



A COMPREHENSIVE REVIEW ON LOW POWER IOT BASED SOLAR PANEL HEALTH MONITORING SYSTEM

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Abstract:

The growing use of solar energy systems has led to a need for better methods to maintain their performance. A major problem with solar panels is the accumulation of dust and dirt on their surfaces, which reduces their efficiency in generating energy. To address this issue, a low-power and smart solar panel cleaning system has been proposed to clean solar panels automatically. This reduces the need for manual cleaning. The system consists of several components, including an ESP32 microcontroller, DC gear motor, motor driver, water pump, cleaning brush, wiper, and limit switches. These components work together to clean the solar panels effectively. The motor moves the cleaning mechanism across the panel surface, while water is sprayed to help remove stubborn dust and dirt. The system uses solar power with a battery backup, making it energy-efficient and self-sufficient.

The system operates according to a predefined schedule or timer, allowing regular cleaning without human intervention. Embedded control makes the system reliable, easy to maintain, and efficient. The limit switches prevent the cleaning mechanism from moving beyond its required range, thereby improving system safety.

This solution provides a reliable and adjustable method for maintaining solar panel performance. It is suitable for homes, commercial buildings, and remote locations where manual cleaning may be difficult or impractical. The system can help maintain energy production, reduce maintenance



requirements, and support the use of clean and renewable energy through automation and intelligent design.

Keywords: Solar Health Monitoring, IoT, Automatic Cleaning System, Low Power Design, Renewable Energy, Remote Monitoring.

1. INTRODUCTION

The growing need for clean and sustainable energy has encouraged more homes, businesses, and industries to adopt solar power systems. Solar energy is a valuable renewable resource because it is widely available, environmentally friendly, and can provide long-term cost savings. However, maintaining the efficiency of solar panels remains a major challenge, especially in areas where dust, dirt, and other particles accumulate on the panel surface. These particles reduce the amount of sunlight reaching the photovoltaic cells, which can lower the energy output of the system.

In many locations, particularly dry and dusty regions, dust can significantly affect the performance of solar panels. Even a thin layer of dust can reduce panel efficiency. Typically, solar panels are cleaned manually, which requires considerable time and effort and may not be performed at regular intervals. For large solar farms and remote installations, manual cleaning can be difficult, expensive, and time-consuming. In addition, improper cleaning techniques may damage the panels, reducing their lifespan and performance.

To address these challenges, automatic solar panel cleaning systems are becoming increasingly useful. These systems perform the cleaning process automatically, reducing the need for manual intervention. They use components such as brushes and wipers along with a control system to clean the panels at predetermined intervals. This makes the cleaning process more consistent, reduces operating requirements, and helps maintain stable energy production.

The integration of embedded systems and Internet of Things (IoT) technology can further improve the functionality of these cleaning systems. Microcontrollers such as the ESP32 can control components such as motors and sensors while maintaining low power consumption. The system can be programmed to perform cleaning at specific times or according to predefined conditions without requiring continuous human attention. IoT capabilities can also enable remote monitoring and control, making system management more convenient.

In this context, a Low Power IoT-Based Solar Panel Cleaning System with an Automatic Cleaning Mechanism has been developed to address the challenges associated with solar panel maintenance. The system uses a motorized cleaning mechanism, a water spray unit, and control logic to remove dust and dirt effectively. It operates using solar power with a battery backup, making it self-sustaining and energy-efficient. The design is simple, affordable, and easy to install, making it suitable for different applications.

Overall, the proposed system provides a practical approach to maintaining solar panel performance through regular and effective cleaning. It reduces manual intervention, saves time and effort, and



helps maintain energy production. The proposed solution demonstrates how automation and embedded technology can be applied to address real-world maintenance challenges in renewable energy systems.

2. LITERATURE SURVEY

B. G. Chikte and P. B. Agrawal [1] created an IoT-based system to monitor solar energy. This system keeps track of key parameters like voltage, current, and power output from solar panels. It uses IoT to send data from the panels to a remote platform. This lets users check how the panels are working without being on-site. The system helps spot unusual changes in power production, which might show faults or system issues. Their work shows how IoT monitoring can increase transparency, cut down on manual checks, and help with timely repairs. However, the main focus is on monitoring performance, not on cleaning the panels or detecting dust automatically.

Kumar et al. [2] made a real-time solar monitoring system using IoT. The system gathers electrical and operational data from solar panels and sends it to a server for storage and analysis. This ongoing monitoring helps users check how well the solar system is working over time and find issues that deviate from normal operation. Having both current and past data helps spot performance problems and decide on maintenance. The study shows how important remote data collection is for modern solar setups. However, the system mainly focuses on monitoring and does not include automatic cleaning features.

Priya and S. Kumar [3] introduced a low-power IoT-enabled system for solar monitoring. Their focus was on making the monitoring unit use less energy, which is important for remote setups where the system should not use much of the generated power. The system uses IoT communication to send solar performance data while keeping energy use low. The study shows that using low-power hardware and methods can help create sustainable, remote solar monitoring systems. This work is key for low-power systems as it shows how to cut energy use while keeping monitoring ongoing. However, it does not focus on automatic cleaning or dust removal.

S. Kale et al. [4] developed a system that combines cleaning and monitoring solar panels using motorized wipers. The system does two things: removes dust from the panels and checks their condition. The motorized wiper physically cleans the panels, keeping them clean and improving energy output. IoT allows remote monitoring of the system's status. By combining cleaning and monitoring, the system reduces the need for manual work and offers more automation for solar setups. This work is related to the proposed system because it shows the benefit of integrating cleaning and monitoring. However, features like low-power use, water spraying, safety controls, and health checking could make the system even better.

R. Majeed et al. [5] tested how dust affects solar panel performance. They found that dust and other particles on the panels block sunlight, leading to less electricity production. The amount of performance loss depends on factors like how much dust is on the panel and environmental conditions. The researchers also suggested a low-cost cleaning method to reduce the negative



effects of dust. Their findings show the need for regular maintenance, especially in dusty areas. This study supports the development of automated cleaning systems because it clearly links dust buildup to performance drops.

Z. Mahatab Md Sakif et al. [6] proposed a deep-learning-based system called "Sol Net" to detect dust on solar panels. This system uses image processing and deep learning to identify dust or dirt on panel surfaces. Unlike systems that rely only on electrical measurements, this approach uses visual data to check how clean the panels are. Such an intelligent system can help decide if cleaning is needed, offering a smart way to manage solar panel maintenance. This can stop extra cleaning cycles and help save water, energy, and wear on equipment. The study shows how artificial intelligence can make automated solar maintenance systems smarter in their decisions. However, image-based systems might need more computer power and good lighting for images to work well.

U. P. Singh and S. Chandra [7] worked on making solar panel cleaning plans better using deep learning. Instead of cleaning at set times, their method uses current performance and environmental data to decide the best time to clean. Smart scheduling helps avoid cleaning when it is not needed while making sure dust buildup does not cut down solar energy production too much. This method can lower water use, energy use, and wear on cleaning parts. The study shows how prediction and smart methods can improve solar panel care. But setting up such a system needs enough past data and computer resources for good predictions.

M. Abraim et al. [8] made a system to track dust on solar panels and how it affects solar power. The system shows how much dust is building up over time, which helps decide when to clean. Having ongoing dust information is helpful because fixed cleaning times might lead to extra cleaning when there is not much dust. By using up-to-date information for cleaning choices, the system makes cleaning more efficient and improves the reliability of the solar setup. Their work shows how checking dust levels is key in smart solar maintenance. However, the monitoring system alone does not offer a full automatic cleaning solution.

P. Borah, L. Micheli, and N. Sarmah [9] provided a comprehensive review of soiling losses in photovoltaic systems. Their study investigates how environmental factors—including dust, humidity, wind, and other atmospheric conditions—affect the buildup of particles on solar panel surfaces. Accumulated dirt can block sunlight from reaching the photovoltaic cells, thereby reducing the amount of electrical energy they generate. The authors also examined various cleaning and soiling mitigation techniques employed to minimize these losses. Their review offers valuable insights into the environmental factors influencing PV performance and underscores the significance of choosing an appropriate cleaning strategy. This study aids in advancing automated cleaning systems by emphasizing the importance of accounting for environmental conditions during the design of maintenance mechanisms.

O. J. Alshawabkeh and colleagues. Reference [10] introduced an AIoT-based dust detection system that integrates Artificial Intelligence with the Internet of Things. The system employs color



recognition and Adaptive Neuro-Fuzzy Inference System (ANFIS) techniques to detect dust accumulation on photovoltaic panels. The AI component enhances the system's ability to assess cleanliness conditions, while IoT connectivity facilitates the monitoring and communication of the detected data. By combining AI and IoT, automated cleaning systems can achieve intelligent decision-making capabilities. For instance, the cleaning process can only begin once the detected dust level hits a specific threshold. This method can minimize redundant cleaning tasks and enhance resource efficiency. However, AI-based systems may entail higher computational complexity than simpler sensor-based alternatives.

M. P. Ndeto and colleagues. [11] developed a self-powered solar panel cleaning system that utilizes solar energy to drive the cleaning mechanism. The system's primary goal is to minimize reliance on external power sources while ensuring the photovoltaic panels remain clean. Because the cleaning energy is supplied by the solar installation itself, the system has the potential to operate autonomously in remote areas. This approach can also lower the need for manual maintenance and reduce operational expenses. This study is especially pertinent to energy-efficient solar cleaning systems, as it illustrates the feasibility of creating a self-powered cleaning mechanism driven by renewable energy. However, incorporating additional real-time monitoring and intelligent cleaning decisions could further improve its capabilities.

H. A. Khan and colleagues. Reference [12] created a dust detection system for photovoltaic panels that utilizes deep learning. The system leverages deep learning techniques to detect dust accumulation by analyzing available panel images or visual data. Precise dust detection can help determine when cleaning is needed, thereby supporting timely maintenance. By automating the detection process, the system lessens reliance on manual visual inspections and enhances the consistency of maintenance decisions. This approach is particularly beneficial for large-scale solar installations, where manually inspecting every panel can be time-consuming. Nevertheless, the efficacy of deep-learning-based detection is contingent upon variables including the quality and volume of training data, image fidelity, environmental factors, and computational resources.

Portelli et al. [13] introduced a method using sensors to detect power losses in solar panels caused by dust. Instead of just checking for dust visually, the system looks at how the solar panels are performing and finds out how much energy is being lost because of dirt buildup. Measuring how much performance drops can give useful data about how dust affects energy production. This information can help people in charge of the system plan when to clean the panels. The method shows that looking at electrical performance can tell you a lot about how clean the panels are. But, electrical measurements alone might not always tell you if the loss is from dust or other issues like shading, temperature changes, or equipment problems.

R. Aman et al. [14] created a system that uses deep learning to analyze the performance of solar panels. The system checks real-time data and uses smart data analysis to spot possible losses in efficiency. By looking at changes in how the panels work, the system can help predict when something is going wrong and when maintenance is needed. This kind of predictive analysis is



helpful because it lets you fix problems before energy output drops a lot. The study shows that combining real-time monitoring with artificial intelligence can make solar systems more reliable. However, these smart systems might need more data and more powerful computers than regular monitoring systems.

S. M. Tewari et al. [15] built an AI-powered robot that cleans solar panels and connects to the internet. The robot uses automatic cleaning and smart decisions to remove dust without needing constant human help. AI helps the robot decide when and how to clean. The internet connection allows people to monitor and control the robot from far away. This approach makes cleaning more consistent, reduces the need for people to do the work by hand, and keeps the panels performing well. Using AI, IoT, and robots together is a more advanced way to take care of solar panels. However, these systems can be more complicated and might cost more, use more power, and require more setup.

