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Smart Cultivation using IOT and ML for Carnation flowers: A SURVEY

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ABSTRACT

Agriculture is the most important sector of Indian Economy. Indian agriculture sector accounts for 18 percent of India's GDP and provides employment to 50% of the country's workforce. But latest studies have shown a steady decline in the contribution made by agriculture to the Indian economy although it is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. This project explores the integration of Internet of Things (IoT) and Artificial Intelligence (AI) with a focus on Machine Learning (ML) to implement smart cultivation practices for Carnation Flowers. Through the deployment of sensor networks and IoT devices, real-time data on environmental conditions, soil moisture, and plant health are collected. The collected data is then processed using advanced AI and ML algorithms to provide predictive analytics, enabling precision cultivation strategies and proactive disease management. The synergy of IoT and AIML in Carnation Flower cultivation offers an intelligent and automated framework that enhances yield quality, optimizes resource utilization, and promotes sustainable and efficient farming practices.

I. INTRODUCTION

Agricultural practices have undergone a transformative shift with the advent of cutting-edge technologies like the Internet of Things (IoT) and Artificial Intelligence/Machine Learning (AI/ML). The amalgamation of these technologies has spurred the development of smart agricultural systems capable of revolutionizing cultivation methodologies.

A system is developed that can suggest crops based on weather, soil characteristics, crop requirements, and climatic circumstances from the open weather API.

In this context, this research endeavours to design, implement, and evaluate a tailored smart agriculture system dedicated to optimizing the cultivation of carnation flowers. Carnation cultivation, renowned for its ornamental value and economic significance, presents unique challenges concerning environmental monitoring and pest management.

The proposed system addresses these challenges by leveraging IoT-enabled sensors for comprehensive environmental monitoring. Key parameters such as temperature, soil moisture content, and humidity levels are continuously monitored in real-time, providing farmers with crucial insights into the plant's immediate surroundings.

Moreover, the integration of AI/ML techniques augments the system's functionality by enabling automated bug detection using image processing algorithms. This innovative approach facilitates early detection of pests and diseases, empowering farmers to adopt proactive measures, thereby minimizing crop losses and ensuring optimal plant health.

The study discusses why some machine learning models are more suitable for usage in agriculture than others , discusses the implementation of several machine learning algorithms in sensor data analytics within the agricultural ecosystem, and is thoroughly reviewed in this study.

The significance of this research lies in its potential to empower small-scale carnation farmers with affordable and accessible technological solutions. By harnessing the capabilities of IoT and AI/ML, the system not only simplifies monitoring complexities but also equips farmers with predictive analytics, enabling informed decision-making for irrigation, ventilation, and pest control.

Through this study, we aim to demonstrate the feasibility, efficacy, and practicality of implementing such an integrated smart agriculture system tailored explicitly for carnation cultivation. The subsequent sections delve deeper into the system architecture, methodologies employed, experimental setup, results obtained, and implications for the agricultural sector.

II. LITERATURE SURVEY

The literature review explores a comprehensive range of scholarly works, research papers, and technological developments that highlight the application of IoT and AIML in smart agriculture. This section delves into the evolution of IoT in agricultural settings, examining its role in monitoring environmental factors crucial for carnation growth.

This review critically assesses existing studies, identifying gaps, opportunities, and best practices in employing IoT and AIML technologies within the domain of smart carnation cultivation, setting the stage for the research's innovative contributions and advancements.

Furthermore, it scrutinizes the implementation of AIML algorithms for predictive analysis, disease detection, and precision farming, elucidating their contributions to the cultivation of high-quality carnation flowers. The integration of cutting-edge technologies such as the Internet of Things (IoT) and Artificial Intelligence and Machine Learning (AIML) has revolutionized various sectors, including agriculture.

In the context of cultivating carnation flowers, leveraging these advancements holds immense potential for optimizing cultivation practices, enhancing yield, and ensuring resource efficiency. Additionally, the review synthesizes research that showcases the role of AIML algorithms in the context of carnation farming.

This includes investigations into AI-driven predictive models that forecast blooming periods, disease outbreaks, and optimal resource management strategies. Exploring AI applications in disease detection, classification, and mitigation strategies within the context of carnation flowers is fundamental to establishing a robust system that safeguards crop health and minimizes losses.

