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Smart Agriculture System Using IoT with Help of AI-Techniques

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ABSTRACT: Agriculture is one of the most important sectors that supports the economy and food supply of many countries. However, traditional farming methods mainly depend on manual observation and experience. Due to unpredictable climate changes, improper irrigation, soil degradation, and plant diseases, farmers often face crop loss and low productivity. To overcome these problems, modern technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI) are introduced in agriculture.This project presents a Smart Agriculture System using IoT with the help of AI techniques. The system uses IoT sensors to continuously monitor soil moisture, temperature, and humidity in real time. The collected data is transmitted to a cloud server for storage and processing. AI algorithms analayze soil conditions and seasonal factors to recommend suitable crops. An AI-based image processing model detects plant diseases from crop images and suggests proper fertilizers and pesticides. A mobile application provides farmers with real-time data, crop recommendations, disease alerts, and government scheme information. The proposed system improves productivity, reduces manual effort, and supports sustainable farming.

KEYWORDS: Internet of Things (IoT), Artificial Intelligence (AI), Smart Farming, Digital Agriculture, Precision Agriculture, Agricultural Automation, Wireless Sensor Networks, Soil Health Monitoring, Environmental Monitoring, Real-Time Data Monitoring, Crop Yield Prediction, Intelligent Irrigation System, Plant Disease Classification, Convolutional Neural Network (CNN), Image-Based Disease Detection, Agricultural Data Analytics, Cloud-Based Agriculture System, IoT-Based Monitoring System, Decision Support System, Sustainable Farming Technology.

I. INTRODUCTION

Agriculture plays a major role in the development of rural and urban economies. Farmers face many challenges such as water scarcity, unpredictable rainfall, pest attacks, and lack of proper guidance. Traditional farming methods depend on physical inspection of crops and soil, which may not always provide accurate results.With the advancement of technology, smart farming solutions are becoming popular. IoT technology allows sensors to collect real-time data from agricultural fields. AI technology helps in analyzing this data and making intelligent decisions. By combining IoT and

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AI, farming becomes more efficient, automated, and data-driven.The main objective of this project is to design a smart agriculture system that monitors soil health, detects plant diseases, recommends suitable crops, and provides all information through a mobile application.

II. LITERATURE SURVEY

In 2019, Patil et al. focused on using IoT sensors to monitor soil parameters such as moisture and temperature. This work helped farmers observe field conditions remotely, but it lacked intelligence for crop selection or disease management.

In 2020, Sharma et al. improved the system by integrating cloud computing with IoT. Real-time data storage and remote access were achieved; however, the system did not support AI-based analysis or crop disease detection.

By 2021, Kumar et al. introduced AI-based image processing for plant disease identification. This marked a shift toward intelligent farming. Although disease detection accuracy improved, the system was not connected with soil sensor data, limiting holistic farm management.

In 2022, Reddy et al. combined IoT and AI to recommend crops based on soil conditions. This work addressed decision-making but lacked a user-friendly mobile application and real-time advisory features.

In 2023, Singh et al. developed a mobile-based AI advisory system for disease identification and farmer guidance. While accessibility improved, the system did not include IoT-based soil monitoring, field analytics, or government scheme integration.

Many researchers have worked on improving agriculture using modern technologies like IoT and Artificial Intelligence. Some systems use IoT sensors to measure soil moisture, temperature, and humidity. These systems help farmers monitor their fields and control irrigation. But most of these systems only show data and do not give smart suggestions.

Some research works use cloud technology to store sensor data. Farmers can see the data using mobile or web applications. This makes monitoring easy, but these systems do not always provide proper analysis or recommendations.

Other researchers focused on Artificial Intelligence for plant disease detection. They use image processing and machine learning models to detect diseases from leaf images. These systems can identify diseases with good accuracy. However, they usually work separately and are not connected with real-time soil monitoring systems.

There are also crop recommendation systems that suggest suitable crops based on soil and weather conditions. But in many cases, the data is entered manually instead of using real-time sensors.