3. PROPOSED METHODOLOGY

The system is designed to improve solar panel performance by providing an automatic cleaning mechanism. It uses low-power components integrated into the system to maintain the cleanliness of the solar panel. Dust accumulation is one of the major factors that reduces solar panel efficiency, so the proposed system helps remove dust automatically. It combines mechanical components with intelligent control to perform the cleaning process without requiring manual intervention.

The setup consists of a solar panel, battery, ESP32 microcontroller, motor driver, DC gear motor, cleaning mechanism with a wiper and brush, water pump, and limit switches to detect the movement of the cleaning mechanism. The solar panel generates electricity, which is stored in the battery. The stored energy supplies power to the other components. The ESP32 acts as the main control unit and coordinates the operation of the system.

The following diagram shows the proposed methodology of the Low-Power IoT-Based Solar Panel Health Monitoring System

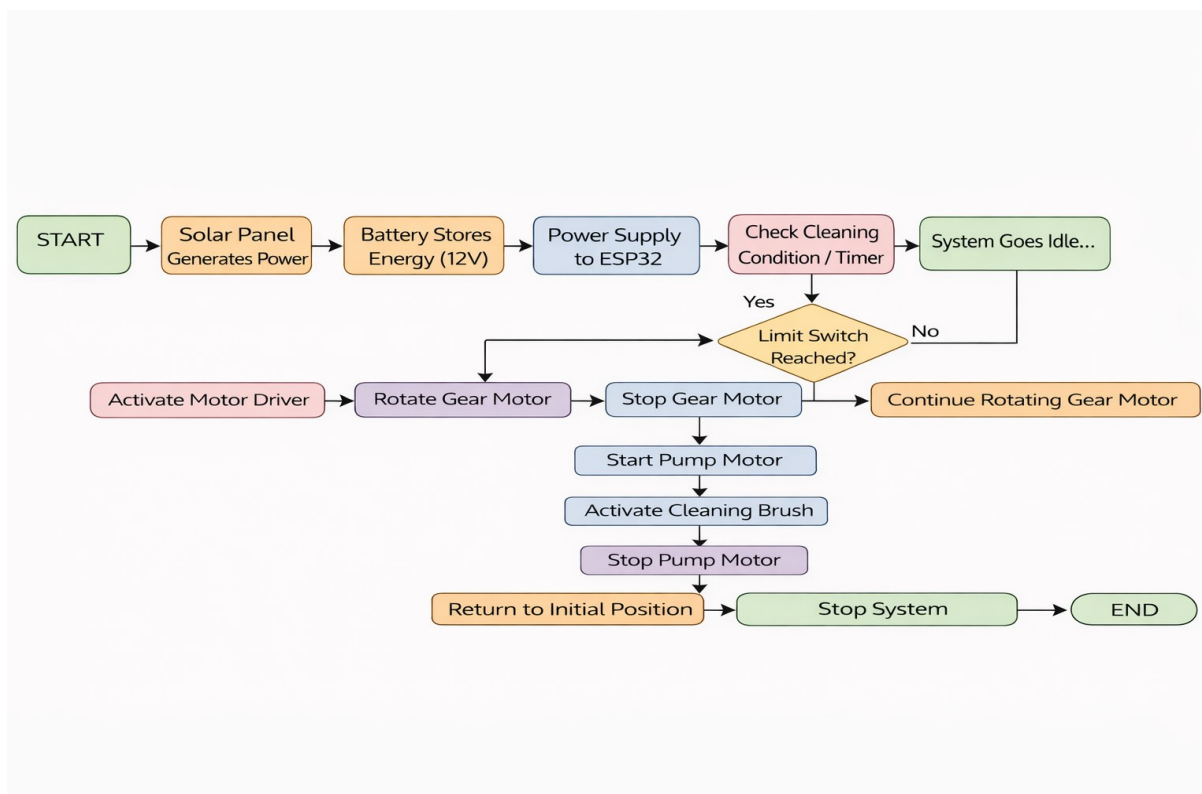


Figure 1 Block Diagram of Proposed System

The system operates according to a predefined schedule or set of control conditions. At specified times, the ESP32 initiates the cleaning process. It sends a signal to the motor driver to operate the DC gear motor, which moves the cleaning mechanism across the solar panel. The brush and wiper remove dust from the panel surface, while the water pump sprays water to improve the cleaning effectiveness. This process helps keep the solar panel clean and maintain its performance.

Limit switches are installed at both ends of the solar panel to detect when the cleaning mechanism reaches the edges. When the mechanism reaches an end position, the corresponding switch sends a signal to the ESP32. The controller then stops the motor or changes its direction. This prevents excessive movement, protects the mechanical components, and improves the safety of the system.

The system operates with low power consumption and uses solar energy with a battery backup. This makes it self-sustaining and energy-efficient. The ESP32 also provides scope for future IoT-based monitoring, allowing the system status and cleaning schedules to be monitored and controlled remotely.

The integration of mechanical, electrical, and intelligent control components results in a reliable and automated solar panel cleaning system. The proposed approach helps maintain panel efficiency, reduces manual effort, and saves maintenance time. It's simple and flexible design makes it suitable for residential applications, commercial installations, and large-scale solar power



systems.

4. CONCLUSION

The proposed IoT-Based Solar Panel Cleaning System provides an effective approach to maintaining solar panel performance through automation and intelligent design. Dust accumulation is a major problem that can reduce the efficiency of solar panels. The proposed system addresses this issue by using an automatic cleaning mechanism consisting of a wiper, rotating brush, and water sprayer.

The system uses an ESP32 microcontroller along with mechanical and electrical components to achieve smooth and reliable operation. It uses solar power with a battery backup, making it energy-efficient and suitable for locations with limited access to conventional electricity. Limit switches are incorporated to ensure that the cleaning mechanism moves safely and to prevent mechanical damage.

The system reduces the need for manual panel cleaning, thereby saving time, effort, and maintenance costs. It also helps maintain consistent panel performance and supports improved energy generation. The simple and affordable design makes the system suitable for residential applications as well as large-scale solar installations.

The system has some limitations, such as dependence on weather conditions and possible wear of mechanical components over time. However, it provides an efficient solution for regular solar panel maintenance. The proposed system demonstrates how automation and embedded technology can be applied to improve renewable energy systems. It also provides opportunities for future enhancements, including advanced IoT-based monitoring, real-time performance tracking, and improved control mechanisms.

REFERENCES

1. Badage, R. N., & Karande, K. J. (2016). Use of Information and Communication Technologies (ICT) in career planning of rural youth of India. Proc. the Annual International Conference on Intelligent Computing, Computer.
2. Bhushan, S., & Karande, K. J. (2021). Advancing Social Media Analytics: A Robust Multi-Criteria Decision-Making Model-Based Framework. Webology 18 (6), 9339-9343.
3. Bhushan, S., & Karande, K. J. (2023). ENHANCING RESEARCH IN SOCIAL MEDIA ANALYTICS WITH AN ADVANCED ROBUST MULTI-CRITERIA DECISION MAKING MODEL. Webology.
4. Bokefode, J. D., Swapnaja A, U., Subhash V, P., Kailash J, K., & Sulabha S, A. (2015). Developing secure cloud storage system by applying AES and RSA cryptography algorithms with role based access control model. International Journal of Computer Applications 118 (12), 46-52.



5. Burje, P. R., Karande, K. J., & Jagadale, A. B. (2014). Embedded on-board diagnostics system using CAN network. 2014 IEEE Global Conference on Wireless Computing & Networking (GCWCN), 31-35.
6. Burje, P. R., Karande, K. J., & Jagadale, A. B. (2014). Embedded on-board diagnostics system using CAN protocol. 2014 International Conference on Communication and Signal Processing, 734-737.
7. Daithankar, M. V., & Karande, K. J. (2014). Analysis and integration of skin color models used for human face detection. 2014 IEEE Global Conference on Wireless Computing & Networking (GCWCN), 70-74.
8. Deepika, S., & Karande, K. J. (2021). Distance Log Mar Visual Acuity Comparison With Severity Of Diabetic Retinopathy. Webology (ISSN: 1735-188X) 18 (6).
9. Deshmukh, S. G., Karande, K. J., Ogura, K., Kheraj, V., & Deshmukh, R. S. (2022). Post-Annealing Influence on Structural, Surface and Optical Properties of Cu₃BiS₃ Thin Films for Photovoltaic Solar Cells. Artificial Intelligence, Internet of Things (IoT) and Smart Materials for.
10. Deshmukh, S. G., Kheraj, V., Karande, K. J., & Kulkarni, S. G. (2024). Thin Film Nanomaterials: Synthesis, Properties and Innovative Energy Applications. Bentham science publishers.
11. Deshmukh, S. G., Kheraj, V., Karande, K. J., Panchal, A. K., & Deshmukh, R. S. (2019). Hierarchical flower-like Cu₃BiS₃ thin film synthesis with non-vacuum chemical bath deposition technique. Materials Research Express 6 (8), 084013.
12. Deshpande, H. S., & Karande, K. J. (2016). A planar microstrip RF energy harvester 3D cube antenna for multiple frequencies reception. 2016 Conference on Advances in Signal Processing (CASP), 327-331.
13. Deshpande, H., & Karande, K. (2016). Integrated CMOS 3D Microstrip Patch Antenna Prototype for Wireless Energy Harvesting. International Conference on Communication and Signal Processing 2016 (ICCASP).
14. Deshpande, H., & Karande, K. J. (2018). Energy Optimal Radio Harvester for Multi Sensory System. 2018 IEEE Global Conference on Wireless Computing and Networking (GCWCN), 44-48.
15. Deshpande, H., Karande, K. J., & Deshmukh, S. G. (2022). RF energy harvesting multi-frequency receptor model for micropower applications. AIP Conference Proceedings 2494 (1), 060002.
16. Dhotre, V., & Karande, K. (2014). Refinement of data streams using Minimum Variance principle. 2014 International Conference on Contemporary Computing and Informatics.
17. Gade, A. A., Karande, K. J., & Jagadale, A. B. (2015). Space vector modulation based feed



- control using three phase induction motor. International Journal of Modern Trends in Engineering and Research 2 (7), 44-46.
18. Gaikwad, D. S., & Karande, K. J. (2016). Image processing approach for grading and identification of diseases on pomegranate fruit: An overview. International Journal of Computer Science and Information Technologies 7 (2).
 19. Gaikwad, D., Karande, K., & Deshpande, H. (2016). Pomegranate fruit diseases identification and grading. International Conference on Communication and Signal Processing 2016 (ICCASP).
 20. Gidde, N. D., Karande, K. A., Jadhav, S. S., Mistry, R., Mhetre, P., & Joshi, S. (2021). Microsponge: An Overview. Journal of University of Shanghai for Science and Technology 23, 671-682.
 21. Hofree, G., Ruvolo, P., Reinert, C., Bartlett, M. S., & Winkielman, P. (2012). Why are you smiling? In a strategic context, people's affective responses reflect the meaning of android's facial expressions. 2012 IEEE International Conference on Development and Learning and.
 22. Ingole, A. L., & Karande, K. J. (2018). Automatic age estimation from face images using facial features. 2018 IEEE Global Conference on Wireless Computing and Networking (GCWCN).
 23. Iyer, B., Nalbalwar, S. L., & Pathak, N. P. (2019). Computing, Communication and Signal Processing: Proceedings of ICCASP 2018. Springer.
 24. Jadhav, G. R., & Karande, K. J. (2014). Automatic vehicle number plate recognition for vehicle parking management system. Computer Engineering and Intelligent Systems, ISSN, 2222-1719.
 25. Jadhav, G. R., & Karande, K. J. (2015). Extraction of Vehicle Number Plate. International Journal of Innovations in Engineering and Techonology 6 (2).
 26. Joshi, A., & Karande, K. (2023). Comprehensive survey on analysis and modelling of femur bone fracture for an operative planning. Computer Methods in Biomechanics and Biomedical Engineering: Imaging.
 27. Joshi, A., & Karande, K. (2023). Comprehensive Way for Modeling of Femur Bone Fracture from CT Images. International Conference on Emerging Trends in Artificial Intelligence, Data.
 28. Joshi, A., Karande, K., & Gunaki, R. (2025). FEA-based Virtual Operation and Stress Distribution Analysis of DHS Screws in Proximal Femoral Bone Fractures: A Strategic Guide for Orthopedic Surgeons in Operational Planning. Journal of Pharmacology and Pharmacotherapeutics 16 (2), 202-213.
 29. Kailash J Karande, N. V. I. (2021). Multimodal Image Fusion Technique for Automated Correlation Identification in Medical Images. AU Patent 2,021,105,871.
 30. Kailash J, K. (2012). Modified Modular Independent Component Analysis (ICA) Approach



for Face Recognition. INTERNATIONAL CONFERENCE ON INFORMATION TECHNOLOGY, ELECTRONICS AND.

