IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 20, April 2026
Impact Factor: 8.2

Hybrid Deep learning & IoT Based Crop Disease Early Warning System Using Efficient Net and LSTM Algorithm

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Abstract: *Smart farming, enabled by the Internet of Things (IoT), is changing traditional farming methods for effective food production. This technology-driven strategy uses sensors, automation and data analytics to monitor and control agricultural operations in real time. Farmers will be equipped to make educated decisions to optimize water consumption, prevent wasting of resources, and increase crop health with the help of IoT-enabled equipment such as soil moisture monitors, weather stations, and drone technology. Moreover, IoT devices use machine learning to deliver predictive analytics to take pre-emptive steps against illnesses and unfavourable weather situations. IoT in agriculture leads to increased production and helps to overcome difficulties like manpower scarcity and environmental sustainability. This study discusses the practical aspects, advantages and limitations of IoT in smart farming. The results emphasize the significance of these technologies in advancing precision agriculture, lowering costs, and encouraging sustainable practices, so laying the groundwork for a more robust agricultural industry.*

Keywords: IoT, Sensor, Relay, PumP, IoT, Cloud

I. INTRODUCTION

Smart Farming is a concept of farming management employing contemporary technologies to boost the quantity and quality of agricultural products. Farmers of the 21st century have GPS, soil scanning, data management and Internet of Things at their fingertips.

Research in smart agriculture is aimed at the development of a decision support system for farm management. Smart farming addresses the challenges of population increase, climate change and labor. It has received much technical attention for planting and watering crops, as well as their health and harvesting. The IOT based smart agricultural system is developed to monitor the crop field with the assistance of sensors (light, humidity, temperature, soil moisture etc.) and automation of irrigation system. In agriculture, IOT (Internet of things) is the use of sensors, cameras and other devices to convert each element and activity on a farm into data. This technique will greatly mitigate the negative externalities of contemporary agriculture on the environment. We need smart agriculture to grow and evolve from what it is now. Smart Cities employ Internet of Things (IOT) technologies such as linked sensors, lighting and meters to gather and analyze data. Then they utilize this data to make cities better better infrastructure, better public utilities and services and so on. For Farmers it is tough to comprehend technical jargon and utilization of technology [1]-[5].

IoT can be a mix of knowledge, online related products, which is a vital part of the future Internet. The IoT is about automating operations to eliminate or reduce human interaction. IoT in agriculture is all about automation of agricultural operations to make them more efficient and successful. Traditional agricultural practices are inefficient

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because of greater levels of human contact, higher labour costs, higher electricity consumption, higher water usage etc. and do not involve the care of animals. This project is done with the help of wireless sensor network which collects the information from various sensors and sent to the most server using wireless protocols. The data gathered throughout the approach offers the data about the different environmental conditions which is used to observe the full process. Monitoring the environmental conditions is not the answer to increase yield, quality and output of the crops. It is vital to build a combined and unique system that can ensure all the aspects impacting production including cultivation, harvesting and post-harvesting storage.

IoT might be a mix of knowledge, online connected issues, which is an important part of the longer term Internet. The IoT is about automating operations to eliminate or reduce human interaction. IoT in agriculture is all about automation of agricultural operations to make them more efficient and successful. Traditional agricultural practices are inefficient because of greater levels of human contact, higher labor costs, higher electricity consumption, higher water usage etc. and do not involve the care of animals. This project is done with the help of wireless sensor network which collects the information from various sensors and sent to the most server using wireless protocols . The data gathered throughout the approach offers the data about the different environmental conditions which is used to observe the full process. Monitoring environmental conditions is not the way to increase the yield, quality and output of crops. A combined and unique system needs to be developed that can take care of all the factors affecting productivity like cultivation, harvesting and post harvesting The Web of Things (IoT) is reconstructing the agri-business which enables the farmers to pander to challenges within the field, like through a broad range of strategies, like accuracy and practical farming [6]-[10].

