., Gopi, C., Prasad, Y. V. D., Vellela, S. S., & Roja, D. (2025, April). Machine learning based automated liver fibrosis stage diagnosis with prediction. In 2025 International Conference on Advances in Modern Age Technologies for Health and Engineering Science (AMATHE) (pp. 1-6). IEEE.

[30] Burra, R. S., APCV, G. R., & Vellela, S. S. (2024). Enhancing Ddos Detection Through Semi-Supervised Machine Learning: A Novel Approach for Improved Network Security. International Research Journal of Modernization in Engineering Technology and Science, 6.

[31] Vellela, S. S., Vullam, N. R., Gorintla, S., Rao, T. S., & Harinadh, T. (2025, July). Exploring the Anti-Inflammatory Potential of Green-Synthesized Pyrazolines. In 2025 6th International Conference on Data Intelligence and Cognitive Informatics (ICDICI) (pp. 814-819). IEEE.

[32] Vellela, S. S., Chandra, S. S., Thommandru, R., Mastan Basha, S., & Sri Ram, D. (2023). Novel Approach to Mitigate Starvation in Wireless Mesh Networks. Available at SSRN 5262254.

[33] Praveen, S. P., Vellela, S. S., Sharma, K., & Dalavai, L. Quantitative Evaluation of Smart Textile Adoption in Rural Weaving Communities using Machine Learning. Journal of the Textile Association, 86(3), 277-284.

[34] Mandava, R., Dalavai, L., Vellela, S. S., Purimetla, N. R., Mohan, B. K., & Harinadh, T. (2025, June). An In-Depth Study on the Integration of Explainable AI Techniques to Enhance Interpretability in Clinical Risk Prediction Models. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 43-47). IEEE.

[35] Rao, M. V., Krishna, C. V. M., Vellela, S. S., Vara, J., Paul, K. J., & Rao, K. N. (2025, March). Enhancement and Blind Image Restoration for Quality Improvements of Camera Captured Pictures/Videos. In 2025 7th International Conference on Intelligent Sustainable Systems (ICISS) (pp. 791-796). IEEE.

[36] Vellela, S. S., Anusha, P., Vullam, N. R., Jala, J., Bellapu, V. S., & Vindhya, A. S. (2025, October). Quantum Cryptography and Key Distribution for Secure Communication in the Post Quantum World. In 2025 International Conference on Sustainable Communication Networks and Application (ICSCN) (pp. 619-624). IEEE.

[37] Vellela, S. S., Vuyyuru, L. R., Jidugu, S. K., Rao, M. P., & Srinivas, B. R. (2025, November). The Impact Of Quantum Computing On Blockchain Security And Quantum Resistant Protocols. In 2025 2nd International Conference on Intelligent Systems for Cybersecurity (ISCS) (pp. 1-6). IEEE.

[38] Kumar, M. S., Vellela, S. S., Gorintla, S., Malathi, N., Rao, T. S., & Rani, N. R. (2025, October). Intelligent Resource Allocation in Wireless Sensor Networks: A Hybrid Optimization Approach for Energyconstrained Environments. In 2025 2nd International Conference on Electronic Circuits and Signaling Technologies (ICECST) (pp. 724-729). IEEE.

[39] Krishna, T. V., Rani, N. R., Ranjani, B. S., & Vellela, S. S. (2025). Distributed Big-Data Analytics with PySpark for Personalized Restaurant Recommendation Systems. Journal of Next Generation Technology (ISSN: 2583-021X), 5(6).

[40] Harinadh, T., Anusha, P., Roja, D., Vellela, S. S., & Muthukumar, P. (2025). PySpark Orchestrated Machine Learning Paradigms for Advanced Network Intrusion Detection. Journal of Next Generation Technology (ISSN: 2583-021X), 5(6).

[41] Mandava, R., Haritha, K., Vellela, S. S., Purimetla, N. R., Mohan, B. K., & Harinadh, T. (2025, June). Analysing User Perceptions of Trust in Financial Systems Using Explainable AI. In 2025 Second International Conference on Networks and Soft Computing (ICNSoC) (pp. 26-30). IEEE.

[42] Burra, R. S., APCV, G. R., & Vellela, S. S. (2024). Strategic Insights: Unleashing the Power of Big Data Analytics for Credit Investigation and Risk Mitigation in Commercial Banking. International Journal of Progressive Research in Engineering Management and Science, 4(01), 458-464.

[43] Vellela, S. S., Purimetla, N. R., Vindhya, A. S., Vullam, N. R., Srinivas, B. R., & Vuyyuru, L. R. (2025, October). Design and Simulation of Quantum Error Correction Codes for Scalable Quantum Architectures. In 2025 7th International Conference on Innovative Data Communication Technologies and Application (ICIDCA) (pp. 1570-1575). IEEE.