31. Kailash, K., Raza, A., Mahalingham, S., & Talwalkar, S. (2012). Outcome of universal-2 total wrist arthroplasty for rheumatoid arthritis: our experience at Wrightington. Orthopaedic Proceedings 94 (SUPP_XXXIX), 143-143.
32. Kale, K. V. (2008). Advances in computer vision and information technology. IK International Publishing House.
33. Karande, J. K., Talbar, N. S., & Inamdar, S. S. (2012). Face recognition using Oriented Laplacian of Gaussian (OLOG) and Independent Component Analysis (ICA). Digital Information and Communication Technology and it's Applications.
34. Karande, K. J. (2012). Multiscale wavelet based edge detection and Independent Component Analysis (ICA) for Face Recognition. 2012 International Conference on Communication, Information & Computing.
35. Karande, K. J. (2013). Localized spatiotemporal modular ICA for face recognition. 2013 IEEE Symposium on Computational Intelligence in Biometrics and Identity.
36. Karande, K. J. (2020). Preface. IOP Conf.series.materail science and engg 814, 011001.
37. Karande, K. J. (2022). Feed Dispense Monitoring Machine for Accurate Feeding of Hens in Poultry House. IN Patent 202,221,010,527 A.
38. Karande, K. J., & Badage, R. N. (2016). Facial feature extraction using independent component analysis. Proceedings of the Annual International Conference on Intelligent Computing.
39. Karande, K. J., & Prasad, P. S. (2020). Model Driven Methodology for JAVA. Unpublished.
40. Karande, K. J., & Talbar, S. N. (2007). Simplified and modified approach for face recognition using PCA. 2007 IET-UK International Conference on Information and Communication.
41. Karande, K. J., & Talbar, S. N. (2008). Face recognition under variation of pose and illumination using independent component analysis. ICGST-GVIP, ISSN.
42. Karande, K. J., & Talbar, S. N. (2009). Independent component analysis of edge information for face recognition. International Journal of Image Processing IJIP 3 (3), 120-130.
43. Karande, K. J., Katti, V. S., Sambhoji, S. S., Patil, K., Killedar, S., & Chavan, S. (2026). Secure Image Steganography: Comparing LSB, AES-LSB, and Steghide. 2026 IEEE International Conference on Industry 4.0, Artificial Intelligence.
44. Kasture, A. M., Karande, K. J., & Nawale, S. D. (2024). Optimization of Harmonic Generation in Frequency Multiplying Circuit for Wireless Application. 2024 3rd Edition of IEEE Delhi Section Flagship Conference (DELCON), 1-5.
45. Kasture, A., Karande, K., & Nawale, S. (2024). Performance Analysis of Various Nonlinear



- Elements in Frequency Multiplying Circuits for Wireless Applications. INTERNATIONAL JOURNAL 12 (4), 1332-1336.
46. Katti, V. S., & Karande, K. J. (2025). Emerging Trends and Innovations in Sentiment Analysis: A Comprehensive Review. International Conference on ICT for Sustainable Development, 158-166.
 47. Katti, V., & Karande, K. J. (2025). Personalized depression management system using llms and reinforcement learning: A survey. International Conference on Recent Trends in Machine Learning, IOT, Smart.
 48. Kawathekar, P. P., & Karande, K. J. (2014). 2014 International Conference on Signal propagation and computer technology (ICSPCT 2014). IEEE.
 49. Kawathekar, P. P., & Karande, K. J. (2014). Severity analysis of Osteoarthritis of knee joint from X-ray images: A Literature review. 2014 International Conference on Signal propagation and computer technology.
 50. Kawathekar, P. P., & Karande, K. J. (2015). Use of textural and statistical features for analyzing severity of radio-graphic osteoarthritis of knee joint. 2015 International Conference on Information Processing (ICIP), 1-4.
 51. Kendule, J. A., & Karande, K. (2024). A Survey of Internet of Things Frameworks for Crowd Management System. Modern Approaches in Machine Learning and Cognitive Science: A Walkthrough.
 52. Kendule, J. A., & Karande, K. J. (2023). Variable Synergic Squeeze Convolved Equilibrium Network Enabled Crowd Management in IoT. International Journal of Image, Graphics and Signal Processing 15 (4), 69.
 53. Lale, D. P., & Karande, K. J. (2016). Gender classification using facial features. Int. J. Adv. Res. Electron. Commun. Eng.(IJARECE) 5 (9), 2227-2231.
 54. Mahajan, A. S. B., & Karande, K. J. (2015). PCA and DWT based multimodal biometric recognition system. 2015 International Conference on Pervasive Computing (ICPC), 1-4.
 55. Mahesh, K. K., Kishore, P., & Kailash, J. K. (2017). Survey on iris image analysis. Indian J. Sci. Technol 10 (9), 1-15.
 56. Mulay, A. V., & Karande, K. J. (2016). Water quality monitoring system based on wireless sensor network. International Journal of Innovations in Engineering Research and Technology, 1-4.
 57. Mulik, S., Dhobale, N., Pujari, K., & Karande, K. (2022). The Use of Artificial Intelligence-Based Models for Biomedical. Artificial Intelligence, Internet of Things (IoT) and Smart Materials for.
 58. Nagaswarupa, H. P., Sillanpää, M. E. T., Murthy, H. C. A., & Naik, R. (2024). Multifunctional inorganic nanomaterials for energy applications. CRC Press.



59. Nandgaonkar, V. N., & Karande, K. J. (2021). Significance Of Artificial Intelligence and Machine Learning Algorithms in Brain Tumor Diagnosis. *Solid State Technology* 64 (2), 7125-7131.
60. Patil, P. G., & Karande, K. J. (2016). Brain tumor detection techniques: a survey. *Int Res J Eng Technol (IRJET)* 3 (10).
61. Patil, P. G., Karande, K. J., & Surwase, S. V. (2022). Detection of brain tumor using optimized fuzzy C-means and SVM classifier. *AIP Conference Proceedings* 2494 (1), 020007.
62. Shaikh, K. M., Karande, K. J., & Surwase, S. V. (2018). Nested slot suspended patch antenna using CST microwave studio. 2018 International Conference on Information, Communication, Engineering and.
63. Surwase, S. V., & Karande, K. J. (2014). Technical aspects in development of Marathi calculator using text to speech synthesizer. 2014 IEEE Global Conference on Wireless Computing & Networking (GCWCN), 92-96.
64. Unnikrishnan, S., Surve, S., & Bhoir, D. (2011). Advances in Computing, Communication and Control: International Conference, ICAC3 2011, Mumbai, India, January 28-29, 2011. Proceedings. Springer Science & Business Media.
65. Unnikrishnan, S., Surve, S., & Bhoir, D. (2013). Advances in Computing, Communication, and Control: Third International Conference, ICAC3 2013, Mumbai, India, January 18-19, 2013, Proceedings. Springer.
66. Aasawari Boxey, D. A. O. M., Jadhav, A., Gade, P., & Ghanti, P. (2022). Face Recognition using Raspberry Pi. *Journal of Image Processing and Intelligent Remote Sensing* 2 (4), 15-23.
67. ABHANGRAO, M. R., JADHAV, M. S., GHODKE, M. P., & Mulani, A. (2017). Design And Implementation Of 8-bit Vedic Multiplier. *International Journal of Research Publications in Engineering and Technology*.
68. Aiwale, S., Kolte, M. T., Harpale, V., Bendre, V., Khurge, D., & Bhandari, S., et al. (2024). Non-invasive anemia detection and prediagnosis. *Journal of Pharmacology and Pharmacotherapeutics* 15 (4), 408-416.
69. Altaf O. Mulani, M. S., & Jadhav, M. M. (2022). Painless Machine Learning approach to estimate blood glucose level of non-invasive device. *Artificial Intelligence, Internet of Things (IoT) and Smart Materials for*.
70. Altaf O. Mulani, P. G. F., Sardey, M. P., Kinage, K., & Sadanand, S., et al. (2024). ML-powered Internet of Medical Things (MLIoMT) Structure for Heart Disease Prediction. *Journal of Pharmacology and Pharmacotherapeutics* 16 (1), 1-8.
71. Anil, D., & A. O., M. (2024). Smart farming using IOT based Agri BOT. *Naturalista Campano* 28 (1), 723-729.
72. AnnaSaheb S Dandage, A. O. M., Rupnar, V. R., & Pise, T. A. (2025). IoT-Powered Weather



- Monitoring and Irrigation Automation: Transforming Modern Farming Practices. *International Journal of Telecommunications & Emerging Technologies* 11 (1).
73. Aryan Ganesh Nagtilak, A. O. M., Ulegaddi, S. N., & Mane, M. (2023). Automatic Solar Powered Pesticide Sprayer for Farming. *International Journal of Microwave Engineering and Technology* 9 (2).
74. Babaladi, S. S., & Mulani, A. O. (2026). An Overview on Timely Detection of Plant Leaf Disorder Using Deep Learning and Machine Learning Models. 2026 Contemporary Computing Innovations Conference (CCIC), 1-6.
75. Basawaraj Birajadar, G., Osman Mulani, A., Ibrahim Khalaf, O., & Farhah, N., et al. (2024). Epilepsy identification using hybrid CoPrO-DCNN classifier. University of Bahrain.
76. Bhanvase, T. M., Mulani, A. O., & Pise, A. C. (2025). Guava Disease Detection Using Deep Convolutional Neural Networks. 2025 IEEE 7th International Conference on Cybernetics, Cognition and Machine.
77. Chaudhari, K. R., Mulani, A. O., Gajare, M. P., Jadhav, V., Yawle, P., & Bang, A. V. (2026). Bit error rate analysis of various error correction codes with concatenated RS-convolutional codes. *Journal of Discrete Mathematical Sciences and Cryptography* 29 (1), 199-214.
78. Deshmukh, A. B., Deshmukh, M. T., Chincholkar, Y. D., Patil, A. S., & Mulani, A. O. (2026). Predictive modeling of drug release kinetics using supervised machine learning algorithms. *Int. J. Drug Deliv. Technol* 16, 978-986.
79. Gadade, B., & Mulani, A. (2022). Automatic system for car health monitoring. *International Journal of Innovations in Engineering Research and Technology*.
80. Gadade, B., Mulani, A. O., & Harale, A. D. (2024). Iot based smart school bus and student monitoring system. *Naturalista Campano* 28 (1), 730-737.
81. Gadade, B., Mulani, A. O., & Harale, A. D. (2024). IoT Based Smart School Bus and Student Tracking System. *IoT Based Smart School Bus and Student Tracking System*.
82. Ghodake, R. G., & Mulani, A. O. (2016). Microcontroller based automatic drip irrigation system. *Techno-societal 2016, international conference on advanced technologies for*.
83. Ghodke, R. G., Birajdar, G. B., Mulani, A. O., Shinde, G. N., & Pawar, R. B. (2024). Design and Development of an Efficient and Cost-Effective surveillance Quadcopter using Arduino. *Sanshodhak*.
84. Ghodke, R. G., Birajdar, G. B., Mulani, A. O., Shinde, G. N., & Pawar, R. B. (2024). Design and Development of Wireless Controlled ROBOT using Bluetooth Technology. *Sanshodhak*.
85. Jadhav, D. V. S., Salunke, G. D., Chaudhari, K. R., Mulani, D. A. O., & Thigale, D. S. P., et al. (2024). Deep Learning-Based Face Mask Recognition in Real-Time Photos and Videos, *Afr. J. Biomed. Res* 27.
86. Jadhav, D. V. S., Salunkhe, D. S. S., Salunkhe, D. G., Yawle, P. R., & Pol, D. R. S., et al.