From the existing studies, it is clear that most systems focus on only one feature like monitoring or disease detection. Very few systems combine IoT monitoring, AI disease detection, and crop recommendation in one single platform.

Therefore, our proposed system integrates IoT and AI together to provide a complete smart agriculture solution with real-time monitoring, disease detection, crop recommendation, and a mobile application for farmers.

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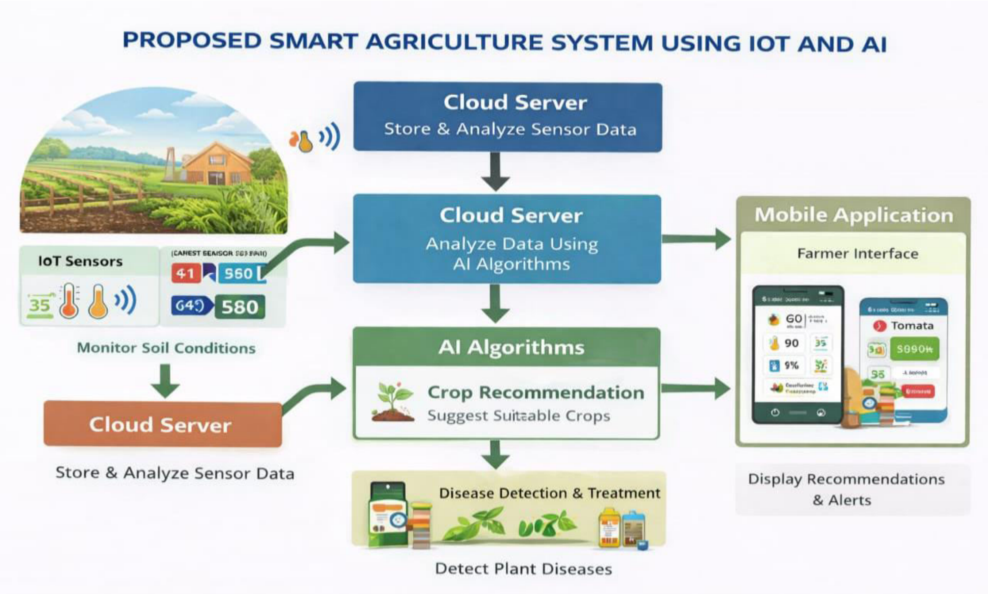
III. PROPOSED SYSTEM



The proposed system integrates hardware and software technologies to provide intelligent farming support. IoT sensors are installed in the agricultural field to monitor soil conditions continuously. The sensor data is sent to the cloud using wireless communication modules. AI algorithms analyze the data and provide crop recommendations based on soil health and seasonal conditions. An AI-based image processing model is used to detect plant diseases from captured images. The system also provides treatment suggestions such as fertilizers and pesticides. A mobile application acts as the interface between the system and farmers. All data, recommendations, and alerts are displayed in the app.

IV. SYSTEM ARCHITECTURE

The system architecture consists of multiple layers. The IoT sensor layer collects environmental data from the field. The microcontroller processes the sensor readings and sends them to the cloud through the communication module. The cloud layer stores the data and allows remote access. The AI layer analyzes soil parameters and crop images. The analytics layer generates reports and predictions. The mobile application layer displays the final results to farmers.

Explanation:

The Smart Agriculture System using IoT and AI helps farmers take better care of their crops. In this system, sensors are placed in the field to check soil moisture, temperature, and humidity. These sensors send the data to a microcontroller, which collects all the information. Then, using Wi-Fi or GSM, the data is sent to the cloud through the internet.In the cloud, the data is stored and analyzed. The AI system studies the data and gives useful suggestions like which crop is suitable and whether there is any plant disease. After that, reports and results are shown in a mobile app. The farmer can check the app to see farm conditions and take action like watering the plants. This system saves time, water, and money, and helps increase crop production.

