Artificial Intelligence in Agriculture and its Application

Mr. V. Anbarasan,
HOD, Department of Computer Application,
Christ College of Arts and Science,
Kilachery, Thiruvallur(Dt.).

Mrs. Jayalakshmi.V,
Assistant Professor,
Department of Computer Application,
DRBCCC Hindu College, Pattabiram.

Abstract:
The application of artificial intelligence (AI) has recently become apparent in the agricultural sector. This sector faces many challenges to maximize yields, including improper soil treatment, disease and pest epidemics, big data requirements, poor performance, and knowledge gaps between farmers and technology. The main concepts of AI in agriculture are its flexibility, high performance, accuracy, and cost-effectiveness. This paper outlines AI applications in soil management, crop management, weed control, and disease control. Here particular attention is paid to the strengths and limitations of the application and how to use expert systems to improve productivity.

Keywords: Agriculture, Artificial Intelligence, IOT, Soil, Crop Management

I.Introduction

Artificial intelligence is based on the principle that machines can easily imitate it and define human intelligence so that it can perform tasks from the simplest to the most complex. Artificial intelligence goals include learning, thinking, and perception. Some examples, a self-driving car visual recognition system, a recommended engine that suggests your favorite products based on what you bought in the past, voice and voice recognition of virtual assistant Siri on Apple iPhone. AI has a huge impact on all areas of the industry. Industries that want to automate specific tasks using intelligent machines, and even agriculture!

Agriculture and agriculture are one of the oldest and most important professions in the world. It plays an important role in the economy. Agriculture is a $ 5 trillion industry worldwide. The world's population is expected to exceed 9 billion by 2050, and agricultural production needs to be increased by 70% to meet demand. As the world's population grows, land, water and resources are no longer sufficient to continue the supply chain of demand. Therefore, the most productive needs

a smarter approach and more efficient farming. The paper will discuss the challenges which farmers facing when using traditional farming methods, and by helping artificial intelligence replace traditional methods with more efficient methods and make the world a better place. Learn how to revolutionize your life.

Artificial intelligence in agriculture:

Crop yield prediction and price forecasts – identify the output yield of crops and forecast prices for the next few weeks will help the farmer to obtain maximum profit.

Intelligent spraying – AI sensors can detect weed affected areas and can precisely spray herbicides in the right region reducing the usage of herbicides.

Predictive insights – Insights on "Right time to sow the weeds" for maximum productivity. Insights on the impacts created by the weather conditions.

Agriculture robots – Using autonomous robots for harvesting huge volumes of crop at a higher volume and faster price.

Crop and Soil monitoring – Using Artificial Intelligence and Machine Learning, we can monitor the crop health for diagnosing pests/soil defects, nutrient deficiencies in soil, etc.

Disease diagnosis – Prior information and classification of plant diseases help farmers control the disease through proper strategy.

II. Related Work:

The world's population is estimated to reach about 10 billion by 2050, and under moderate fiscal development, agricultural order will increase by about 50% compared to 2013 [1]. Currently, about 37.7% of the total area is used for crop production. Agriculture is important, from job creation to contributions to national income. It plays an important role in the economic prosperity of industrialized countries and also in the economies of developing countries. The expansion of agriculture has led to a significant increase in per capita income for the rural population. Therefore, it is wise and appropriate to emphasize the agricultural sector more. In countries like India, the agricultural sector accounts for 18% of GDP and provides employment for 50% of the country's workforce.

The development of the agricultural sector promotes rural development, further transforms rural areas, and ultimately structural changes [2]. With the advent of technology, dramatic changes have been observed in many industries around the world [3]. Surprisingly, agriculture is gaining momentum in the development and commercialization of agricultural technology, even though it is the least digitized. Artificial intelligence (AI) is beginning to play an important role in our daily lives by expanding our perceptions and our ability to change our surroundings [4, 5, 6]. [7] A method of harvest planning based on the combination of harvest allocation and vehicle routing is presented. With these new technologies, the workforce, which was limited to just a few industries, is now contributing to many sectors.

AI is based on a wide range of disciplines such as biology, linguistics, computer science, mathematics, psychology, and engineering. Paper addresses the proposed system of flower and leaf identification and irrigation by IOT carried out on plant farms [8,9]. ML is the ability to learn something without being explicitly programmed, and DL is deep neural network learning [10,11].

The main subject of AI is to facilitate problem solving. This includes the use of ANN [12,13] ANN is a processing algorithm or hardware inspired by the design and behavior of the human brain [12,13]. Neural networks have amazing capabilities for self-organization and adaptive learning. It has replaced many traditional methods in many areas such as computer science, mathematics, physics, engineering image / signal processing, economics / finance, philosophy, linguistics, and neurology. ANN goes through the learning process. Learning is the process of adapting to changes in the environment. There are two learning methods: supervised learning and unsupervised learning.

III. Agricultural life cycle

The agricultural process can be divided into different parts.

Fig 1: Agriculture life cycle

Soil preparation:

It is an early stage of agriculture where farmers prepare soil for sowing. This process crushes large chunks of soil and removes debris such as sticks, stones and roots. Also, the addition of fertilizers and organic matter depends on the type of crop to create the ideal situation for crops.

Sowing:

At this stage, attention should be paid to the distance between the two seeds and the depth at which the seeds are planted. At this stage, climatic conditions such as temperature, humidity and precipitation play an important role.

Addition of fertilizer:

Maintaining soil fertility is an important factor for farmers to continue to grow nutritious and healthy crops. Farmers rely on fertilizers because these substances contain phytoene nutrients such as nitrogen, phosphorus and potassium. Fertilizers are simply planted nutrients that are applied to agricultural land to supplement the necessary elements that are naturally present in the soil. This phase also determines the quality of the harvest

Watering:

This stage helps to moisten the soil and maintain water levels. Under watering and overwatering can delay the growth of crops and, if not done properly, can damage crops.

Weed protection:

Weeds are unwanted plants that grow near crops and at garden boundaries. Weed control is an important consideration as weeds reduce yields, increase production costs, affect harvests and reduce crop quality.

Harvesting:

Harvesting is the process of collecting ripe crops from the field. This is a labor-intensive activity as this activity requires a lot of human resources. This phase also includes post-harvest processing such as cleaning, grading, packing and cooling.

Storage:

In this phase of the post-harvest system, products are stored in a way that ensures food security outside the agricultural period. This includes packing and shipping the harvest.

Challenges for farmers when using traditional farming methods:

List the common challenges that exist in the agricultural sector.

In agriculture, climatic factors such as precipitation, temperature and humidity play an important role in the agricultural life cycle. Deforestation and increased pollution are causing climate change, making it difficult for farmers to make decisions about soil preparation, sowing and harvesting.

Each crop requires a specific nutrient supply of the soil. There are three major nutrients needed for soil: nitrogen (N), phosphorus (P) and potassium (K). Lack of nutrients can reduce the quality of crops.

Weed control plays an important role, as evidenced by the agricultural life cycle. If uncontrolled, it can lead to increased production costs and also absorb nutrients from the soil, which can lead to nutrient deficiencies in the soil.

IV. Application of artificial intelligence in agriculture

This industry achieves healthier crops, controls pests, monitors soil and crop conditions, organizes farmer data, supports workloads, and improves various agricultural tasks throughout the food supply chain. We are looking to artificial intelligence technology to do so.

Use of weather forecasts: Due to changing climatic conditions and increasing pollution, it is difficult for farmers to determine the appropriate time for sowing. With the help of artificial intelligence, farmers can use weather forecasts to analyze weather conditions. This helps you plan which crops to sow when.

Soil and crop health tracking system: The kind of soil and nutrients of soil performs an crucial issue with inside the kind of crop is grown and the quality of the crop. Due to increasing, deforestation soil excellence is degrading and it`s tough to decide the quality of the soil.

A German-primarily based tech start-up PEAT has advanced an AI-primarily based application oriented utility referred to as Plantix that may become aware of the nutrient deficiencies in soil together with plant pests and sicknesses through which farmers also can get an concept to apply fertilizer which facilitates to enhance harvest quality. This app makes use of photo recognition- based technology.

The farmer can grab pictures of flora the use of smartphones. We also can see soil recovery strategies with guidelines and different answers through brief films in this utility. Similarly, Trace Genomics is every other system learning-based business enterprise that facilitates farmers to do a soil evaluation to farmers. Such kind of app facilitates farmers to display soil and crop`s health situations and

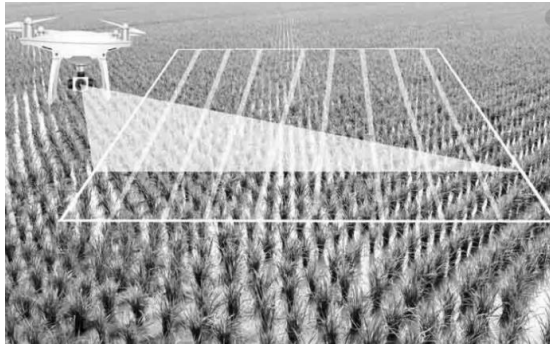bring wholesome plants with a better degree of productivity.

Fig 2: Drone Image

Crop Health Analysis with Drones: SkySqurrel Technologies has developed a drone-based Ariel imaging solution for monitoring crop health. In this technique, the drone collects data from the field, the data is transferred from the drone to the computer via a USB drive, and analyzed by an expert. The company uses an algorithm to analyze the captured images and provide a detailed report on the current state of the farm. This helps farmers identify pests and bacteria, and helps farmers use pest control and other methods in a timely manner to take the necessary steps.

Precision Agriculture and Predictive Analysis: AI applications in agriculture are inaccurately managed by providing appropriate guidance on water management, crop rotation, timely harvesting, crop types to grow, optimal planting, and pest epidemics. We have developed applications and tools to assist farmers in type attack, nutrition management. By using machine learning algorithms in combination with images captured by satellites and drones, AI-enabled technologies predict weather conditions, analyze crop sustainability, temperature, rainfall, wind speed, and the sun radiation.

Unconnected farmers can now enjoy the benefits of AI with tools as simple as SMS-enabled phones and seed apps. Farmers with WiFi access, on the other hand, can use AI applications to receive ongoing AI-specific plans for their land. These IoT and AI-driven solutions enable farmers to meet global demand for food growth by sustainably increasing production and profits without depleting valuable natural resources. In the future, AI will help farmers evolve into agronomists and use the data to optimize yields to individual rows of crops.

Agricultural Robotics: AI companies are developing robots that can easily perform multiple tasks in the agricultural field. These types of robots are trained to fight weeds and harvest crops faster and more than humans. These types of robots are trained to inspect crop quality, detect weeds, and at the same time harvest and pack crops. These robots can also tackle the challenges of forced agricultural labor.

Activated Pest Detection System: Pests are one of the worst enemies for farmers and damage crops. The AI system uses satellite images and uses AI algorithms to compare historical data to detect if insects have landed and what insects, such as locusts , grasshoppers, bugs, etc to the famers for taking the necessary precautions. It help farmers to fight with pests using the pest control required for AI.

V. Conclusion

Artificial intelligence in agriculture is not only helping for farmers to automate their agriculture, but it is also shifting to precision cultivation to achieve higher yields and better quality with less resource consumption. Now a day many companies involved in improving artificial intelligence-based products and services such as machine learning, agriculture, drones, and training data for automated machine manufacturing which will advance their technology in the future and feed the world's growing population into this production sector.

References:

[1]FAO. Food and Agriculture Organization of the United Nations, 2017, 2017. THE STATE OF FOOD AND AGRICULTURE LEVERAGING FOOD SYSTEMS FOR INCLUSIVE RURAL TRANSFORMATION. 978-92-5-109873-8pp. 1–181.

[2]Mogili, U.M.R., Deepak, B.B.V.L., 2018. Review on application of drone systems in precision agriculture. International Conference on Robotics and Smart Manufacturing. Procedia Computer Science 133, pp. 502–509

[3]Shah, G., Shah, A., Shah, M., 2019. Panacea of challenges in real-world application of big data analytics in healthcare sector. Data Inf. Manag., 1–10 https://doi.org/10.1007/ s42488-019-00010-1.

[4]Kakkad, V., Patel, M., Shah, M., 2019. Biometric authentication and image encryption for image security in cloud framework. Multiscale and Multidiscip. Model. Exp. and Des., 1–16 https://doi.org/10.1007/s41939-019-00049-y

[5]Kundalia, K., Patel, Y., Shah, M., 2020. Multi-label movie genre detection from aMovie poster using knowledge transfer learning. Augment Hum Res 5 (2020), 11. https:// doi.org/10.1007/s41133-019-0029-y

[6]Gandhi, M., Kamdar, J., Shah, M., 2020. Preprocessing of non-symmetrical images forEdge detection. Augment Hum Res 5, 10. https://doi.org/10.1007/s41133-019-0030-5

[7]Ahir, K., Govani, K., Gajera, R., Shah, M., 2020. Application on virtual reality for enhanced education learning, military training and sports. Augmented Human Research (2020) 5:7

[8]Plessen, M.G., 2019. Freeform Path Fitting for the Minimisation of the Number of Transitions between Headland Path and Interior Lanes within Agricultural Fields. Arxiv 1910.12034v1, 1–7.

[9]Patel, D., Shah, D., Shah, M., 2020a. The Intertwine of Brain and Body: A Quantitative Analysis on How Big Data Influences the System of Sports. Annals of Data Science. https://doi.org/10.1007/s40745-019-00239-y.

[10]Patel, D., Shah, Y., Thakkar, N., Shah, K., Shah, M., 2020b. Implementation ofArtificial intelligence techniques for Cancer detection. Augmented HumanResearch 5 (1). https://doi.org/10.1007/s41133-019-0024-3.

[11]Kodali, R.K., Sahu, A., 2016. An IoT based soil moisture monitoring on Losant platform. 2nd International Conference on Contemporary Computing and Informatics. IEEE, pp. 764–768

[12]Shah, D., Dixit, R., Shah, A., Shah, P., Shah, M., 2020a. A comprehensive analysis regarding several breakthroughs based on computer intelligence targeting various syndromes. Augment Hum Res 5, 14 (2020). https://doi.org/10.1007/s41133-020-00033-z.

[13]Shah, K., Patel, H., Sanghvi, D., Shah, M., 2020b. A comparative analysis of logistic regression, random Forest and KNN models for the text classification. Augment Hum Res 5, 12 (2020). https://doi.org/10.1007/s41133-020-00032-0.