- (2024). Iot Based Health Monitoring System for Human, Afr. J. Biomed. Res 27.
87. Jadhav, H. M., Mulani, A., & Jadhav, M. M. (2022). Design and development of chatbot based on reinforcement learning. Machine learning algorithms for signal and image processing, 219-229.
88. Jadhav, K. P., Pawar, A., Shinde, A., Salunkhe, R., Sarade, V., & Mulani, A. O. (2024). IOT Based Industrial Power Loss Reducer Using Power Compensation. International Conference on Data Science, Machine Learning and Applications.
89. Jadhav, V. S., Salunkhe, S. S., Salunkhe, G., Yawle, P. R., Pol, R. S., & Mulani, A. O., et al. (2024). IOT based health monitoring system for Human. African Journal of Biomedical Research, 1309-1315.
90. Kalyankar, P. A., Mulani, A. O., Thigale, S. P., Chavhan, P. G., & Jadhav, M. M. (2022). Scalable face image retrieval using AESC technique. Journal Of Algebraic Statistics 13 (3), 173.
91. Kambale, K. S., Sawant, N. M., Mulani, A. O., More, V. P., & Zambare, S. A. (2024). RNN-LSTM Based Model for Automatic Heart Disease Prediction Using the UCI Heart Disease Dataset. International Conference on Data Science, Machine Learning and Applications.
92. Kamble, A., & Mulani, A. O. (2022). Google assistant-based device control. Int. J. of Aquatic Science 13 (1), 550-555.
93. Kapase, P., Shrikhande, P., & Lokhande, S. (2022). IOT based plant monitoring system.
94. Karche, S. N., & Mulani, A. O. (2023). AESC Technique for Scalable Face Image Retrieval. International Journal of Innovative Research in Computer and Communication ... 52* Electric vehicle parameters estimation using Web portal AO Mulani Recent Trends in Electronics and Communication Systems 10 (3).
95. Kedar, M. S., & Mulani, A. (2021). IoT based soil, water and air quality monitoring system for pomegranate farming. Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM).
96. Kolekar, S. D., Walekar, V. B., Patil, P. S., Mulani, A. O., & Harale, A. D. (2022). Password Based Door Lock System. Int. J. of Aquatic Science 13 (1), 494-501.
97. Kolhe, V. A., Pawar, S. Y., Gohery, S., Mulani, A. O., Sundari, M. S., & Kiradoo, G., et al. (2024). Computational and experimental analyses of pressure drop in curved tube structural sections of Coriolis mass flow metre for laminar flow region. Ships and Offshore Structures 19 (11), 1974-1983.
98. Kulkarni, P. R., Mulani, A. O., & Mane, P. B. (2016). Robust invisible watermarking for image authentication. Emerging Trends in Electrical, Communications and Information Technologies.
99. Kulkarni, T. M., Mulani, A. O., & Madan, T. (2024). Deep Learning Based Face-Mask



- Detection: An Approach to Reduce Pandemic Spreads in Human Healthcare. African Journal of Biological Sciences 6 (6).
100. Kutubuddin Sayyad Liyakat, K., O Mulani, A., Ibrahim Khalaf, O., & Algburi, S., et al. (2024). IoT Devices for Monitoring Health Status and Vital Signs in Patients with Cancer. International Journal of Computing and Digital Systems 16 (1), 1-12.
 101. Liyakat, K. K. S., Warhade, N. S., Pol, R. S., Jadhav, H. M., & Mulani, A. O. (2022). Yarn quality detection for textile industries using image processing. Journal Of Algebraic Statistics 13 (3), 3465-3472.
 102. M., C. J. M. (2021). Machine Learning based Autonomous Fire Combat Turret. Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12 (2).
 103. Mandwale, A. J., & Mulani, A. O. (2015). Different Approaches For Implementation of Viterbi decoder on reconfigurable platform. 2015 International Conference on Pervasive Computing (ICPC), 1-4.
 104. Mandwale, A. J., & Mulani, A. O. (2016). Implementation of High Speed Viterbi Decoder using FPGA. International Journal of Engineering Research & Technology (IJERT) 5 (2).
 105. Mandwale, A., & Mulani, A. O. (2014). Implementation of convolutional encoder & different approaches for viterbi decoder. IEEE International Conference on Communications, Signal Processing Computing.
 106. Mane, A. (2015). Area Efficient Technique for implementation of Discrete Wavelet Transform on FPGA. IEEE Conference on Engineering & Technology (ICETECH).
 107. Mane, A. (2017). An Efficient implementation of DWT for image compression on reconfigurable platform. International Journal of Control Theory and Applications 10 (15), 7.
 108. Mane, A. (2018). High-Speed Area-Efficient Implementation of AES Algorithm on Reconfigurable Platform. Computer and Network Security.
 109. Modi, S., Misal, V., Kulkarni, S., & Mulani, A. O. (2025). Plant Health AI Analyzer Using Supervised Learning. Plant Health 5 (4).
 110. More, S. S., & Mulani, A. O. (2024). Deep Learning Assisted Analysis of Ocular Multi Diseases-A Review. International Conference on Data Science, Machine Learning and Applications.
 111. More, S. S., & Mulani¹, A. O. (2026). Deep Learning Assisted Analysis of Ocular. Proceedings of the 6th International Conference on Data Science, Machine.
 112. Mulani, A. O. (2016). Optical Communication. Electrotech Publications, Satara.
 113. Mulani, A. O. (2025). A Robust Image Watermarking Framework Integrated with AES Encryption for Secure Digital Media Protection. Journal of Advancement in Electronics Signal Processing 2 (3), 47-56.



114. Mulani, A. O. (2025). Electric Vehicle Parameters Estimation Using Web Portal, Recent Trends in Electronics & Communication Systems, Volume 10, Issue 3, 2023. International Open-Access, Double-Blind Multidisciplinary Online 5 (4).
115. Mulani, A. O., & Kulkarni, T. M. (2023). Face mask detection system using deep learning: a comprehensive survey. International Conference on Emerging Trends in Artificial Intelligence, Data.
116. Mulani, A. O., & Mane, P. (2018). Secure and area efficient implementation of digital image watermarking on reconfigurable platform. International Journal of Innovative Technology and Exploring Engineering 8.
117. Mulani, A. O., & Mane, P. B. (2014). Area optimization of cryptographic algorithm on less dense reconfigurable platform. 2014 International Conference on Smart Structures and Systems (ICSSS), 86-89.
118. Mulani, A. O., & Mane, P. B. (2016). Area efficient high speed FPGA based invisible watermarking for image authentication. Indian journal of Science and Technology 9 (39), 1-6.
119. Mulani, A. O., & Mane, P. B. (2017). Fast and Efficient VLSI implementation of DWT for image compression. International Journal for Research in Applied Science and Engineering.
120. Mulani, A. O., & Shinde, G. N. (2021). An approach for robust digital image watermarking using DWT-PCA. Journal of Science and Technology 6 (1).
121. Mulani, A. O., Bang, A. V., Birajadar, G. B., Deshmukh, A. B., & Jadhav, H. M., et al. (2024). IoT based air, water and soil monitoring system for pomegranate farming.
122. Mulani, A. O., Birajadar, G., Ivković, N., Salah, B., & Darlis, A. R. (2023). Deep learning based detection of dermatological diseases using convolutional neural networks and decision trees. Traitement du Signal 40 (6), 2819.
123. Mulani, A. O., Deshmukh, M., Jadhav, V., Chaudhari, K., & Mathew, A. A., et al. (2025). Transforming drug therapy with deep learning: the future of personalized medicine. Drug Research 75 (08), 326-333.
124. Mulani, A. O., Jadhav, M. M., & Seth, M. (2022). Painless Non-invasive blood glucose concentration level estimation using PCA and machine learning. The CRC Book entitled Artificial intelligence, Internet of Things (IoT) and.
125. Mulani, A. O., Liyakat, K. K. S., Warade, N. S., Patil, A., Kolte, M. T., Kinage, K., & Rana, M., et al. (2026). Iot sensors in a wireless environment for healthcare monitoring: A framework for fault detection. Journal of Pharmacology and Pharmacotherapeutics 17 (1), 94-100.
126. Mulani, A. O., Modi, S. P., Misal, V. M., & Kulkarni, S. R. (2026). Development of



- an Eco-Efficient Pesticide Spraying Rover for Sustainable Farming. 2026 IEEE International Conference on Emerging Computing and Intelligent.
127. Mulani, A. O., Patil, R. M., & Liyakat, K. K. S. (2023). DISCRIMINATIVE APPEARANCE MODEL FOR ROBUST ONLINE MULTIPLE TARGET TRACKING.
128. Mulani, A. O., Patil, R. M., & Liyakat, K. K. S. (2023). Modelo de apariencia discriminatorio para un sólido seguimiento en línea de múltiples objetivos. *Télématicque: Revista Electrónica de Estudios Telemáticos* 22 (1), 24-43.
129. Mulani, A. O., Warade, N. S., Khalaf, O. I., Bsoul, Q., Waghole, D., & Jadhav, M., et al. (2025). Resource management optimisation of OFDM-IDMA system for 5G multi-tier backhaul networks. *Egyptian Informatics Journal* 31, 100756.
130. Mulani, A., & Mane, P. B. (2016). DWT based robust invisible watermarking. Scholars' Press.
131. Mulani, D. (2016). Design of Computer/Laptop independent data transfer system from one USB flash drive to another using ARM 11 processor. *International Journal of Science, Engineering and Technology Research* 5 (12).
132. Mulani, D. A. (2025). Design and Implementation of 256-bit Vedic Multiplier on Reconfigurable Platform. *Journal of Materials & Metallurgical Engineering* 15 (3).
133. Mulani, D. A. O. (2019). Effect of rotation and projection on real time hand gesture recognition system for human computer interaction. *Journal of The Gujrat Research Society* 21 (16), 3710-3718.
134. Mulani, D. A. O. (2024). A comprehensive survey on semi-automatic solar-powered pesticide sprayers for farming. *Journal of Energy Engineering and Thermodynamics (JEET)* ISSN, 2815-0945.
135. Mulani, P. (2018). High Speed Area Efficient FPGA Implementation of AES Algorithm. *Institute of Advanced Engineering and Science* 7 (3), 157-165.
136. Mulani, P. (2019). High throughput and area efficient FPGA Implementation of AES algorithm. *International Journal of Engineering and Advanced Technology* 8 (4), 519-523.
137. Mulani, P. K. (2015). Application of MATLAB for Second Level Discrete Wavelet Transform through Filter Bank. *International Conference on Engineering and Technology (ICETECH)*, 4.
138. Mulani, P. K. (2015). Robust invisible Watermarking for image authentication. *ICECIT* 2015, 4.
139. Mulani, P. R. K. (2015). Robust Invisible Digital Image Watermarking using Discrete Wavelet Transform. *International Journal of Engineering Research & Technology (IJERT)* 4 (01), 3.
140. Mulani, R. (2015). Analysis of Biomedical image using wavelet transformation. *International*



Journal of Innovations in Engineering Research and Technology.