[44] Devana, V. K. R., Beno, A., Devadoss, C. P., Sukanya, Y., Ravi Sankar, C. V., Balamuralikrishna, P., ... & Babu, K. V. (2024). A compact self isolated MIMO UWB antenna with band notched characteristics. IETE Journal of Research, 70(8), 6677-6688.

[45] Potti, Dr Balamuralikrishna. "Characteristic Mode Analysis of Two Port Semi-circular Arc-Shaped Multiple-Input-Multiple-Output Antenna With High Isolation for 5G Sub-6 GHz and Wireless Local Area Network Applications." Int J Commun Syst (2022): e5257.

[46] Srija, V., & Krishna, P. B. M. (2015). Implementation of agricultural automation system using web & gsm technologies. International Journal of Research in Engineering and Technology, 4(09), 385-389.

[47] Potti, B., Subramanyam, M. V., & Prasad, K. S. (2013). A packet priority approach to mitigate starvation in wireless mesh network with multimedia traffic. International Journal of Computer Applications, 62(14).

[48] Potti, B., Subramanyam, M. V., & Satya Prasad, K. (2016). Adopting Multi-radio Channel Approach in TCP Congestion Control Mechanisms to Mitigate Starvation in Wireless Mesh Networks. In Information Science and Applications (ICISA) 2016 (pp. 85-95). Springer Singapore.

[49] Potti, D. B., MV, D. S., & Kodati, D. S. P. (2015). Hybrid genetic optimization to mitigate starvation in wireless mesh networks. Hybrid Genetic Optimization to Mitigate Starvation in Wireless Mesh Networks, Indian Journal of Science and Technology, 8(23).

[50] Devana, V. K. R., Beno, A., Alzaidi, M. S., Krishna, P. B. M., Divyamrutha, G., Awan, W. A., ... & Alathbah, M. (2024). A high bandwidth dimension ratio compact super wide band-flower slotted microstrip patch antenna for millimeter wireless applications. Heliyon, 10(1).

[51] Doss, B., Balamuralikrishna, P., Nagaraju, C. H., Lakshmaiah, D., & Naresh, S. Blockchain-Based Secure Big Data Storage on the Cloud. In Blockchain Technology for IoT and Wireless Communications (pp. 11-18). CRC Press.

[52] Kapileswar, N. and Simon, J., 2025, October. A Hybrid Acoustic-Optical Communication Technique for Ultra-Low Latency Underwater IoT Network. In 2025 2nd International Conference on Electronic Circuits and Signaling Technologies (ICECST) (pp. 468-473). IEEE.

[53] Simon, J. and Kapileswar, N., 2025, June. Federated deep learning-driven cloud-IoT framework for real-time healthcare monitoring and privacy-preserving anomaly detection. In 2025 3rd International Conference on Self Sustainable Artificial Intelligence Systems (ICSSAS) (pp. 1866-1871). IEEE.

[54] Kapileswar, N. and Simon, J., 2025, June. Quantum-Resilient Consensus Mechanisms for Scalable Blockchain Networks using Lattice-based Cryptography. In 2025 6th International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV) (pp. 1849-1854). IEEE.

[55] Kapileswar, N. and Simon, J., 2025, August. DeepCurrent: An Attention-Driven Graph Neural Network for Energy-Efficient Routing and Data Aggregation in UIoT Networks. In 2025 International Conference on Modern Sustainable Systems (CMSS) (pp. 716-720). IEEE.

[56] Sathish, K., 2025, February. Dynamic Topology Optimizing Magnetic Circuits for Underwater Systems for Improved

Performance and Efficiency. In 2025 International Conference on Electronics and Renewable Systems (ICEARS) (pp. 433-438). IEEE.

[57] Sathish, K., 2025, September. Adaptive Fusion and Feature Refinement for Visibility Enhancement in Turbid Underwater Scenes. In 2025 3rd International Conference on Intelligent Cyber Physical Systems and Internet of Things (ICoICI) (pp. 456-460). IEEE.

[58] D. N. Ravikiran and C. G. Dethe, "Improvements in routing algorithms to enhance lifetime of wireless sensor networks," Int. J. Comput. Netw. Commun., vol. 10, no. 2, pp. 23–32, 2018.

[59] R. Thommandru and R. Saravanakumar, "Performance analysis of circularly polarised MIMO antenna for wireless applications," in Proc. ICICNIS, IEEE, Dec. 2024, pp. 513–518.

[60] D. N. Ravikiran et al., "Secure visual data processing: Image encryption and decryption through reversible logic gates in VLSI design," Int. J. Mod. Trends Sci. Technol., vol. 10, no. 2, 2024.

[61] R. Saravanakumar et al., "Cross scoop fractal antenna design with notch at 15 degree for emerging applications at 5.2 GHz," in Proc. RAEEUCCI, IEEE, Apr. 2024, pp. 1–7.