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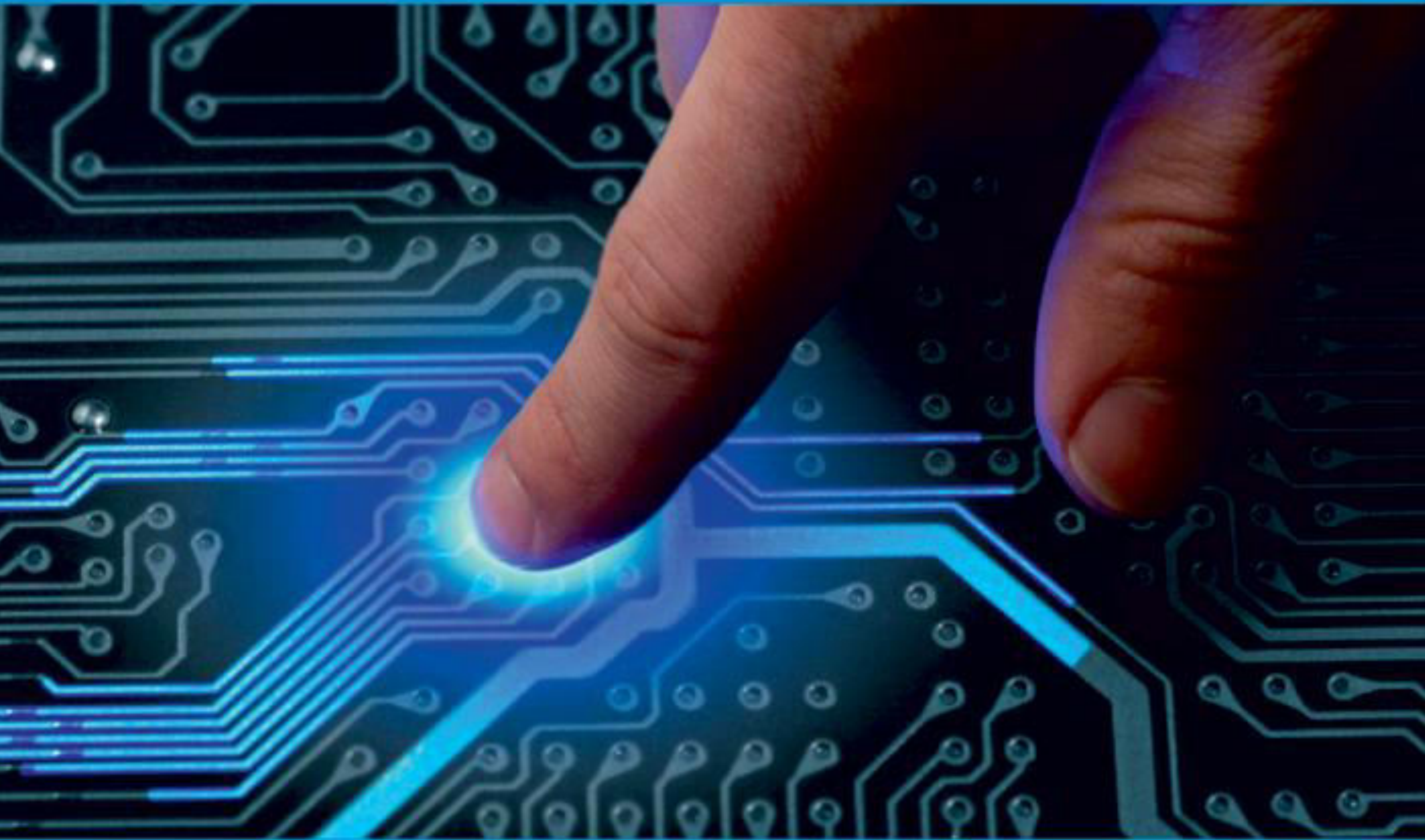