141. Mulani, R. A. O., Ganjewar, S. P., Kadu, P. S., & Khadke, R., et al. (2020). Smart Ration Automated Teller Machine For Pandemic Situations. IN Patent App. 202,021,048,830.
142. Mulani, R. G. A. O. (2016). Sensor based Automatic Drip Irrigation System. Journal for Research 2 (2), 53-56.
143. Mulani, R. K. A. O. (2017). Raspberry pi based voice operated Robot. International Journal of Recent Engineering Research and Development 2 (12).
144. Mulani, T. (2024). Face Mask Detection on Real Time Images and Videos using Deep Learning. International Journal of Electrical Machine Analysis and Design (IJEMAD) 2.
145. Nagane, U. P., & Mulani, A. O. (2021). Moving Object Detection and Tracking Using Matlab. Journal of Science and Technology 6 (Special Issue 1).
146. Nagrale, M., Pol, R. S., Birajadar, G. B., Mulani, A. O., Kutubuddin, K., & Liyakat, S. (2024). Internet of robotic things in cardiac surgery: an innovative approach. Afr J Biol Sci 6 (6), 709-725.
147. Nagtilak, M. A. G., Ulegaddi, M. S. N., Adat, M. A. S., & Mulani, A. O. (2021). Breast Cancer Prediction using Machine Learning. International Journal of Research in Science and Engineering 1 (2).
148. Pathan, A. N., Shejal, S. A., Salgar, S. A., Harale, A. D., & Mulani, A. O. (2022). Hand gesture controlled robotic system. Int. J. of Aquatic Science 13 (1), 487-493.
149. Pol, D. R. S., Deshmukh, A. B., Jadhav, M. M., Liyakat, K. K. S., & Mulani, A. O. (2022). I Button Based Physical Access Grid Based Realistic Optimal Path Planning. Journal of Algebraic Statistics, 11987-12002.
150. Pol, R. S., Bhalerao, M. V., & Mulani, A. O. (2022). A real time IoT based System Prediction and Monitoring of Landslides. International Journal of Food and Nutritional Sciences 11 (7).
151. Rahul, G. G., & Mulani, A. O. (2025). Microcontroller Based Drip Irrigation System. International Open-Access, Double-Blind, Peer-Reviewed, Refereed. Multidisciplinary Online 5 (4).
152. S.Pol, D. D. R. (2021). Cloud Based Memory Efficient Biometric Attendance System Using Face Recognition. Stochastic Modeling & Applications 25 (2), 403-416.
153. Sawant, N. M., Mulani, A. O., Kondooru, S., Linge, S. G., Gawande, P. G., & Koli, M. S. (2024). AgriRent: Renting the Farm Equipment. International Conference on Data Science, Machine Learning and Applications.
154. Shinde, G., & Mulani, A. (2019). A ROBUST DIGITAL IMAGE WATERMARKING USING DWT -PCA. International Journal of Innovations in Engineering Research and Technology.



155. Shinde, M., & Mulani, A. (2021). Effects Of Foot Reflexology On Lactation In Postnatal Mothers At A Tertiary Care Hospital In Karad. *International Journal Of Current Research And Review* 13 (16), 225-229.
156. Shinde, R., & Mulani, A. O. (2015). Analysis of Biomedical Imagell. *International Journal on Recent & Innovative trend in technology (IJRITT)*.
157. Shinde, R., & Mulani, A. O. (2015). Biomedical Image fusion using Wavelet transform. *International Conference On Current Advances in Electronics, Electrical and*.
158. Singh, S., Arya, K. V., Rodriguez, C. R., & Mulani, A. O. (2025). Emerging Trends in Artificial Intelligence, Data Science and Signal Processing.
159. Swami, S. S., & Mulani, A. O. (2017). An efficient FPGA implementation of discrete wavelet transform for image compression. *2017 International Conference on Energy, Communication, Data Analytics and*.
160. Takale, D. A. M. S. (2023). A video watermarking technique with video and image as watermark using DWT and PCA. *Journal of Northeastern University* 25.
161. Takale, S., & Mulani, A. (2022). DWT-PCA based video watermarking. *Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM)*.
162. Takale, S., & Mulani, A. (2022). Video Watermarking System. *International Journal for Research in Applied Science and Engineering*.
163. Thigale, S. P., Jadhav, H. M., Mulani, A. O., Birajadar, G. B., Nagrale, M., & Sardey, M. P. (2024). Internet of things and robotics in transforming healthcare services. *Afr J Biol Sci (S Afr)* 6 (6), 1567-1575.
164. Ughade, U. R., Gikwad, S. M., Yeole, A. N., & Mulani, D. A. O. (2023). Automatic attendance system using face recognition. *Journal of Image Processing and Intelligent Remote Sensing* 3 (4), 11-18.
165. Anjali Pise, K. K. (2025). A Genetic Algorithm-Driven Energy-Efficient Routing Strategy for Optimizing Performance in VANETs. *Engineering, Technology & Applied Science Research* 15 (No. 5, 2025), 27273-27278.
166. Pise, A. C., & Karande, D. K. J. (2021). An exploratory study of cluster based routing protocol in VANET: a review. *International Journal of Advanced Research in Engineering and Technology*.
167. Pise, A. C., & Karande, K. J. (2023). Energy-Efficient Optimal Routing Protocols in VANETs. *66th Annual IETE Convention, AIC-2023 September16-17*.
168. Pise, A. C., & Karande, K. J. (2024). Investigating Energy-Efficient Optimal Routing Protocols for VANETs: A Comprehensive Study. *International Conference on Information and Communication Technology for*.
169. Pise, A. C., & Karande, K. J. (2024). K-mean energy efficient optimal cluster based



- routing protocol in vehicular ad-hoc networks. *Modern Approaches in Machine Learning and Cognitive Science: A Walkthrough*.
170. Pise, A. C., & Karande, K. J. (2025). Architecture, Characteristics, Applications and Challenges in Vehicular Ad Hoc Networks. 27th IEEE International Symposium on Wireless Personal Multimedia.
171. Pise, A. C., & Karande, K. J. (2025). Cluster head selection based on ACO in vehicular ad-hoc networks. *Machine Learning for Environmental Monitoring in Wireless Sensor Networks*.
172. Pise, A., & Karande, K. (2025). Hybrid Remora Optimization Algorithm for Energy Efficient Optimal Routing Scheme in VANETs. *International Journal of Intelligent Engineering & Systems* 18 (9), 584.
173. Shejwal, V., Karande, K. J., & Pise, A. C. (2025). Automated Pomegranate Disease Detection and Classification Using Vision Transformer. *International Conference on Recent Trends in Machine Learning, IOT, Smart*.
174. Dhanawadel, A., Mulani, A. O., & Pise, A. C. (2024). IOT based Smart farming using Agri BOT. *Sanshodhak*.
175. Maske, Y., Jagadale, A. B., Mulani, A. O., & Pise, A. C. (2023). Development of BIOBOT system to assist COVID patient and caretakers. *European Journal of Molecular & Clinical Medicine* 10 (01), 2023.
176. Nale, D., Pise, A. (2025). Web Based – Application for Result Analysis. In: Singh, S., Arya, K.V., Rodriguez, C.R., Mulani, A.O. (eds) *Emerging Trends in Artificial Intelligence, Data Science and Signal Processing. AIDSP 2023. Communications in Computer and Information Science*, vol 2439. Springer, Cham. https://doi.org/10.1007/978-3-031-88759-8_1D.
177. D. Nale and A. C. Pise, Smart Result Analysis-pdf Extractor, 2024 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), Bhopal, India, 2024, pp. 1-6, doi: 10.1109/SCEECS61402.2024.10482279.
178. C. Pise, Jadhav P., Detection of Cast Iron Composition by Cooling Curve Analysis using Thermocouple Temperature Sensor, 2nd International Conference on Engineering Technology, Science and Management Innovation (ICETSMI – 2018), 2nd September 2018.
179. C. Pise, Facial Expression Recognition Using Facial Features, IEEE International Conference on Communication and Electronics Systems (ICCES 2018), October 2018.
180. C. Pise, Jadhav P, Estimating Parameters of Cast Iron Composition using Cooling Curve Analysis, IEEE International Conference on Communication and Electronics Systems (ICCES 2018), Coimbatore, October 2018.
181. Pise, A. C. (2016, December). Android based Portable Health Support System. In *International Conference on Innovations in Engineering and Technology (CIET 2016)*, SKN



Sinhgad College of Engineering (pp. 30-31).

182. A Pise, A. C. (2016, December). Baysian Classifier & FCM Segmentation for Lung Cancer Detection in early stage. In International Conference on Innovations in Engineering and Technology (CIET 2016), SKN Sinhgad College of Engineering (pp. 30-31).

183. Pise, A. C. (2016, December). Cast Iron Composition Measurement by Coding Curve Analysis. In International Conference on Innovations in Engineering and Technology (CIET 2016), SKN Sinhgad College of Engineering (pp. 30-31).

184. Pise, A. C. (2016, December). War field Intelligence Defence Flaging Vehicle. In International Conference on Innovations in Engineering and Technology (CIET 2016), SKN Sinhgad College of Engineering (pp. 30-31).

185. C. Pise, [Segmentation of Optic](#) Disk and Optic Cup from retinal Images, ICEECMPE – Chennai, June 2015

186. Pise, A. C. (2015, April). Diseases Detection of Pomegranate Plant. In IEEE sponsored International Conference on Computation of Power, Energy, Information and Communication (pp. 22-23).

187. P. V. Bankar and A. C. Pise, Face recognition by using Gabor and LBP, 2015 International Conference on Communications and Signal Processing (ICCSP), Melmaruvathur, India, 2015, pp. 0045-0048, doi: 10.1109/ICCSP.2015.7322425.

188. Lole, A. C. Pise and S. V. Surwase, Efficient implementation of UTAMF Algorithm for edge preservation on FPGA, 2015 International Conference on Green Computing and Internet of Things (ICGCIoT), Greater Noida, India, 2015, pp. 667-670, doi: 10.1109/ICGCIoT.2015.7380547.

189. Pise, A. C. (2014). Single Chip Solution For Multimode Robotic Control. Ist IEEE International Conference on Computing Communication and Automation, 26-27.

190. S. A. Thite, A. C. Pise and A. B. Jagadale, Single Chip Solution for Multimode Robotic Control, 2015 International Conference on Computing Communication Control and Automation, Pune, India, 2015, pp. 555-557, doi: 10.1109/ICCUBEA.2015.114.

191. Lole Bhagyashri A., Pise A.C and Surwase S. V., Area optimized implementation of unsymmetric trimmed adaptive Median Filter for edge preservation on FPGA, 2015 International Conference on Green Computing and Internet of Things (ICGCIoT), Greater Noida, India, 2015, pp. 86-89, doi: 10.1109/ICGCIoT.2015.7380434.

192. Pise, A. C., & Katti, V. S. (2014), Efficient Design for Monitoring of Greenhouse Parameters using Zigbee Wireless Sensor Network. In fifth SARC international conference IRF, IEEE forum ISBN (pp. 978-93).