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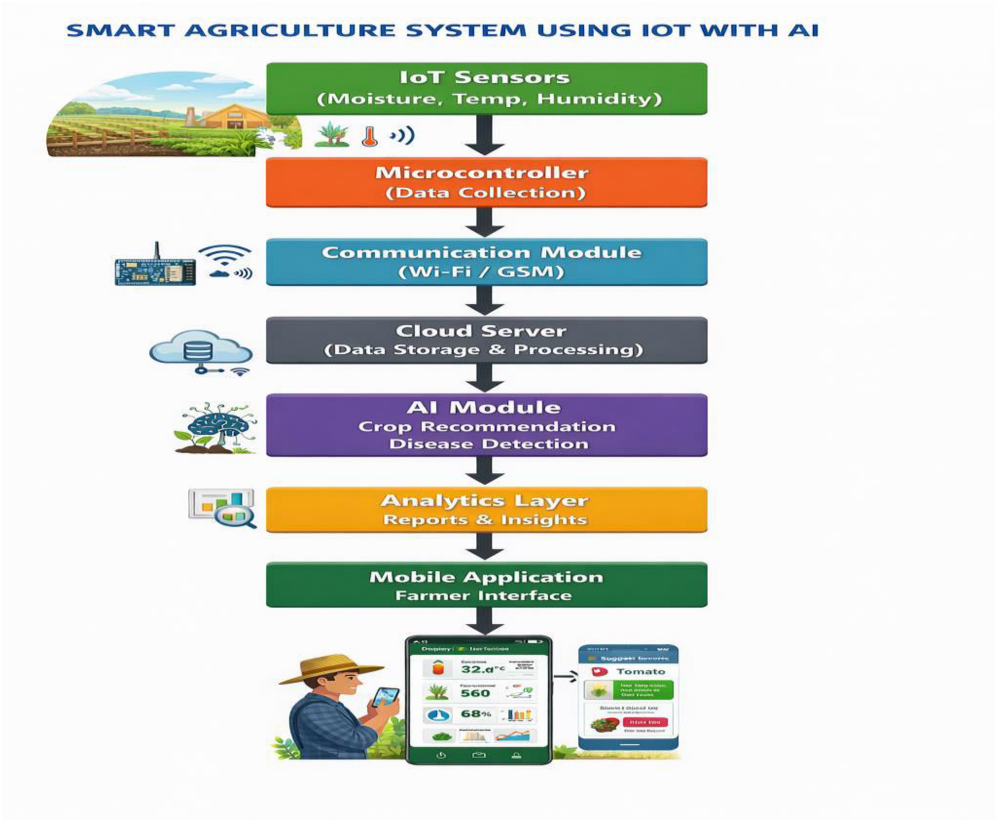

V. METHODOLOGY

The research methodology follows a structured process. First, the agricultural problems were identified. Then, IoT sensors were selected and deployed in the field. Data collection was performed continuously using sensors connected to a microcontroller. The collected data was transmitted to a cloud server for storage.Machine learning algorithms were developed for crop recommendation. Deep learning models were trained using plant disease image datasets. The AI models were integrated with the cloud platform. A mobile application was developed to provide a user-friendly interface. Finally, the system was tested under different agricultural conditions to evaluate performance.

VI. IMPLEMENTATION

The hardware implementation includes soil moisture sensors, DHT temperature-humidity sensors, a microcontroller such as Arduino or ESP8266, and Wi-Fi/GSM modules. The sensors are connected to the microcontroller, which collects analog and digital data.The software implementation includes cloud storage using platforms such as Firebase or AWS. Machine learning models are developed using Python and trained using agricultural datasets. Deep learning models such as Convolutional Neural Networks (CNN) are used for disease classification.

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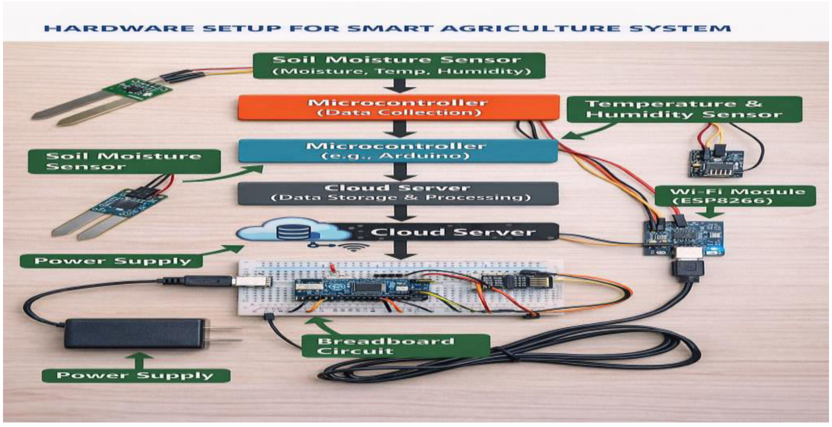
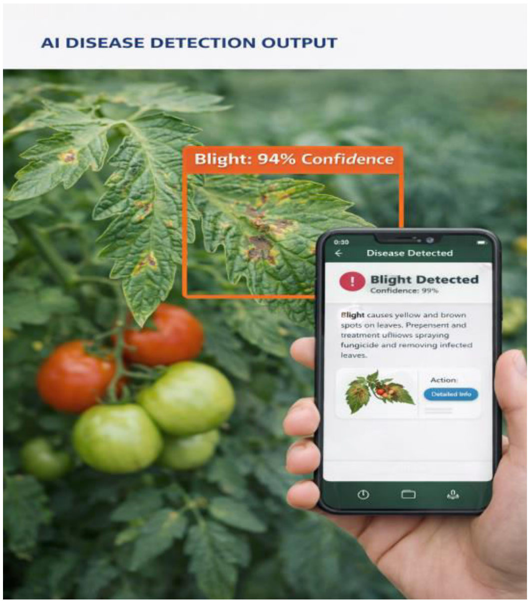
1. HARDWARE SETUP:



Explanation:
The hardware setup of the Smart Agriculture System consists of different electronic components connected together to monitor farm conditions. First, soil moisture sensors are placed in the soil to measure the water level present in the land. These sensors help in understanding whether the soil is dry or wet. A temperature and humidity sensor is also used to measure the surrounding temperature and air moisture. All these sensors are connected to a microcontroller, such as Arduino, which acts as the main control unit of the system. The microcontroller collects data from all sensors and processes it.

The entire circuit is arranged on a breadboard, which helps in connecting components easily without soldering. A power supply is given to the microcontroller and sensors so that the system can work continuously. To send the collected data to the internet, a Wi-Fi module like ESP8266 is connected to the microcontroller. This module transmits the sensor data to the cloud server. The cloud server stores and processes the information for further analysis. In this way, the hardware setup collects real-time farm data and sends it to the online system, which later helps farmers monitor their crops through a mobile application. This setup makes farming smarter, reduces manual effort, and ensures proper irrigation and crop management.

2. AI DISEASE DETECTION OUTPUT:



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Explanation:
This image shows the AI disease detection output in the Smart Agriculture System. The farmer takes a picture of the plant leaf using a mobile application. The AI system analyzes the image and detects whether the plant has any disease. In this example, the system identifies "Blight" disease with high confidence (around 94–99%). The app displays the disease name, confidence level, and also gives information about the symptoms, such as yellow and brown spots on the leaves. It also suggests possible treatments like spraying fungicide and removing infected leaves. This helps the farmer quickly understand the problem and take the correct action to protect the crops and increase yield.

3. MOBILE APP SCREENSHOT:

Explanation:
The Smart Agriculture System mobile app helps farmers easily monitor their farm conditions in real time. The app shows important soil data such as temperature, moisture level, and humidity. Based on this data, the system provides crop suggestions, like recommending tomato as a suitable crop. The app also gives plant disease alerts if any problem is detected. For example, it shows "Blight Detected" and informs the farmer that action is required. The farmer can click on detailed information to know about the disease and treatment methods. This mobile application makes farming smarter and easier by giving all important information in one place.

VII. RESULTS AND DISCUSSION

The IoT sensors successfully monitored soil conditions in real time. The collected data was transmitted accurately to the cloud without delay. The AI-based crop recommendation system provided suitable crop suggestions based on soil parameters. The disease detection model achieved high accuracy in identifying plant diseases from images.The mobile application displayed all outputs clearly and allowed farmers to make quick decisions. The integrated system reduced manual inspection and improved resource management.

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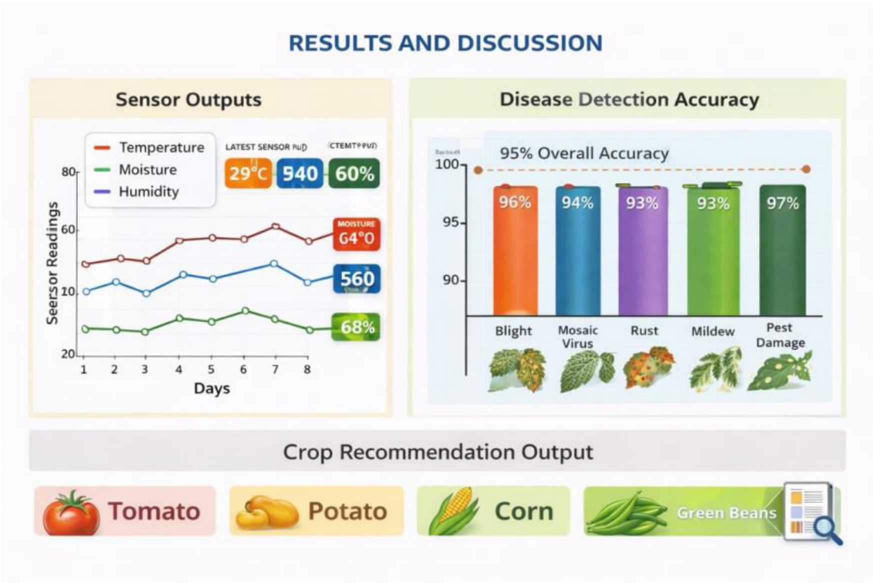
RESULT GRAPH OR SCREENSHOT



Explanation:
The Results and Discussion section shows the performance of the Smart Agriculture System. The sensor output graph displays temperature, moisture, and humidity readings collected over several days. These readings help in understanding the environmental conditions of the farm. The disease detection accuracy chart shows that the AI model performs very well, with an overall accuracy of about 95%. It can detect different plant diseases like blight, mosaic virus, rust, mildew, and pest damage with high accuracy (around 93%–97%). This proves that the AI system is reliable and effective. The crop recommendation output suggests suitable crops such as tomato, potato, corn, and green beans based on the analyzed soil and weather conditions. Overall, the results show that the system works efficiently in monitoring crops, detecting diseases, and recommending suitable crops to improve productivity.

VIII. CONCLUSION

The Smart Agriculture System using IoT with AI techniques successfully integrates real-time monitoring, intelligent analysis, and mobile accessibility. The system helps farmers select suitable crops, detect diseases early, and optimize water and fertilizer usage. The experimental results prove that the system improves agricultural productivity and supports sustainable farming practices.This paper presented a Smart Agriculture System using IoT with the help of AI Techniques to address the limitations of traditional farming practices. The proposed system successfully integrates IoT sensors, AI-based image processing, cloud computing, analytics, and a mobile application to provide real-time monitoring and intelligent decision support for farmers.IoT sensors effectively monitored soil parameters such as moisture, temperature, and humidity, enabling better understanding of field conditions. AI techniques were used to recommend suitable crops based on soil health and seasonal conditions and to accurately detect crop diseases from images, allowing early intervention. The mobile application provided a user-friendly platform to display sensor data, disease alerts, crop recommendations, treatment products, government schemes, and field analytics.The experimental results demonstrated that the proposed system reduces manual effort, improves crop management, optimizes resource usage, and minimizes crop losses. Overall, the system enhances agricultural productivity and promotes sustainable and data-driven farming practices, making it suitable for real-world agricultural applications.

IX. FUTURE ENHANCEMENT

In the future, advanced deep learning models can improve disease detection accuracy. Weather forecasting APIs can be integrated to improve irrigation scheduling. Automated irrigation systems can be added for real-time water control. Drone-based monitoring can help in large-scale farms. Market price prediction systems and blockchain-based supply chain tracking can also be included.

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REFERENCES

1. Hu, C., Deng, Y., Min, G., Huang, P., & Qin, X. (2018). QoS promotion in energy-efficient datacenters through peak load scheduling. IEEE Transactions on Cloud Computing, 9(2), 777-792.
2. Varshini, M., Chandrapathi, M., Manirekha, G., Balaraju, M., Afraz, M., Sarvanan, M., & Dharnasi, P. (2026). ATM access using card scanner and face recognition with AIML. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 113–118.
3. Bhagyasri, Y., Bhargavi, P., Akshaya, T., Pavansai, S., Dharnasi, P., & Jitendra, A. (2026). IoT based security & smart home intrusion prevention system. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 457–462.
4. Roy, S., & Saravana Kumar, S. (2021). Feature Construction Through Inductive Transfer Learning in Computer Vision. In Cybernetics, Cognition and Machine Learning Applications: Proceedings of ICCCMLA 2020 (pp. 95–107). Springer.
5. Keerthana, L. M., Mounika, G., Abhinaya, K., Zakeer, M., Chowdary, K. M., Bhagyaraj, K., & Prasad, D. (2026). Floods and landslide prediction using machine learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 125–129.
6. Ananth, S., & Saranya, A. (2016, January). Reliability enhancement for cloud services-a survey. In 2016 International Conference on Computer Communication and Informatics (ICCCI) (pp. 1-7). IEEE.
7. Chandu, S., Goutham, T., Badrinath, P., Prashanth Reddy, V., Yadav, D. B., & Dharnas, P. (2026). Biometric authentication using IoT devices powered by deep learning and encrypted verification. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 87–92.
8. Poornima, G., & Anand, L. (2024, April). Effective strategies and techniques used for pulmonary carcinoma survival analysis. In 2024 1st International Conference on Trends in Engineering Systems and Technologies (ICTEST) (pp. 1-6). IEEE.
9. Singh, K., Amrutha Varshini, G., Karthikeya, M., Manideep, G., Sarvanan, M., & Dharnasi, P. (2026). Automatic brand logo detection using deep learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(1), 126–130.
10. Gopinathan, V. R. (2025). Designing Cloud-Native Enterprise Systems by Modernizing Applications with Microservices and Kubernetes Platforms. International Journal of Research and Applied Innovations, 8(5), 13052-13063.
11. Nandhini, T., Babu, M. R., Natarajan, B., Subramaniam, K., & Prasanna, D. (2024). A NOVEL HYBRID ALGORITHM COMBINING NEURAL NETWORKS AND GENETIC PROGRAMMING FOR CLOUD RESOURCE MANAGEMENT. Frontiers in Health Informatics, 13(8).
12. Tirupalli, S. R., Munduri, S. K., Sangaraju, V., Yeruva, S. D., Saravanan, M., & Dharnasi, P. (2026). Blockchain integration with cloud storage for secure and transparent file management. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 79–86.
13. Devarajan, R., Prabakaran, N., Vinod Kumar, D., Umasankar, P., Venkatesh, R., & Shyamalagowri, M. (2023, August). IoT Based Under Ground Cable Fault Detection with Cloud Storage. In 2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS) (pp. 1580-1583). IEEE.
14. Rupika, M., Nandini, G., Mythri, M., Vasu, K., Abhiram, M., Shivalingam, N., & Dharnasi, P. (2026). Electronic gadget addiction prediction using machine learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 500–505.
15. Chinthamalla, N., Anumula, G., Banja, N., Chelluboina, L., Dangeti, S., Jitendra, A., & Saravanan, M. (2026). IoT-based vehicle tracking with accident alert system. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 486–494.
16. Akshaya, N., Balaji, Y., Chennarao, J., Sathwik, P., & Dharnasi, P. (2026). Diabetic retinopathy diagnosis with deep learning. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(2), 506–512.
17. Dadigari, M., Appikatla, S., Gandhala, Y., Bollu, S., Macha, K., & Saravanan, M. (2026). Bitcoin price prediction with ML through blockchain technology. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 130–136.
18. Amitha, K., Ram Manohar Reddy, M., Yashwanth, K., Shylaja, K., Rahul Reddy, M., Srinu, B., & Dharnasi, P. (2026). AI empowered security monitoring system with the help of deployed ML models. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 69–73.

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19. Nagarajan, C., Neelakrishnan, G., Janani, R., Maithili, S., & Ramya, G. (2022). Investigation on Fault Analysis for Power Transformers Using Adaptive Differential Relay. Asian Journal of Electrical Sciences, 11(1), 1-8.
20. Feroz, A., Pranay, D., Srikar Sai Raj, B., Harsha Vardhan, C., Rohith Raja, B., Nirmala, B., & Dharnasi, P. (2026). Blockchain and machine learning combined secured voting system. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 119–124.
21. Chinthala, S., Erla, P. K., Dongari, A., Bantu, A., Chityala, S. G., & Saravanan, M. S. (2026). Food recognition and calorie estimation using machine learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(2), 480–488.
22. Gogada, S., Gopichand, K., Reddy, K. C., Keerthana, G., Nithish Kumar, M., Shivalingam, N., & Dharnasi, P. (2026). Cloud computing/deep learning customer churn prediction for SaaS platforms. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 74–78.
23. Vishwarup, S. et al., "Automatic Person Count Indication System using IoT in a Hotel Infrastructure," 2020 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, 2020, pp. 1-4, doi: 10.1109/ICCCI48352.2020.9104195
24. Chanamalla, B., Murali, V. N., Suresh, B., Deepak, M. S., Zakriya, M., Yadav, D. B., & Saravanan, M. (2026). AI-driven multi-agent shopping system through e-commerce system. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 463–470.
25. Prasad, E. D., Sahithi, B., Jyoshnavi, C., Swathi, D., Arun Kumar, T., Dharnasi, P., & Saravanan, M. (2026). A technology driven – solution for food and hunger management. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 440–448.
26. Anitha, K., Vijayakumar, R., Jeslin, J. G., Elangovan, K., Jagadeeswaran, M., & Srinivasan, C. (2024, March). Marine Propulsion Health Monitoring: Integrating Neural Networks and IoT Sensor Fusion in Predictive Maintenance. In 2024 2nd International Conference on Device Intelligence, Computing and Communication Technologies (DICCT) (pp. 1-6). IEEE.
27. Thotla, S. B., Vyshnavi, S., Anusha, P., Vinisha, R., Mahesh, S., Yadav, D. B., & Dharnasi, P. (2026). Traffic congestion prediction using real time data by using deep learning techniques. , 8(2), 489–494.
28. Rakesh, V., Vinay Kumar, M., Bharath Patel, P., Varun Raj, B., Saravanan, M., & Dharnasi, P. (2026). IoT-based gas leakage detector with SMS alert. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(2), 449–456.
29. Vimal Raja, G. (2025). Context-Aware Demand Forecasting in Grocery Retail Using Generative AI: A Multivariate Approach Incorporating Weather, Local Events, and Consumer Behaviour. International Journal of Innovative Research in Science Engineering and Technology (Ijirset), 14(1), 743-746.
30. Akula, A., Budha, G., Bingi, G., Chanda, U., Borra, A. R., Yadav, D. B., & Saravanan, M. (2026). Emotion recognition from facial expressions using CNNs. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(1), 120–125.
31. Chinthala, S., Erla, P. K., Dongari, A., Bantu, A., Chityala, S. G., & Saravanan, M. S. (2026). Food recognition and calorie estimation using machine learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(2), 480–488.