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A Study of IoT Based Gadgets to Update a Moderate Condition of Farmer

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ABSTRACT*:* This aimed to presents a smart farming by the help of AI and IOT. It focusses on two-phase project targeting precision agriculture. In the first phase, we employ innovative deep learning algorithms for accurate animal detection, showcasing a model's effectiveness through rigorous training and real-world evaluation. The second phase focuses on implementing an intelligent irrigation system, utilizing ambient temperature and humidity data to dynamically optimize irrigation schedules. The integrated approach aims to enhance early threat detection from animals and promote efficient water management, contributing to the advancement of sustainable and productive smart farming practices.

KEYWORDS*:* smart farming, Internet of Things (IoT), Artificial intelligence (AI).

I.INTRODUCTION

In the realm of precision agriculture, the integration of advanced technologies is crucial for optimizing productivity and resource management. This research focuses on leveraging deep learning techniques for precise animal detection and implementing an intelligent irrigation system in farming fields. The project aims to enhance early threat detection, promote resource-efficient practices, and contribute to the evolution of sustainable smart farming.

Traditional agricultural practices face challenges that demand innovative solutions. In this context, our research integrates innovative deep learning algorithms into precision agriculture, targeting efficient animal detection and intelligent irrigation. By automating these processes, we strive to overcome manual limitations, enhance productivity, and promote a more sustainable and technologically advanced approach to modern farming.

II.LITERATURE SURVEY

In response to the pressing need for effective and efficient garbage disposal methods in urban settings, our research endeavors to address the shortcomings of existing solutions. While numerous recommendations have been proposed and some implemented, their overall productivity remains questionable. This study specifically focuses on the outcomes of an Internet of Things (IoT)-based waste collection system. The integration of IoT technology aims to enhance the efficacy of waste management, providing a comprehensive and data-driven approach to address the challenges faced by contemporary urban environments.

A design for precision of agriculture which is proposed in the study [1]. Precision agriculture relies on the strategic use of sensors to address critical challenges in water management for optimal crop yield. This study focuses on calibrating and deploying WATERMARK sensors in a commercial vineyard, showcasing their ability to accurately assess soil moisture levels. By integrating this data with management zones, the research demonstrates a potential increase in final yield. The high accuracy ($R^2 = 0.85$) of WATERMARK sensors highlights their crucial role in facilitating precise and sustainable vineyard management within the realm of precision agriculture.

The proposed work [2] In the face of climate change challenges in India, our Auto Grow system integrates IoT and AI in a Controlled Environment Agriculture (CEA) setup. This innovative greenhouse solution optimizes resource use autonomously through an IoT-based data sensing subsystem. The prototype successfully captures

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vital parameters like temperature, moisture, humidity, pH, and primary nutrients for efficient irrigation and nutrient supply control. Successfully tested in a prototype lab system.

The proposed work in the paper [3] presents an IoT-based system for monitoring paddy growth, utilizing sensors to gather real-time data on temperature, humidity, soil moisture, and water levels. The information is transmitted wirelessly to a cloud platform, offering farmers insights to optimize crop output and reduce water usage. A cost-effective tool for precision agriculture, this system empowers farmers to enhance resource efficiency and minimize environmental impact.

The proposed work in the paper [4] As agriculture's economic impact remains crucial globally, the need for smart techniques to address growing food demands becomes inevitable. This project explores the application of deep learning methods, specifically CNNs and RNNs, in smart farming. Our analysis encompasses various farming parameters such as weather reports, plant irrigation, pest control, germination periods, and disease detection. Modular solutions are proposed for each aspect, offering insights into efficient and data-driven agricultural practices.

The proposed work in the paper [5] presents a thorough exploration of insect identification and classification, addressing the limitations of existing datasets with a novel and challenging insect image dataset. Comprising 1848 images spanning 118 classes, this dataset reflects a more realistic representation of pest diversity. Fine-tuning is performed on seven deep convolutional neural networks, including VGG16, ResNet50, DenseNet121, Res2Net50_26w_4s, SCNet50_vld, Ghost Net, and Regents. Results from extensive experiments on our dataset reveal that the last four state-of-the-art networks exhibit promising performance in pest identification and classification.

The proposed work in the paper [6] addresses the challenges in precision agriculture's computer vision, focusing on semantic segmentation from aerial agricultural images. Existing methods struggle with irregular shapes and small objects. To overcome this, we propose a deep learning framework that combines momentum contrast learning with a Point Rend-based model. Our experiments confirm the model's effectiveness in achieving improved semantic segmentation for aerial agricultural images.The proposed work in the paper [7] presents, precision agriculture is vital for countries with large populations, fertile land, and water resources. This paper introduces an IoT-based smart irrigation system, creating a management device for efficient water utilization. The device automatically manages irrigation time, addressing under- and over-irrigation issues, optimizing water consumption, distribution, and reserves. Leveraging open-source clouds, fusion centers, sinks, and field-deployed sensors, the system's performance is compared with existing methodologies. Experimental results demonstrate a 30% energy saving and improved network stability, making it adaptable for various irrigation models and advantageous for deployment in regions with limited network infrastructure.

The proposed work [8] This paper introduces a smart irrigation system utilizing the Internet of Things (IoT) through Arduino Mega 2560. The objectives include exploring the IoT-based smart irrigation concept, developing a system with Arduino Mega 2560 to autonomously water plants based on soil sensor data, and analyzing real-time soil conditions via a connected smartphone. The study focuses on farming crops and gardening, with noted limitations in scalability due to potential prohibitive costs for large areas. The implementation involves the Blynk application software, DHT11 sensor, and moisture level sensor. Experimental findings demonstrate the superiority of smart irrigation over normal irrigation, considering factors like sunlight, water pH, and windy conditions. The paper concludes that all three objectives have been successfully achieved based on the conducted experiments.

The proposed work in the paper [9] The smart irrigation system, an amalgamation of software, hardware, and firmware leveraging computational techniques like IoT, artificial intelligence, and machine learning, plays a crucial role in optimizing resource usage and enhancing crop yields. This article highlights recent advancements in smart irrigation systems within agriculture, covering components, modern irrigation techniques, comparison parameters, and system requirements. Additionally, it addresses existing challenges, issues, and outlines potential future research directions in the realm of smart irrigation systems

The proposed work in the paper [10] Agriculture, constituting a sizable portion of India's economy, faces challenges in efficiently managing scarce water resources. This paper addresses this concern by proposing a Smart Irrigation System (SIS) that combines Internet of Things (IoT) and machine learning algorithms for enhanced crop productivity. The SIS utilizes sensors to collect soil moisture, air temperature, and humidity data,

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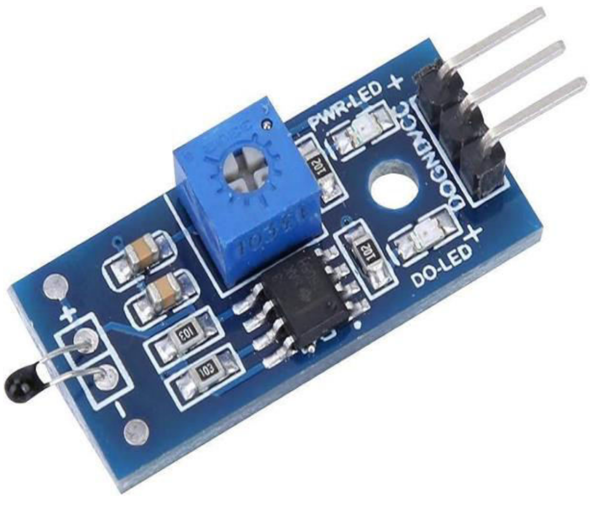
transmitted via Zigbee technology to a local base station, powered by Raspberry Pi. The second module involves machine learning techniques for decision-making, where a classification model predicts crop water requirements (ETcrop) based on the gathered parameters. Notably, the solar-powered sensor module enhances system robustness while minimizing power consumption. This integrated approach offers an ideal and precise smart irrigation solution, fostering automation and advancements in agricultural practices.

The proposed work in the paper [11] is a contemporary agricultural landscape, effective farm management is crucial, demanding meticulous attention to environmental and dietary factors. To address these needs, a smart system capable of remote operation and monitoring of animal farms is essential. This system should autonomously provide feed and water, manage biogas produced by animal waste, detect fires, and conduct surveillance across the entire farm. Achieving cost-effectiveness, this intelligent system employs microcontrollers, water level sensors, ultrasonic sensors, gas sensors, temperature and humidity sensors, and an IP Camera. Connectivity to the Internet or Intranet facilitates remote control via smart devices such as smartphones or computers. This paper presents the development of an IoT-based smart animal farm, incorporating the specified features to enhance efficiency and automation in agricultural practices.

The proposed work in the paper [12] in agricultural automation embraces technologies like Deep Neural Networks (DNN) and the Internet of Things (IoT), fostering the development of fine-grained controlling, monitoring, and tracking applications. In this dynamic landscape, managing ecosystem relationships, especially with wildlife, becomes increasingly pivotal. Traditional methods employed by farmers, ranging from scarecrows to chemical repellents have shown drawbacks such as environmental pollution, prohibitive costs, unreliability, and inefficacy. To address these challenges, we propose a system integrating AI Computer Vision through Deep Convolutional Neural Networks (DCNN) for animal detection and recognition. The system utilizes specific ultrasound emissions to repel animals once detected. Activated by the camera, the edge computing device employs DCNN software for target identification, triggering the Animal Repelling Module to emit tailored ultrasound signals based on the detected animal category. This innovative approach combines AI and ultrasound technology for a more efficient and sustainable solution to wildlife intrusion in agriculture.

A. Temperature Sensor

The temperature sensor is a fundamental component in various scientific and industrial applications, including its crucial role in precision agriculture. In the context of agricultural practices, accurate monitoring of temperature is essential for understanding the thermal conditions that influence plant growth, pest activity, and overall crop health. Temperature sensors contribute to creating a data-driven approach, allowing farmers to make informed decisions regarding irrigation, pest control, and other critical aspects of crop management. These sensors enable real-time data collection, aiding in the optimization of farming practices and resource utilization. In this journal, we explore the significance of temperature sensors in precision agriculture, emphasizing their role in enhancing crop yield, resource efficiency, and the overall sustainability of modern farming practices.



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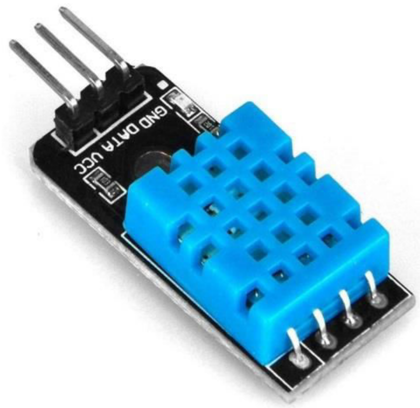
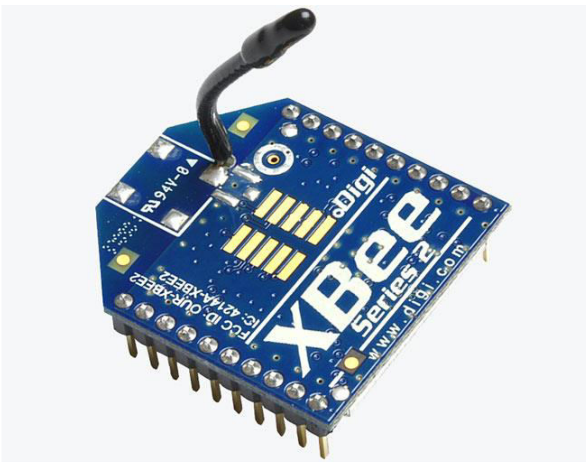
B. Humidity Sensor

The humidity sensor holds paramount importance in various applications, with particular significance in precision agriculture. In the realm of agriculture, monitoring humidity levels is essential for understanding the environmental conditions that impact plant growth, disease prevalence, and overall crop well-being. This sensor plays a crucial role in providing real-time data on atmospheric moisture, enabling farmers to implement precision irrigation strategies, optimize pest management, and enhance overall crop health. By incorporating humidity sensors into agricultural systems, farmers gain valuable insights into the dynamic microclimates of their fields, facilitating informed decision-making for resource-efficient and sustainable farming practices. This journal delves into the pivotal role of humidity sensors in precision agriculture, shedding light on their contributions to improved crop yields and the advancement of modern farming methodologies.



C. Zigbee

Zigbee is a wireless communication standard that operates on low-power, low-data-rate wireless personal area networks (WPANs). Developed for short-range, low-rate wireless data transmission, Zigbee finds extensive applications in various industries, including home automation, industrial control, healthcare, and agriculture. In the agricultural context, Zigbee technology is often employed for creating wireless sensor networks that enable the monitoring of environmental parameters such as soil moisture, temperature, and humidity. Its low-power consumption makes it suitable for battery-operated devices, allowing for prolonged sensor node operation in the field. This journal explores the utilization of Zigbee in agriculture, focusing on its role in establishing efficient and reliable wireless communication networks for precision farming and environmental monitoring.



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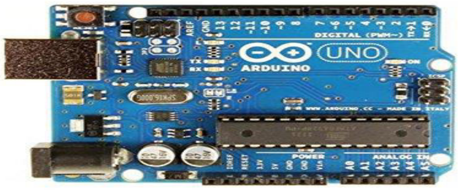
prompt action and proper waste processing. For example, if the system detects high moisture levels in organic waste, it can send out alarms for prompt collection or recommend changing the waste composition by increasing aeration.

D. Arduino

Arduino, a revolutionary open-source electronics ecosystem, embodies the fusion of state-of-the-art hardware and software paradigms. Anchored by its microcontroller boards, Arduino epitomizes programmable versatility, enabling the seamless execution of a myriad of tasks. These microcontrollers serve as the bedrock upon which a tapestry of innovation is woven,



This intricate interplay transforms Arduino into a conduit for imaginative exploration, allowing users to orchestrate bespoke solutions that transcend conventional boundaries.

In the symphony of electronic creativity, Arduino emerges as a virtuoso, harmonizing the democratization of technology with a user-centric ethos. This open-source platform beckons both enthusiasts and seasoned professionals into a realm of boundless possibilities, where the marriage of code and circuitry unlocks a universe of electronic ingenuity. Arduino, thus, stands as an indomitable force in the evolution of electronics, an emblematic gateway propelling individuals towards the frontiers of inventive expression and technological empowerment.

- **Internet Of Things (IoT)**

The Internet of Things (IoT) is a revolutionary concept that has permeated various facets of our modern lives, ushering in an era where the inanimate becomes intelligent, responsive, and interconnected. At its essence, IoT encapsulates a complex network of physical devices, equipped with sensors, actuators, and communication capabilities, all orchestrated to seamlessly collect, exchange, and act upon data. This dynamic interplay between the digital and physical realms is reshaping industries and daily experiences alike. In the realm of smart homes, IoT manifests in a tapestry of devices such as smart thermostats, lights, and security systems, all harmonizing to create a responsive and intuitive living space. The healthcare landscape has been transformed with wearable IoT devices, empowering individuals with real-time health monitoring and facilitating remote patient care. Industries leverage the Industrial Internet of Things (IoT) to optimize manufacturing processes, enhance efficiency, and usher in a new era of automation. Smart cities harness the power of IoT for urban planning, traffic management, waste optimization, and the delivery of public services. Agriculture embraces precision farming, where IoT sensors meticulously monitor soil conditions, crop health, and irrigation needs, contributing to sustainable and resource-efficient practices. Yet, as IoT propels us into this era of unprecedented connectivity, it brings forth challenges that demand careful consideration – concerns over privacy, security, and the ethical use of the vast troves of data generated. In navigating this transformative landscape, the evolution of IoT continues to redefine how we perceive and interact with our increasingly interconnected world. Now a days IOT helps in many fields like agriculture fields, medical, educational fields and so on.

- **Artificial Intelligence (AI)**

The pursuit of creating intelligent systems mirroring human cognitive capacities characterizes the expansive realm of Artificial Intelligence (AI). AI, a multifaceted domain, encompasses a diverse spectrum of technologies, algorithms, and applications. At its core, machine learning emerges as a pivotal facet, endowing systems with the

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ability to learn and adapt from experiences without explicit programming. Progressing further, deep learning represents an advanced iteration, leveraging intricate neural networks capable of nuanced pattern recognition and decision-making.

The applications of AI permeate various domains, illustrating its transformative impact on diverse fields. In healthcare, AI plays a crucial role in facilitating diagnostics and tailoring personalized treatment plans. Concurrently, in finance, AI drives innovations such as fraud detection and algorithmic trading, reshaping the landscape of financial systems. Everyday conveniences, exemplified by virtual assistants and language translation services, underscore the pervasive role of AI in enhancing our daily lives.

However, as AI continues its march forward, ethical considerations loom large on the horizon. Concerns over algorithmic biases and data privacy emerge as critical factors influencing the responsible development and deployment of AI. Striking a balance between technological progress and ethical considerations becomes imperative to ensure the equitable and responsible integration of AI into society.

The evolution of AI holds the promise of a future where intelligent systems collaboratively augment human capabilities. This collaborative synergy is poised to drive unprecedented advancements and innovations across industries, fostering a landscape where human ingenuity and artificial intelligence converge for the betterment of societies worldwide.

In the tapestry of technological evolution, the trajectory of AI unfolds as a catalyst for transformative change. Beyond its current applications, the relentless march of AI promises a future where intelligent systems seamlessly collaborate with human counterparts.

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Ref	Year	Name	Accuracy
1	2011	Wireless Sensor Network for Precision Agriculture	99%
2	2023	IoT based Data Sensing System for AutoGrow, an Autonomous greenhouse System for Precision Agriculture	NA
3	2023	Precision Agriculture: IoT Based System for Real-Time Monitoring of Paddy Growth	NA
4	2022	Automation in Agriculture and Smart Farming Techniques using Deep Learning	NA
5	2021	A Comparative Deep Learning Algorithms for Agricultural Insect Recognition	NA
6	2022	Momentum Contrast Learning for Aerial Image Segmentation and Precision Agriculture Analysis	NA
7	2022	Automated Smart Irrigation System using IoT with Sensor Parameter	NA
8	2019	Smart Irrigation System Using Internet of Things	93.3%
9	2021	Smart Irrigation System Techniques using Artificial Intelligence and IoT	NA
10	2018	Smart Irrigation System using Zigbee Technology and Machine Learning Techniques	NA
11	2016	Internet of Things (IoT) enabled smart animal farm.	NA
12	2022	Animal Repellent System for Smart Farming using AI and Edge Computing	99.5 0%

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IV.CONCLUSION

In conclusion, our project represents a significant advancement in precision agriculture, integrating deep learning for animal detection and smart irrigation management. The system efficiently addresses challenges in early threat detection and optimizes water usage, contributing to sustainable farming practices. The successful implementation of this integrated solution underscores its potential for revolutionizing agricultural methodologies, fostering productivity, and promoting environmental resilience.

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