193. Pise, A. C., & Bankar, P. (2014, April). Face Recognition using Color Local Texture Features. In International Conference on Electronics and Telecommunication, Electrical and



Computer Engineering.

194. Pise, A. C. (2014, April). Monitoring parameters of Greenhouse using Zigbee Wireless Sensor Network. In 1st International Conference on Electronics and Telecommunication, Electrical and Computer Engineering (pp. 5-6).
195. Pise, A., & Deshmukh, A. (2010, April). Compensation schemes and performance Analysis of IQ Imbalances in Direct Conversion Receivers. In Proceedings of the 2009 International Conference on Signals, Systems and Automation (ICSSA 2009). Universal-Publishers.
196. Pise A., Nale D. Web Based – Application for Result Analysis, Communications in Computer and Information Science 2439 CCIS 2025, Scopus Indexed
197. Prof. A. C. Pise, Namrata Dabade, Sumitra Deshmane, Puja Gavade, AI Maze Escape Game Using Minmax Algorithm, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29506](https://doi.org/10.48175/IJARSCT-29506)
198. Prof. Anjali Pise, Mr. Omkar Kumbhar, Mr. Sujal Mane, Mr. Ruturaj Patil, AI ChatBot Using Python, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29509](https://doi.org/10.48175/IJARSCT-29509)
199. Prof. Anjali Pise, Mr. Omkar Kumbhar, Mr. Sujal Mane, Mr. Ruturaj Patil, AI ChatBot Using Python – A Systematic Review, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429.
200. Niharika Bodake, Akshata Gaurkar, Vaishnavi Chavan, Vaishnavi Bhosale, Prof. A. C. Pise, A Review on IoT Based Solid Waste Management System, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29434](https://doi.org/10.48175/IJARSCT-29434).
201. Prof. A. C. Pise, Namrata Dabade, Sumitra Deshmane, Puja Gavade, Smart Wheelchair, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29437](https://doi.org/10.48175/IJARSCT-29437).
202. Sanket Badave, Prajwal Bhujbal, Aaditya Aradhya, Vishant Bagewadikar, A. C. Pise (2025), “Drowsiness Detection System”, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29405](https://doi.org/10.48175/IJARSCT-29405)
203. Prof. A. C. Pise, Namrata Dabade, Sumitra Deshmane, Puja Gavade, AI Maze Escape Game Using Minmax Algorithm, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29505](https://doi.org/10.48175/IJARSCT-29505)
204. Niharika Bodake, Akshata Gaurkar, Vaishnavi Chavan, Vaishnavi Bhosale, Prof. A. C. Pise, IoT Based Solid Waste Management System, International Journal of Advanced Research in



Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29415](https://doi.org/10.48175/IJARSCT-29415)

205. Prof. A. C. Pise, Namrata Dabade, Sumitra Deshmane, Puja Gavade, Smart Wheelchair with Automated Breaking and GPS, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29435](https://doi.org/10.48175/IJARSCT-29435)

206. Sanket Badave, Prajwal Bhujbal, Aaditya Aradhye, Vishant Bagewadikar, A. C. Pise (2025), A Review on Driver Drowsiness Detection Systems Using Image Processing and AI Techniques, International Journal of Advanced Research in Science, Communication and Technology, Volume 5, Issue 4, October 2025, ISSN: 2581-9429. [10.48175/IJARSCT-29403](https://doi.org/10.48175/IJARSCT-29403).

207. A. C. Pise, Raut S., Smart Vehicle: A Systematic Review, International Journal of Research Publication and Reviews, ISSN 2582-7421, Vol 4, no 10, pp 2728-2731 October 2023.

208. Sonali P. Raut, & A. C. Pise. (2023). Smart Vehicle. Journal of Electronics, Computer Networking and Applied Mathematics, 4(01), 38–47. <https://doi.org/10.55529/jecnam.41.38.47>

209. Pise, A. C. IoT Based Landmine Detection Robot. International Journal of Research in Science & Engineering ISSN: 2394-8299 Vol: 03, No. 04, June-July 2023.

210. Jayshri Prakash Patale, A. B. Jagadale, A. O. Mulani, & Anjali Pise (2022). A Systematic survey on Estimation of Electrical Vehicle. Journal of Electronics, Computer Networking and Applied Mathematics, (JECNAM) ISSN, 2799-1156. 3(01), 1–6. <https://doi.org/10.55529/jecnam.31.1.6>

211. Pise, A. C. (2022). An IoT Based Real Time Monitoring of Agricultural and Micro irrigation system. International journal of scientific research in Engineering and management (IJSREM), VOLUME: 06 ISSUE: 04 | APRIL – 2022, ISSN: 2582-3930, 6(04).

212. Harale, A. D., & Karande, K. J. (2026). Gabor-Augmented Two-Stream Framework With GoogLeNet-Based Temporal Attention for Semantic Dynamic Hand Gesture Recognition. Computer Animation and Virtual Worlds 37 (3), e70118.

213. Gadade, B., Mulani, A. O., & Harale, A. D. (2024). Iot based smart school bus and student monitoring system. Naturalista Campano 28 (1), 730-737.

214. Gadade, B., Mulani, A. O., & Harale, A. D. (2024). IoT Based Smart School Bus and Student Tracking System. IoT Based Smart School Bus and Student Tracking System.

215. Kolekar, S. D., Walekar, V. B., Patil, P. S., Mulani, A. O., & Harale, A. D. (2022). Password Based Door Lock System. Int. J. of Aquatic Science 13 (1), 494-501.

216. Avinash D. Harale and Kailash J. Karande , “Literature review on Dynamic Hand Gesture Recognition”, AIP Conference Proceeding ,31st Oct 2022, <https://doi.org/10.1063/5.0107577>

217. A. D. Harale and K. J. Karande, “Gabor-Augmented Two-Stream Framework With GoogLeNet-Based Temporal Attention for Semantic Dynamic Hand Gesture Recognition,”



Computer Animation and Virtual Worlds 37, no. 3 (2026): e70118, <https://doi.org/10.1002/cav.70118>.

218. A. D. Harale , Amruta S. Bankar and K. J. Karande, “Gestures Controlled Home Automation using Deep Learning: A Review”, International Journal of Current Engineering and Technology, Vol.11, No.6,page no-617-621, Dec 2021

219. D. Harale, Ms. Asma Hakim, Dr.K.J.Karande, “Hand gesture identification system for hearing and speech impairment”, TELEMATIQUE, Volume 23 Issue 1, 2024 page n- 497–501, April 2024

220. A.D. Harale, Atik N. Pathan and A. O. Mulani, “Hand Gesture Controlled Robotic System” International Journal of Aquatic Science, ISSN: 2008-8019 Vol 13, Issue 01, Jan 2022

221. D. Harale, K. J. Karande, Sagar S. Bhumkar, “Wireless Hand Geture Control Robot with Object Detection”, Journal of Image Processing and Intelligent Remote Sensing, ISSN 2815-0953, Vol. 3 No. 04 (2023), July 2023.

222. A.D.Harale, Ms.Asma Hakim, Altaf Mulani, K.J.Karande, “Implementation of Human Gesture Recognition Using CNN”, June 2024 ,Journal of STM.

223. Dheeraj Muttin and Avinash Harale, “IoT Based Personal Medical Assistant System”, “International Journal of Innovative Research in Technology (IJIRT)”, Volume 8 Issue 5 | ISSN: 2349-6002, October 2021.

224. Vijay Waghmode and Avinash Harale, “Development of Alphanumeric Digital Fuel Gauge for Automotive Applications”, “International Conference on Communication and Signal Processing”, IEEE, April 4-6, 2019.

225. Gorakhnath U. Waghmode and Avinash D. Harale, “A Cloud Computing Based WSNs for Agriculture Management”, Springer International Publishing, Conference: Techno-Societal DOI 10.1007/978-3-319-53556-2_107 December 2018.

226. Sanaha S. Path and Avinash D. Harale, “Silkworm Eggs Counting System Using Image Processing Algorithm”, Springer International Publishing, Conference: Techno-Societal DOI:10.1007/978-3-319-53556-2_32_ December 2018.

227. S. S. Kulkarni and A.D.Harale, “Image Processing for Driver’s Safety and Vehicle Control using Raspberry Pi and Webcam”, “IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI)-IEEE, 2017.

228. Supriya A Salunke and Avinash D Harale, “Vehicle Tracking System for School Bus by Arduino”, International Research Journal of Engineering and Technology (IRJET), ISSN: 2395-0072, Volume: 04 Issue: 03, Mar -2017.

229. Bhakti B.Bhaganagare Avinash.D.Harale, “Iris as Biometrics for Security System”, 2nd International Conference on Electrical, Computer and Communication Technologies, IEEE, 2017.

230. Supriya A Salunke and Avinash D Harale, “Vehicle Tracking System Using GPRS For



School Bus”, International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE), ISSN-2395-2717, Vol 3, Issue 1, January 2017.

231. Sanaha S. Pathan and Avinash D. Harale, “Automated silkworm eggs count”, IEEE International Conference on Advances in Electronics, Communication and Computer Technology (ICAECCT)”, Rajarshi Shahu College of Engineering, Pune India. Dec 2-3, 2016.

232. Sanaha S. Pathan and Avinash D. Harale, “Silkworm Egg Counting System Using Image Processing Algorithm -A Review”, International Research Journal of Engineering and Technology (IRJET) Volume: 03 Issue: 06, ISSN: 2395-0072, June-2016.

233. Gorakhnath U.Waghmode and Avinash D.Harale , “A survey on: Cloud Enabled Agricultural Management”, International Journal of Research (IJR), e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 09, September 2015.

234. Mrunmayee V. Daithankar, Kailash J. Karande and Avinash D. Harale, “Analysis of Skin Color Models for Face Detection”, International Conference on Communication and Signal Processing, IEEE April 3-5, 2014.

235. Apurva Sutar, K. J. Karande and A. D. Harale, “Deep Learning based Automated Billing Cart”, International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), ISSN (Online) 2581-9429, Volume 3, Issue 4, April 2023.

236. Apurva Sutar, K. J. Karande and A. D. Harale , “Deep Learning Based Smart Billing Cart Using RFID and Yolo”, Purakala, ISSN: 0971-2143, Vol 32 Issue 1, 2023.

237. Yogesh Jadhav, Kakade Vishal, Virendra Metkari, Siddheshwar S. Gangonda, “IOT Based Greenhouse Monitoring and Controlling System”, IJSRD - International Journal for Scientific Research & Development| Vol. 12, Issue 3, 2024 | ISSN (online): 2321-0613.

238. Akash Lawande, Kishor Mane, Kunal Davad, Siddheshwar S. Gangonda, “Pipeline Survey Robot”, IJSRD - International Journal for Scientific Research & Development| Vol. 12, Issue 3, 2024 | ISSN (online): 2321-0613.

239. Siddheshwar S. Gangonda, Prashant P. Patavardhan, Kailash J. Karande, “VGHN: variations aware geometric moments and histogram features normalization for robust uncontrolled face recognition”, International Journal of Information Technology, <https://doi.org/10.1007/s41870-021-00703-0>.

240. Siddheshwar Gangonda and Prachi Mukherji, “Speech Processing for Marathi Numeral Recognition using MFCC & DTW Features”, International Journal of Engineering Research and Applications (IJERA) pp. 118-122, ISSN: 2248- 9622.

241. Siddheshwar S. Gangonda, Prashant P. Patavardhan, Kailash J. Karande, “Recognition of Marathi Numerals using MFCC and DTW Features”, 2nd International Conference on Recent Trends in Image Processing and Pattern Recognition (RTIP2R 2018), 21th -22th Dec., 2018, organized by Solapur University, Solapur in collaboration with University of South Dakota (USA)



and Universidade de Evora (Portugal), India.