IoT helps in collecting information on the variables like climate, humidity, temperature and soil fertility, an IoT-based study allows the discovery of wild plants, water levels, precise position, field interruption, field development, horticulture. IoT helps with gathering information IoT utilizes Farmers to connect from anyplace to his residence. Remote sensors detect home circumstances, and house forms are controlled and mechanized by tiny controllers. • The sensor network placed in each part will continuously update the readings of the parameters in the MY-SQL database using a WIFI connection module. • Any change in data, which may cause the activation of the alarm, will be registered and reported in the server room. • The responsible authorities or the locals can retrieve the data and the warning notifications of the same. • The data is kept in the MY-SQL Database named PHP Web server where it may be utilized to conduct some analysis on field [11]-[14].

II. PROPOSED WORK

Agriculture has an essential part in the growth of the country. In our country more than 72% of people are dependent on farming in which one third of the population invest in farming. Hence, the obstacles and concerns related to agriculture should be concentrated to prevent the country growth. The only answer proposed to this problem is to modernize agriculture with the help of smart technology. IoT can help to improve the efficiency of agriculture and farming operations by automating them and reducing the need for human intervention. Irrigation in agriculture is one of the methods supporting crop production by providing the necessary water to the land. It takes a lot of time and work to cultivate irrigation. An automated irrigation system based on sensor is a potential approach to control agricultural activity. This research paper gives a large study into the irrigation system in smart agriculture. Being the backbone of Indian economy agriculture is worth to be upgraded. To overcome backwardness of conventional ways of agriculture and to boost the crop output, to reduce the danger of damage crops and to perform optimal use of water resources, current technology of Internet of things (IoT) is playing an important role nowadays. The paper proposes a “smart irrigation system” where a large amount of real time data from agricultural fields is collected using a soil sensor. This includes the development of a system that can monitor temperature, humidity, moisture, and even the movement of animals which may destroy the crops in the agricultural field using sensors with Arduino board. In case of any discrepancy, an SMS notification and notification on the application developed for the same is sent to the farmer’s smart phone using Wi-Fi/3G/4G. The sensors communicate with each other via Internet connection. Data acquired from

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sensors are transferred to the Web server over wireless sensor network. IoT framework processes and analyzes the observed data. The farmer's smartphone application is then periodically notified. The farmer can monitor the variation in soil moisture. Hence, excessive water wasting may be prevented. In this study we analyze the tests carried out in this area and provide a fairly low-cost system module with sensors and wireless networks for updated irrigation.

Agriculture is the backbone of food production in our country. Agriculture accounts for 18% of India's Gross Domestic Product (GDP) and employs more than half of the country's population. The Indian government has underlined and highlighted the requirement of innovations to be in above given criterion in agriculture therefore seeking an indicator of technological exposure and creative implementation strategies to boost the production. IoT technologies used in smart farming help the growers and farmers to decrease waste and improve production from the amount of fertilizer used to the number of trips the farm vehicles have taken, thereby enabling effective use of resources like water, energy etc. Relative humidity is the ratio of the quantity of moisture in the air to the maximum amount of moisture the air can hold at that temperature. Irrigation is the basic necessity of agriculture. There are three classic irrigation systems. Channel irrigation. Sprinkler irrigation. Drip Irrigation . According to the demand of crops these three methods are utilized. Sensors acquire information from a physical environment. Industrial regions are required for implementation of wireless communication due to inaccessibility to remote place, to send the information received by the sensors and controlling them is not feasible every time from the remote site.

Internet Of Things (IoT) is a common network of things which may communicate with each other if there is Internet connectivity. IoT has an essential function in agriculture industry which can feed 9.6 billion people on the earth by 2050. Smart Agriculture aids in minimize wastage, effective utilization of fertilizer and therefore increase in the crop production. The present effort aims to design a system to monitor crop-field using sensors and to automate the irrigation system. The sensors used include soil moisture, temperature, humidity, Light. The data from sensors are transferred to Web server database by utilizing Wireless transmission. This technique will be more beneficial in locations where water is scarce. This system is 92% more efficient than the usual. Climate changes and rainfall has been irregular for decades. As a result, many farmers developed climate-aware approaches dubbed smart agriculture. Village farmers under the present system may have been growing the same crop for generations, but weather patterns and soil conditions and epidemics of pests and disease have altered over time. The suggested system technique is used to sense the local agricultural characteristics, locate the sensor and send the data crop fields and crop monitoring Greenhouse Environment or Smart agriculture , used to grow plants under regulated climatic conditions for effective output is an essential feature of the green house and horticulture business.To establish an optimum habitat, essential aspects like temperature, humidity, light intensity, ground water etc. has to be regulated. The main purpose of this project effort is to build an automated greenhouse which is totally sensor based system.The system has inputs from a number of sensors and displays output.The created method is simple, cost efficient and easy to implement. The results demonstrate that the system might be more efficient on man power saving and improving economic value of items. This asset enables the green houseer to improve the cultivation in the method the plants demand. The advantages are a larger crop output, a longer production time, an improved quality and a lower usage of protective pesticides. Wireless sensor network has been used for continuous monitoring and controlling. Here the greenhouse parameters are being sent over internet to open source cloud server. The settings can be adjusted by another locally hosted web-server. The major emphasis of this project was user pleasant UI designing and automated automation

