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Artificial Intelligence in Agriculture

Kesha K. Shah¹, Raj B. Valand², Prof. Hemang Shah³, Mr. Dharminsinh Rathod⁴, Mr. Yash Vashi⁵

^{1, 2, 3, 4, 5}Department of Computer Engineering, R.N.G. Patel Institute of Technology Bardoli, India

Abstract: The United Nations FAO (Food and Agriculture Organization) states that the world population would increase by another 2 billion in 2050 while the additional land area under cultivation will only account to 4% at that time. In certain area more efficient farming practices can be attained using the recent technological advancements and solutions to current bottlenecks in farming. A direct application of AI (Artificial Intelligence) across the farming sector could act to be an epitome of shift in how farming is practiced today. AI powered solution in farming enables a farmer to crop more with less efforts, significantly enhancing the quality for crops. This paper will illustrate use of AI in agriculture.

Keywords: Artificial Intelligence, agriculture, crops, farming

I. INTRODUCTION

AI can assist farmers by giving inputs regarding better yielding of crops by understanding the collected data. Farmers can engage AI to control optimal dates to sow seeds, utilize resources like fertilizers, chemical, water for crops growth, determining the diseases in crops in time, detect and destroy weeds, soil monitoring, mitigating agriculture risk. This technology develop farmers knowledge regarding their soil and make farming endurable. Benefiting solutions for farming are elaborate below:

A. Internet of Things (IOT) Driven Enhancement

2.5 quintillion bytes of data created everyday at current impetus but that impetus is only accelerating with growth of Internet of Things which is structured and non-structure format. This data can be weather pattern, rainfall, soil reports, pest assault, images taken from drones and cameras etc. IoT can observe all this data and give the solutions to enhance crop yields.

Using IoT in AI we can manage livestock with rich data insights, automatic irrigation, Weather forecasting, Sensor-based precision agriculture, Remote crop yield optimization, Soil health monitoring, Smart warehousing, logistics, and distribution, Improve the quality of produce, monitor Greenhouse with real-time data, Weed controlling, Predict analytics for crop sustainability.

B. Image Based Insight Generation

We require the accuracy in farming. Drone based images can help us in increase crop production, monitor crop growth. Sensors and digital imaging capabilities can give farmers a rich picture of their fields and livestock as well as applying pesticides. AI in farming, Human and Computer vision technology, IoT, Business intelligence, and drone data can be combined to ensure quick actions by farmers. Drone image data can generate alerts in real time to accelerate accuracy in farming.

C. Disease Detection

By developing smart phone application that assists in identifying plant damage with the help artificial intelligence. Images taken by farmer are directly uploaded to the server using internet and automatically analyzed by algorithms which identify the disease with results back to the farmer within a few seconds. Critical information on symptoms, triggers, agro-chemicals as well as biological treatments are provided to the farmer.



D. Identification of Crop Readiness

Images of different crops under white or UVA lights are captured to determine how luscious the fruits are. Farmers decide the different readiness level of different crops and add them into separate stack before sending them to the market.

E. Weed detection

Apart from disease weeds are also major threat of crops. Weeds are difficult to detect and discriminate from crops. Computer vision can easily identify weed and discriminate from crops at low cost and with no environmental issues and side effects.

F. Field Management

By using the images of drone, real time estimates can be made during cultivation period by determining areas where crops require water, fertilizers.

G. Decision Making with Algorithms

By using decision making algorithms farmers can identify amount of fertilizer require, irrigation, selection of unnamed aerial vehicle for precision algorithm.

H. Monitoring Health Of Crops

For monitoring crop health and sustainability Artificial intelligence is used. For example detecting the diseases, pests, and nutrition of the farms. Needed fertilizer is determined by Artificial intelligence algorithms. AI algorithms can reduce 40% of needed fertilizer. We can use this AI software from different mobile devices.

I. Autonomous Tractor

Using ever-more sophisticated software coupled with off-the-shelf technology including sensors, radar and GPS, the system allows an operator working a combine to set the course of a driverless tractor pulling a grain cart, position the cart to receive the grain from combine, and then send the fully loaded cart to be unloaded.

J. Autonomous Technique In Irrigation And Enabling Farmers

Irrigation is the labour process in farming. Automatic irrigation system makes the use of soil moisture content , weather pattern, type of crop grown to make entire process of irrigation autonomous. Such system can preserve water, efficient and economic feasible.

K. Drone Technology

Drone technology can help to complete time intensive and harder task at reduced cost. There are six uses of agricultural drones, which are profile below:

- 1) *Soil and field Analysis:* In crop lifecycle drones can be use to collect data about quality of existing soil. By obtaining 3D maps of existing soil, farmers are able to see issues in quality of soil, nutrient management or soil dead zone. This information help the farmers in planning seed planting, better utilization of water resources and effectively management of crop nutrient levels.
- 2) *Seed Planting:* Drone minimize the need for on-the-ground planting, which is costly, time consuming and arduous work. This technology can reduce overall planting time and labor cost across the board.
- 3) *Crop Spraying:* Crops require continuous fertilization and spraying which is very costly, inefficient and burdensome as well as. Drones can scan the field and can spray in real time for even coverage. Aerial spraying with drones are five times faster than traditional machinery.
- 4) *Crop Mapping and Surveying:* Drone technology is the ease and effective in large scale crop and acreage monitoring. Real-time data is used to make decision.
- 5) *Irrigation Monitoring and Management:* Drones can identify the spot irrigation issues, or areas that are less moisture and resolves such issues before it become troublesome.
- 6) *Real-time Livestock Monitoring:* Drones with thermal imaging cameras enables a single pilot to monitor livestock. This allows farmers to keep track of livestock a much greater frequency, and with less time and staff investment.



Fig. 1 Drone technology



L. Crop Harvesting

AI bots help farmers to overcome labor challenge in harvesting. AI bots can harvest the crops at a higher volume and faster than human labor.

II. CONCLUSION

AI is appropriate in agriculture sector as it optimizes the resource use and efficiency. Using AI in Agriculture helps the farmers in effortless farming and makes them relax without concerning about their crops. We can say that AI is boon to the agriculture to feed the increasing population.

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