242. Siddheshwar S. Gangonda, Prashant P. Patavardhan, Kailash J. Karande, “A Comprehensive Survey of Face Databases for Constrained and Unconstrained Environments”, 2nd IEEE Global Conference on Wireless Computing & Networking (GCWCN-2018), 23th-24th Nov. 2018, organized by STES's Sinhgad Institute of Technology, Lonavala, India.

243. Siddheshwar Gangonda and Prachi Mukherji, “Speech Processing for Marathi Numeral Recognition”, ePGCON 2011, 26th April 2011 organized by MAEER's MIT, Kothrud, Pune-38.

244. Siddheshwar Gangonda, “Medical Image Processing”, Aavishkar-2K7, 17th and 18th March 2007 organized by Department of Electronics and Telecommunication Engineering, SVERI's COE, Pandharpur.

245. Bhaganagare, S., Chavan, S., Gavali, S., & Godase, V. (2025). The vocal cortex of the smart home: A review of esp32-based control and automation architectures. *International Journal of Advanced Research in Science, Communication and Technology*, 1071-1094.

246. Bhaganagare, S., Chavan, S., Gavali, S., & Godase, V. V. (2025). Voice-controlled home automation with esp32: A systematic review of IoT-based solutions. *Journal of Microprocessor and Microcontroller Research*, 2(3), 1-13.

247. Dange, R., Attar, E., Ghodake, P., & Godase, V. (2023). Smart agriculture automation using ESP8266 NodeMCU. *J. Electron. Comput. Netw. Appl. Math.*, (35), 1-9.

248. Dhope, V., Chavan, A., Hadmode, N., & Godase, V. (2024). Smart plant monitoring system. *International Journal of Creative Research Thoughts (IJCRT)*. <https://www.ijcrt.org>.

249. Ghadage, I., Ghadge, P., Kamble, R., Mhamane, R., & Godase, V. V. (2025). Development of a cloud-connected industrial temperature and humidity monitoring system. *Development*, 5(4).

250. Ghadage, I., Ghadge, P., Kamble, R., Mhamane, R., & Godase, V. V. (n.d.). Industrial environment monitoring using IoT: A comprehensive review on temperature and humidity control

251. Godase, V., & Jagadale, A. (2019). Three element control using PLC, PID & SCADA interface. *International Journal for Scientific Research and Development*, 7(2), 1105-1109.

252. Godase, V. (2023). Smart agriculture automation using ESP8266 node MCU. *Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM)* ISSN, 2799(1156), 1.

253. Godase, V., Mulani, A., Ghodak, R., Birajadar, G., Takale, S., & Kolte, M. (2024). A MapReduce and kalman filter based secure IIoT environment in hadoop. *Sanshodhak*, 25, 38-47.

254. Godase, V., Pawar, P., Nagane, S., & Kumbhar, S. (2024). Automatic railway horn system using node MCU. *Journal of Control & Instrumentation*, 15(1).

255. Godase, V., & Godase, J. (2024). Diet prediction and feature importance of gut microbiome using machine learning. *Evolution in Electrical and Electronic Engineering*, 5(2), 214-219.

256. Godase, V., Jadhav, Y., & Kakade, V. (2024). IOT based greenhouse monitoring and



- controlling system. International Journal for Scientific Research & Development, 12(3), 138-140.
257. Godase, V. (2025). A comprehensive review on PIR sensor-based light automation systems. International Journal of Image Processing and Smart Sensors, 1(1), 22-29.
258. Godase, V. (2025). A comprehensive review on scalable Arduino radar platform for real-time object detection and mapping. Journal of Microprocessor and Microcontroller Research e-ISSN, 3048-6637.
259. Godase, V. (2025). A comprehensive study of revolutionizing EV charging with solar-powered wireless solutions. Advance Research in Power Electronics and Devices e-ISSN, 3048-7145.
260. Godase, V., Khiste, R., & Palimkar, V. (2025). Ai-optimized reconfigurable antennas for 6G communication systems. Journal of RF and Microwave Communication Technologies, 2(3), 1-12.
261. Godase, V. V. (2025). Artificial intelligence and human society: A double-edged sword. Impact of Artificial intelligence On Society.
262. Godase, V. (2025). Automated water distribution management and leakage mitigation using PLC systems. Journal of Control and Instrumentation Engineering.
263. Godase, V., Altaf Mulani, S. T., Ghodake, R., & Birajadar, G. (2025). Blockchain for transparent irrigation water allocation and management. Int. Water Irrig, 44, 518-521.
264. Godase, V. (2025). Case study: Combating adversarial attacks in AI systems. Artificial Intelligence Education And Innovation.
265. Godase, V. (2025). Comparative study of ladder logic and structured text programming for PLC. Available at SSRN.
266. Godase, V. (2025). Comprehensive review on explainable ai to addresses the black box challenge and its role in trustworthy systems. Sinhgad College of Engineering, Artificial Intelligence Education and Innovation, 127-132.
267. Godase, V. (2025). Cross-domain comparative analysis of microwave imaging systems for medical diagnostics and industrial testing. Journal of Microwave Engineering & Technologies, 12(2), 39-48.
268. Godase, V. (2025). Design and optimization of reconfigurable microwave filters using AI techniques. Journal of RF and Microwave Communication Technologies, 2(2), 26-41.
269. Godase, V. V. (2025). Digital governance and the right to information in india: Pathways to transparency. Available at SSRN 5817082.
270. Godase, V. (2025). Edge AI for smart surveillance: Real-time human activity recognition on low-power devices. International Journal of AI and Machine Learning Innovations in Electronics and Communication Technology, 1(1), 29-46.



271. Godase, V. V. (2025). Education as empowerment: The key to women's socio-economic development. Available at SSRN 5536520.
272. Godase, V. V. (2025). Fra-polar net: A novel image processing framework for transformer condition monitoring. Recent Trends in Semiconductor and Sensor Technology, 2(3), 11-24.
273. Godase, V. (2025). Graphene-based nano-antennas for terahertz communication (source details not available on Scholar profile).
274. Godase, V. (2025). IoT-MCU integrated framework for field pond surveillance and water resource optimization. International Journal of Emerging IoT Technologies in Smart Electronics and Communication.
275. Godase, V. (2025). LoRaEdge-ESP32 synergy: Revolutionizing farm weather data collection with low-power, long-range IoT. Advance Research in Analog and Digital Communications.
276. Godase, V. (2025). Navigating the digital battlefield: An in-depth analysis of cyber-attacks and cybercrime. International Journal of Data Science, Bioinformatics and Cyber Security, 1(1), 16-27.
277. Godase, V. (2025). Optimized algorithm for face recognition using deep face and multi-task cascaded convolutional network (MTCNN). Optimum Science Journal, 66-74.
278. Godase, V., Khiste, R., & Palimkar, V. (2025). Programmable smart surfaces and intelligent reflecting surfaces for enhanced wireless propagation in indoor and outdoor environments. International Journal of Satellite-Based Communication and Wireless Networks System, 1(2), 29-41.
279. Godase, V., Modi, S., Misal, V., & Kulkarni, S. (2025). Real-time object detection for autonomous drone navigation using yolov8. Advance Research in Communication Engineering and its Innovations, 2(2), 17-27.
280. Godase, V. (2025). Smart energy management in manufacturing plants using PLC and SCADA. Advance Research in Power Electronics and Devices, 2(2), 14-24.
281. Godase, V. V. (2025). Vlsi-integrated energy harvesting architectures for battery-free IoT edge systems. Journal of Electronics Design and Technology, 2(3), 1-12.
282. Godase, V. (2025). Voice controlled home automation using ESP32 and IoT-Based cloud integration. International Journal of Advanced Research in Science, Communication and Technology.
283. Godase, V., Pandhare, A., & Pandhare, S. (2026). Mechanical and thermal characterization of natural fiber-reinforced epoxy composites for structural applications. International Journal of Composite Materials and Matrices, 12(1), 37-48p.
284. Hipparkar, J., Mulani, A., Godase, V., Takale, S., & Ghodake, R. (2026). Real-time vision-based disease detection using edge-optimized deep learning models. In 2026 IEEE International



Conference on Emerging Computing and Intelligent Technologies (ICoECIT) (pp. 1-5). IEEE.

285. Jamadade, V. K., Ghodke, M. G., Katakdhond, S. S., & Godase, V. (2025). A review on real-time substation feeder power line monitoring and auditing systems,” *International Journal of Emerging IoT Technologies in Smart Electronics and Communication*, 1(2), 1-16.

286. Jamadade, V., Ghodake, M., Katakdhond, S., & Godase, V. (n.d.). A comprehensive review of real-time feeder monitoring and auditing systems: Architectures, technologies, and analytics for the smart grid (source details not available on Scholar profile).

287. Jamadade, V., Ghodake, M., Katakdhond, S., & Godase, V. (n.d.). A review on ai-powered image generation system using AI

288. Kumbhar, B., Kokelar, S., Rohidas, K., & Jadhav, S. (n.d.). An overview of real-time bus tracking in smart bus stop system (source details not available on Scholar profile).

289. Nagane, S. K., Pawar, P. S., & Godase, V. V. (2022). Cinematica sentiment analysis. *Journal of Image Processing and Intelligent Remote Sensing*, 2(3), 27-32.

290. Vaibhav, V. G. (2025). A neuromorphic-inspired, low-power VLSI architecture for edge AI in IoT sensor nodes. *Journal of Microelectronics and Solid-State Devices*, 12(2), 41-47.

291. Godase, M. V., Mulani, A., Ghodak, M. R., Birajadar, M. G., Takale, M. S., & Kolte, M. (2024). A MapReduce and Kalman filter based secure IIoT environment in Hadoop. *Sanshodhak*, 25, 38–47.

292. A.H.Shinde, V. V. Sardar, S. M. Ubale, and S. M. Moholkar, “IoT-Based Prepaid Energy Meter with Stealing Alert,” in *Proceedings of the 6th International Conference on Recent Trends in ...*, vol. 1737, 2026, DOI: 10.1007/978-981-95-5082-1_12.

293. K. G. Landage, V. B. Manepatil, R. R. Mokashi, and A. H. Shinde, “IoT Based Smart Electricity Energy Meter,” *International Journal of Progressive Research in Engineering Management and Science (IJPREAMS)*, vol. 05, no. 03, pp. 1298–1302, Mar. 2025.

294. V. Dhage, A. Nagane, R. Menkudale, and A. H. Shinde, “The Evolution of Student Monitoring Systems in School Buses: A Detailed Review,” *International Journal of Electrical Machine Analysis and Design (IJEMAD)*, vol. 2, no. 1, Jan.–Jun. 2024, DOI: 10.37591/IJEMAD.

295. S. Pandhare, S. Mali, K. Sahani, and A. H. Shinde, “Sentiment Analysis Based on Movie Review,” *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, vol. 5, no. 4, Oct. 2025, DOI: 10.48175/IJARSCT-29496.

296. S. Pandhare, S. Mali, K. Sahani, and A. H. Shinde, “A Systematic Review – Sentiment Analysis Based on Movie Review,” *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, vol. 5, no. 4, Oct. 2025, DOI: 10.48175/IJARSCT-29495.