Cash crops are the items which give a lot more advantage to the agriculturists than the usual harvests and wants as well. In the meanwhile, the cultivation of such crops is not generally carried out in India, owing to the climate obstacles of the nation and these crops require extensive care for providing the greatest yields else might be easily impacted by diseases and pests. This is the problem which can be overpowered by the use of computerized automated greenhouse technology which can be built up with the use of sophisticated technologies of the Internet of Things i.e., IoT through numerous sensors, actuators, microcontrollers etc. The automated greenhouse technology is one of the best options by which farmers can be benefitted from all over India. In this paper we have proposed the greenhouse technology having the minimal construction cost so that it can afford by the Indian Farmers and if not then they can apply for loans from

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the govt available under various schemes for rural and agricultural development. Internet of Things (IoT) is used for communication that may be used in future development. In which the devices like micro- controllers, transceivers may be employed for future. The Internet of Things (IoT) intends to make the Internet more immersive, ubiquitous and convenient by providing extremely simple access and interaction with a plethora of devices, such as household appliances, cameras, monitoring systems, actuators, displays, automobiles, home automation, smart grids, automotive, traffic management etc. Mobile communication technology have matured with "Anytime, Anywhere" access to information and related services. The Internet of Things (IoT) is an ecosystem in which the items, animals, peoples or birds are given unique IDs and the capacity to communicate data across a network. IoT resulted from the confluence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet. This can also be termed as Internet of Everything. Heart monitoring system using IoT, farm with animal biochip transponder, automobile with sensor devices to inform driver when vehicle tire pressure is low etc. It is also related to machine-to-machine (M2M) communications.

In IoT there are numerous sorts of applications like fitness trackers, health monitoring system, sensor devices in agricultural area etc is shown in Figure 1. Typical obstacles and drawbacks of embedded system areultra-low power supply, sensors, actuation, low pressure cycles, lowpower wireless devices. The latest technologies in Internet of Things (IoT) are allowing the public to take part in sensing, sharing the gathering of data, monitoring process that cannot be simply assessed by an individual.

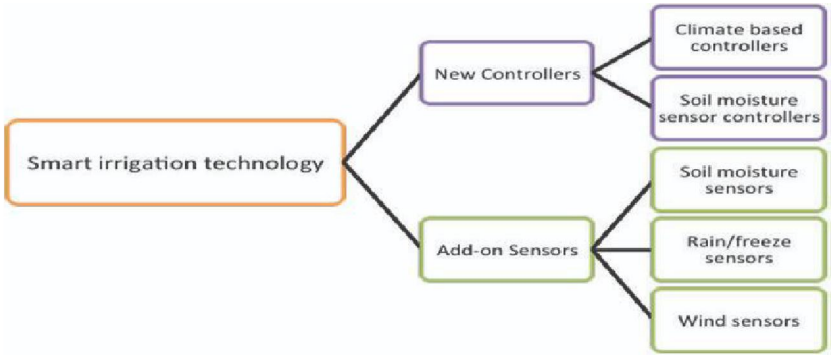

Figure.1. Block Diagram of the Proposed System

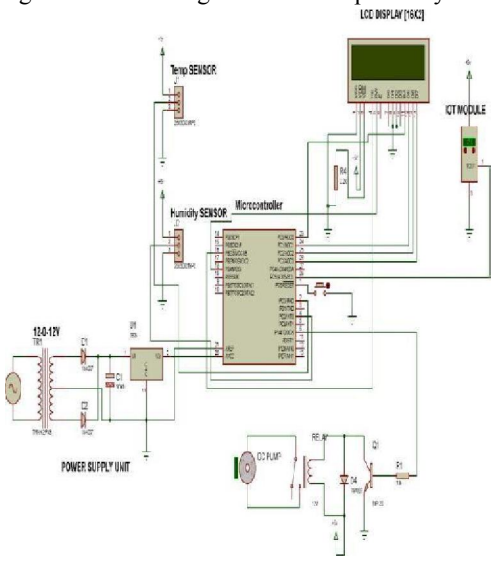

Figure.2. Schematic Diagram of the Proposed System

DOI: 10.48175/IJARSCT-34676

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In this work we proposed a real-time automated dynamic and manual irrigation system for diverse agricultural fields based on Internet of Things. The AgriSens keeps irrigation going on the fly. The treatments are based on the demands of different times of the life cycle of a crop and also considering manual irrigation remotely depending on the inputs of the farmer or expert. The experimental findings clearly show that the AgriSens is beneficial for appropriate water management of diverse crops, while boosting network performance and system functions over the existing systems. The crop productivity is improved over conventional manual watering method to a maximum of 10.21 %. Future plans include studying how the yield is affected by meteorological characteristics like as wind, humidity, temperature and UV radiation with the use of machine learning. IOT enabled technology can make Precision Green House more precise and efficient. IOT may be used in several fields of Green House. Second one crop monitoring. Use of effective energy for pumps, boosters, lights and other reasons also done with the aid of IOT. With IOT sensors are deployed in the agricultural field which is connected to the internet for an appropriate choice may taken. IOT may be used to use fertilizers effectively. Finally conclude that need to design on ideal Agri- IoT architecture which is contained with cheap cost, low power consumption of devices, improved decision making process, QoS service, optimal performance and it is easy to comprehend the farmer without expertise. India economy is based on Agriculture and is backbone of the country. Like India and other countries majority of the population depends on Farming and nations earnings has derived from farming. Farmers cultivate numerous items for us to use such as fruits, vegetables, cotton for our garments, grain and many other things. Nowadays there are various equipment and strategies accessible for farming. The UN Food and Agriculture Organization reports that by 2050, the globe would need to produce 70% more food than in 2006 to feed the increasing population of the Earth [1]. To counter this, the agricultural corporations and farmers are moving from traditional farming to smart farming.

Today's many agriculture sectors depend on IoT Technology for smart farming to raise the efficiency, for worldwide marketing, to increase the profit in less time and cost and others aspects like minimize the human interference in farming. "IoT (Internet of Things) is the trending and effective technology. IoT includes numerous types of sensor, electrical devices, network components and software's. The IoT allows the users to communicate their data in networks without human intervention. To raise the production, efficiency and to reduce the challenges experienced by the farmers in agriculture, current technologies and techniques are required which may be achieved by using Internet of Thing. IoT provides a lot of knowledge and information about newest technologies and farming strategies for farmers. The system is developed for monitoring the agricultural field using sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system in IoT based smart farming [2]. Farmers may now monitor their farms wherever, anytime.

III. CONCLUSION

Precision Green House may be improved in terms of accuracy and efficiency with IOT enabled technology. IOT may be used in several fields of Green House. Second one crop monitoring. Use of effective energy for pumps, boosters, lights and other reasons also done with the aid of IOT. With IOT sensors are deployed in the agricultural field which is connected to the internet for an appropriate choice may take. Efficient usage of fertilizers may be made using IOT. Finally conclude that need to design on ideal Agri- IoT architecture which is contained with cheap cost, low power consumption of devices, improved decision-making process, QoS service, optimal performance and it is easy to comprehend the farmer without expertise. We have developed automated Smart Agriculture system that minimizes the time and resources that is necessary when doing it manually. This system works on the technology of Internet of Things (IoT). The technology also measures water level and soil moisture in fields. This technique works well under ideal settings and may be further improved when conditions are not perfect, such as appropriate illumination or lightning.

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