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The below list outlines survey of papers related to the topic in brief:

SI No.	Title	Authors	Year	Components and Methodology	Advantages	Disadvantages	Conclusion
1	**Smart Agriculture Robotic System Based on Internet of Things to Boost Crop Production**	Mehedi Hasan, Kamrul Nazir Walli Uddin, Ahosan Sayeed and Tasnuva Tasneem	2021	Soil moisture sensor, Humidity and Temperature sensors, DHT22 sensor connection with IoT with a LCD Display. The obtained data from DHT22 and Soil Moisture sensor are stored in the Blynk Cloud platform.	This system is useful to monitor the parameters which are important for agriculture such as temperature, humidity, moisture.	Our project is not directly used in agricultural fields. It is intended to use this in real life application.	The use of smart agriculture practices can enrich the crops production. In this work, a completely unique IoT based smart robotic system is developed using which more output can be generated from identical amount of input.The application of this system in the field can help to improve the harvesting and global production.
2	**Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk**	MUHAMMAD AYAZ , MOHAMMAD AMMAD-UDDIN , ZUBAIR SHARIF , ALI MANSOUR , AND EL-HADI M. AGGOUNE	2019			s power issue as due to its nature; smart farming requires wide use of energy. long term sensor deployment, use of GPS	Every inch of farmland is vital to maximize crop production. However, to deal with every inch accordingly, the use of sustainable IoT-based sensors and communication

		.				repeatedly and transmission of sensed data via GPRS.	technologies is not optional—it is necessary.
3	**IoT and Wireless Sensor Network based Autonomous Farming Robot**	Arsalan Khan Mudassar, Bashir , Sumair Aziz, aMuhammad Umar Khan	2020	Computer vision-based, pixel-wise **CNN (Convolutional Neural Network)** segmentation classifier for crop. This vision algorithm is implemented on Raspberry Pi 3 based single board computer having Broadcom BCM2837 system incorporated on chip [17]. It includes a quad-core processor having 64-bit ARM cortex A53 chip, 1.2 GHz frequency. Also, it includes video core four GPU and contain 1GB LPDDR2-900 SDRAM. Secondly, Arduino Mega 2560 is used for acquiring data from sensors mounted on both robots.	The average accuracy of the system is about 93%. To make the robot autonomous, we used Ultrasonic sensors.	One of the significant applications of the autonomous robot is agricultural monitoring or work in an environment where a human cannot work. It can move quickly in the field without any human intervention and monitor the environmental parameters with the help of sensors mounted on it.	By introducing mobility in some or all nodes in the wireless sensor network, we decreased the number of nodes and thus reducing the cost of the overall system.
4	**IoT Based Agriculture Using AGRIBOT**	Santhosh Kumar S, Anusha M, Mohammed junaid, Anju KC, Meghana.	2019	A GSM SIM300 is used to give the farmer the information on the humidity and temperature. The temperature sensor used is LM35 and the humidity sensor is DST11. LCD-16x2 display is used for displaying the current operation.	This machine has exceptionally less expense. This grower is easy to utilize henceforth, untalented rancher is likewise ready to deal with this machine.	The current approaches are challenging. The tools used here are problematic and troublesome has it requires more man power. Hence, there is a necessity to advance the equipment which will decrease the efforts of the agriculturalists.	The robotic arm helps in unwanted plant elimination. The heart of the proposed system is microcontroller which controls the entire operation. The prototype model has been implemented so that it can be scaled up for development of the larger systems.
5	**Robotics, IoT, and AI in the Automation of Agricultur**	Akshay Krishnan, Shashank Swarna, Balasubramanya H. S	2020	A **binocular stereo vision technique** is used to get 3D contrast images of crop clusters	The primary advantages is that the yield can be shielded from the vagaries of	Initial seed money to be invested is very high. As of now, drones have to	The way forward to achieve a guaranteed increase in food production, is towards implementation of

	al Industry: A Review			**& computer vision algorithms** developed to arrive at readiness of the crop for harvesting based on their colour, shape and location.	climate conditions, increased efficiency and reduced wastage of insecticides, increased efficiency and reduced wastage of insecticides.	frequently return to bases for recharging.	robotics, IoT and AI in the automation of agricultural industry.
6	**Smart Agriculture with AI Sensor by Using Agrobot**	Ms.B.Ragavi, Ms.L.Pavithra, Mrs.P.Sandhiya devi, Ms.G.K.Mohan apriya, Ms.S.Harikirub ha	2020	Optical Sensors – It is used to determine clay natural and moisture content material of the soil, Electrochemical Sensors - soil nutrient degree and PH, HTE MIX Sensors - for determining the moisture content and temperature in both soil and environmental aspect, Motion Detector Sensors- used round the field those sensors any uncommon moments that taking place around, ARM7 processor, LPC2148 IC	In our proposed paper at the side of smart farming gives more accuracy and provides better overall performance to advantage a greater expertise about agricultural improvement and to growth productiveness.		This smart agricultural IOT implementation can gives a better performance for producing a crop agricultural field and cloud based agriculture can gives a performance and it can be able analyze and store the data for future use.
7	**Design and Implementation of an IoT based Automated Agricultural Monitoring and Control System**	Md Shadman Tajwar Haque, Khaza Abdur Rouf , Zobair Ahmed Khan, Al Emran,Md. Saniat Rahman Zishan	2019	The Node MCU (Microcontroller Unit) SoC (System on Chip) development board used on the proposed system is a ESP8266 (Espressif Systems) microcontroller variant which is a cost effective Wi-Fi enabled microchip. The designed board is based on Arduino and be programmed using Arduino IDE.	With this proposed automated centralized system, not only controlling the farm can be made easy but also it can be utilized to reduce the need for manual labor. Thus, reducing the labor cost and increasing the overall profit of the farmer.		Agricultural technologies are being modernized and day by day farmers are opting newer technologies and methods to cultivate crops. Similarly, the project would help the farmers to monitor and control the entire farming process which would cause an overall increase in the yield of crop production.
8	Evaluation of carnation varieties under naturally	Ajay Kumar Singh*, D. K. Singh, Balraj Singh, Shailja Punetha and Deepak Rai	2013	Three subsystems are combined into one primary system. Examines	This would support preserving the crop's soil fertility until it had been		This technology could be used by farmers as an effective decision-making tool to help them reduce

	ventilated greenhouse in mid hills of Kumaon Himalaya			numerous soil and meteorological conditions in a specific place and recommends a crop that would do well there. Based on the plant's requirements for moisture, the system then determines if it is necessary to water the plant. the accuracy of 5 distinct models has been compared. **From the findings, KNN fits the dataset used; therefore, the KNN machine learning algorithm is implemented in the crop recommendation system.**	harvested. This demonstrates how different crops are best adapted to grow under various atmospheric conditions.		manual labor, conserve energy, and increase output. For the future scope of this work, a disease prediction system can be added to the suggested system to predict crop diseases based on image classification.

III. EXISTING SOLUTION

The lack of favorable atmospheric conditions leads to the loss of many crops each year. In India alone, over 11 billion dollars are lost. By combining IoT and machine learning technologies, we has created a system that integrates agriculture. We have proposed a system that will help farmers reduce physical labor, use less energy, and increase productivity will be developed. With the help of a Machine learning algorithm, a system will be developed that can select crops, irrigate them autonomously, and recommend fertilizers. Technology, especially CNNs, is significantly advancing smart cultivation of carnations.

IV. PROPOSED SOLUTION

The humidity, PH, and temperature values are requested from the cloud and been displayed in the API.

The soil moisture content will be examined using a moisture sensor, and the weather will be checked using a cloud platform open weather API. The amount of water being poured into the soil will be calculated using flow sensors.

If the moisture is less than a value which is appropriate for the crop to grow, It notifies the farmer to water the plant through his most used apps like Whatsapp or Telegram. This information is tracked by the IOT sensors and been sent to the Machine Learning Model. The accuracy of 5 distinct models has been compared. From the findings, CNN fits the dataset used; therefore, the CNN machine learning algorithm is implemented in the crop recommendation system.

V. CONCLUSION

This research successfully developed and implemented a novel "Smart Agriculture for Carnation Flowers using IoT and AI/ML" system. The system comprised a network of sensor nodes monitoring environmental and plant growth parameters, an IoT gateway for data transmission, a cloud platform for storage and analysis, and AI/ML models for intelligent decision-making.

The proposed methodology proved effective in achieving the project's objectives. By leveraging the chosen sensors, including temperature, humidity, soil moisture, light intensity, pH, and electrical conductivity sensors, the system gathered comprehensive data on the carnation growth environment. Utilizing various deep learning algorithms like CNNs, regression models, and anomaly detection algorithms, the AI/ML models processed the data to provide actionable insights for optimizing irrigation, fertilization, climate control, and pest/disease management.

VI. FUTURE WORKS

This Model can be further improved by adding an automated water sprinkler which waters the plants when it finds Soil Moisture less and automated Fertilizer Sprinkler which fertilizes the plant upon requirement analysis.

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