297. P. Devram, A. Pise, G. Tanwade, and A. H. Shinde, "A Review on Voice Assistant," *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, vol. 5, no. 4, Oct. 2025, DOI: 10.48175/IJARSCT-29487.
298. P. Devram, A. Pise, G. Tanwade, and A. H. Shinde, "Voice Assistant," *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, vol. 5, no. 4, Oct. 2025, DOI: 10.48175/IJARSCT-29488.
299. P. Devram, A. Pise, G. Tanwade, and A. H. Shinde, "Literature Review on Smart Door Lock Using Keypad & GSM," *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, vol. 5, no. 4, Oct. 2025, DOI: 10.48175/IJARSCT-29452.
300. P. Devram, A. Pise, G. Tanwade, and A. H. Shinde, "Smart Door Lock Using Keypad & GSM," *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, vol. 5, no. 4, Oct. 2025, DOI: 10.48175/IJARSCT-29438.
301. Shubham Salunkhe, Pruthviraj Zambare, Sakshi Shinde, S. K. Godase. (2024). API Development for Cloud Parameter Curation International. *Journal of Electrical and Communication Engineering Technology*, 2(1). <https://doi.org/10.37591/ijecet>
302. Badave, A., Pawale, A., Andhale, T., Godase, S. K., & STM JOURNALS. (2024). Smart home safety using fire and gas detection system. *Recent Trends in Fluid Mechanics*, 1, 35–43. <https://journals.stmjournals.com/rtfm>
303. Asabe, H., Asabe, R., Lengare, O., & Godase, S. (2025). IOT- BASED STORAGE SYSTEM FOR MANAGING VOLATILE MEDICAL RESOURCES IN HEALTHCARE FACILITIES. *INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)*, 05(03), 2427–2433. <https://www.ijprems.com>
304. Karche, S. N., Mulani, A. O., Department of Electronics, SKN Sinhgad College of Engineering, Korti, & University of Solapur, Maharashtra, India. (2018). AESC Technique for Scalable Face Image Retrieval. *International Journal of Innovative Research in Computer and Communication Engineering*, 6(4), 3404–3405. <https://doi.org/10.15680/IJIRCCE.2018.0604036>
305. Obstacle avoidance and Bluetooth control car. (2025). In *International Journal of Advanced Research in Science, Communication and Technology* (Vol. 5, Issue 4) [Journal-article]. <https://www.ijarsct.co.in>
306. Ultrasonic and arduino based radar system. (2025). In *International Journal of Advanced Research in Science, Communication and Technology* (Vol. 5, Issue 4) [Journal-article]. <https://www.ijarsct.co.in>
307. Shitole, M., Thokale, S., Patil, N., Shingare, S., & Godase, S. K. (2025). Review on Ultrasonic Sensor-Based RADAR Systems for object detection and distance Measurement.



- International Journal of Advanced Research in Science Communication and Technology, 392–408. <https://doi.org/10.48175/ijarsct-29424>
308. Chavan, R., Chavan, S., Gaikwad, O., Gaikwad, K., & Godase, S. K. (2025). Review of smart robotic car systems for obstacle detection and Bluetooth Control. International Journal of Advanced Research in Science Communication and Technology, 521–536. <https://doi.org/10.48175/ijarsct-29432>
309. Patil, S., Navale, P., Suryawanshi, V., & Godase, S. K. (2025). Advance solar tracking and automatic sprinkler irrigation system. In SKN Sinhgad College of Engineering, International Journal of Advanced Research in Science, Communication and Technology (Vol. 5, Issue 4) [Journal-article]. <https://www.ijarsct.co.in>
310. Navale, P., Patil, S., Suryawanshi, V., & Prof. S. K. Godase. (2025). Smart Solar-Irrigo System. In International Journal of Advanced Research in Science, Communication and Technology (Vol. 5, Issue 4) [Journal-article]. <https://www.ijarsct.co.in>
311. A Systematic Review- Sugarcane disease prediction. (2025). In International Journal of Advanced Research in Science, Communication and Technology (Vol. 5, Issue 4) [Journal-article]. <https://www.ijarsct.co.in>
312. Zade, M. M., & Mukane, D. S. (2013). Enhancement of image with the help of switching median filter. In National Conference on Emerging Trends in Electronics & Telecommunication.
313. Zade, M. M., Rupanar, B. B., Shilawant, V. S., & Pawar, A. R. (2025). IOT flood monitoring & alerting system using Raspberry Pi-Pico. International Journal of Research Publication & Reviews, 6(3).
314. Zade, M. M. (2019). Performance analysis of PSNR vs. impulse noise for the enhancement of image using SMF. In National Conference on Mathematical Modeling and Computational Intelligence.
315. Zade, M. M. (2019). Dynamic clustering of wireless sensor network using modified AODV. In National Conference on Mathematical Modeling and Computational Intelligence.
316. Zade, M. M. (2019). Classification of power quality disturbances using SVM & their efficiency comparison. In National Conference on Mathematical Modeling and Computational Intelligence.
317. Zade, M. M. (2016). Performance analysis of median filter for enhancement of highly corrupted images. In National Conference on Advanced Trends in Engineering.
318. Zade, M. M. (2016). Implementation of Reed Solomon encoder & decoder using FPGA. In National Conference on Advanced Trends in Engineering.
319. Zade, M. M. (2016). Performance of switching median filter for enhancement of image. In National Conference on Mechatronics at Sinhgad Institute of Technology.
320. Zade, M. M., Kambale, S. D., Mane, S. A., & Jadhav, P. M. (2025). IOT based early fire



detection in jungles. RIGJA&AR, 2(1).

321. Zade, M. R. (2017). Finite element analysis and fatigue analysis of crane hook with different materials. International Research Journal of Engineering and Technology, 4(01).

322. Bansude, V. U., Togrikar, P. S., Karve, S. M., & Zade, M. M. (n.d.). A hybrid model for early PCSO detection using VGG16 CNN and XGBoost on multimodal data. Journal of Technical Education, 342.

323. Mahadev, M., Rahulkumar, D. R., & Shirkande, D. (n.d.). Efficient routing and data fusion in IoT-WSNs for resilient forest fire monitoring.

324. Mr. Zade Mahesh Mahadev published a paper in International Journal of Artificial Intelligence and Machine Learning on “An Iot-Enabled Resilient Wireless Sensor Network Framework For Early Forest Fire Detection And Monitoring” June 2026(SCOPUS)

325. Mr. Zade Mahesh Mahadev published a paper in International Journal of Artificial Intelligence and Machine Learning on “A Reliable, Energy-Efficient And Secure Data Aggregation Framework For Resource Constrained Wireless Sensor Networks” June 2026(SCOPUS)

326. Mr. Zade Mahesh Mahadev published a paper in Shodhkosh-Journal of Visual & Performing Arts on “Visualizing Forest Fire Risks: An Efficient and Resilient IoT-Enabled Wireless Sensor Network Approach” March 2026

327. Mr. Zade Mahesh Mahadev published a paper in Shodhkosh-Journal of Visual & Performing Arts on “The Aesthetics of Data Flow: Enhancing Reliability and Efficiency in Resource-Constrained Wireless Sensor Networks” March 2026

328. Mr. Zade Mahesh Mahadev published a paper in Anveshana’s International Journal of Research in Engineering and Applied Sciences on “EFFICIENT ROUTING AND DATA FUSION IN IOT-WSNS FOR RESILIENT FOREST FIRE MONITORING” AIJREAS VOLUME 10, ISSUE 9 (2025, SEP) (ISSN-2455-6300) ONLINE

329. Mr.M.M.Zade Presented the Paper on “Touchless Fingerprint Recognition System” (Paper-ID 907) in International Conference on “Advanced Technologies for Societal Applications: Techno-Societal 2022 organized by Shri Vithal Education & Research Institute(SVERI), Pandharpur from 9th December 2022 to 10th December 2022.

330. Mr. Mahesh M Zade, “Performance analysis of PSNR Vs. Impulse Noise for the enhancement of Image using SMF”, Journal of Applied Science & Computations (JASC UGC Approved), Volume VI, Issue II, Feb.2019

331. Mr. Mahesh M Zade, “Classification of Power Quality Disturbances Using SVM & their Efficiency Comparison”, Journal of Applied Science & Computations (JASC UGC Approved), Volume VI, Issue II, Feb.2019

332. Mr. Mahesh M Zade, “Dynamic Clustering of Wireless Sensor Network Using



- Modified AODV”, Journal of Applied Science & Computations (JASC UGC Approved), Volume VI, Issue II, Feb.2019
333. Mr. Mahesh M Zade, “Performance analysis of PSNR Vs. Impulse Noise for the enhancement of Image using SMF”, National Conference on Mathematical Modeling and Computational Intelligence 2K19 (MMCI-2k19), in association with JASC, at S. B. Patil College of Engineering, Indapur, Feb.2019
 334. Mr. Mahesh M Zade, “Classification of Power Quality Disturbances Using SVM & their Efficiency Comparison”, National Conference on Mathematical Modeling and Computational Intelligence 2K19 (MMCI-2k19), in association with JASC, at S. B. Patil College of Engineering, Indapur Feb.2019
 335. Mr. Mahesh M Zade, “Dynamic Clustering of Wireless Sensor Network Using Modified AODV”, National Conference on Mathematical Modeling and Computational Intelligence 2K19 (MMCI-2k19), in association with JASC, at S. B. Patil College of Engineering, Indapur Feb.2019
 336. Mr.Mahesh M Zade & Dr.S.M.Mukane,"Enhancement of Image with the help of Switching Median Filter", International Journal of Computer Application (IJCA) SVERI's College of Engineering, Pandharpur, Dec.2013.
 337. Ghadage, A., Gholave, C., Devkar, A., & Naiknavare, M. V. (2025). Email spam detection with machine learning. *International Journal of Advanced Research in Science, Communication and Technology*.
 338. Naiknavare, M. V. (2024). Innovative approaches in greenhouse technology: A critical analysis of spectral data for enhanced plant growth monitoring. *International Journal of Creative Research Thoughts*, 12(5).
 339. Rao, P. V. K. J., Madhava, M., Sreedevi, P., Kiranmayi, K., & Lakshmi, M. B. (2023). Optimisation of process parameters for centrifugal clarification of sugarcane juice for quality jaggery. *Journal of Agricultural Engineering (India)*, 60(3), 261–271.
 340. Ghadage, A., Gholave, C., Devkar, A., & Naiknavare, M. V. (n.d.). Smart poultry farming with ESP8266: A comprehensive review of monitoring and automation approaches.
 341. Khedekar, S., Jadhav, R., Pawar, S., & Naiknavare, M. V. (n.d.). Simplifying travel planning with AI-powered chatbot assistance.
 342. Advancements in Real-Time Crack Detection Techniques for Structural Health Monitoring International Journal of Advanced Research in Science, Communication and Technology, International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal, Volume 5, Issue 4, October 2025
 343. Intelligent Monitoring of Civil Infrastructure Health Tushar Ghadage, Amit Pandhare, Aaditya Metkari, Prof. V. B. Utpat International Journal of Advanced Research in



Science, Communication and Technology International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal Volume 5, Issue 4, October 2025

344. A Comprehensive Review on IoT-Based Smart Energy Meter with Real-Time Monitoring and Automated Billing System Shubham Tathe¹, Abhishek Savalgi², Amit Thombare³, Ganesh Sarak⁴, Ms. V. B. Utpat⁵, Dr. S. V. Pingale⁶ International Journal of Advanced Research in Science, Communication and Technology International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal Volume 5, Issue 4, October 2025
345. Digital Timetable Automation System Anurag Pawar¹, Prathamesh Aradhye², Akash katte³, Prof. Utpat V. B. International Journal of Advanced Research in Science, Communication and Technology International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
346. Automatic Waste Segregation Mayank Kulkarni¹, Sudesh Godase², Digvijay Khilare³, Prof. V. B. Utpat Advanced Research in Science, Communication and Technology International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal