

A Smart Farm Using Artificial Intelligence

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SUMMARY

The AI technology will be useful to replacing conventional farming practices with innovations that support farmers in maximizing crop yields, forecasting weather patterns, and making frugal use of resources. Farmers who using AI are now able to manage their crops and allocate their resources with more knowledge. The self-governing robots not only increase productivity but also lessen the requirement for needless herbicides and insecticides. In addition, farmers may use drones to efficiently apply pesticides and herbicides on their farms, and plant monitoring is no longer a hardship. This essay will go over several AI technologies for raising agricultural yields, issues farmers encounter while using AI, AI startups, and the potential applications of AI in agriculture in the future.

INTRODUCTION

Although artificial intelligence (AI) is not a new idea, it has been rapidly evolving recently and agriculture is not an exception to how artificial intelligence (AI) is changing industries throughout the globe. Significant challenges facing agriculture include the lack of an irrigation system, temperature fluctuations, groundwater density, food scarcity, etc. The AI technology will be useful to replacing conventional farming practices with innovations that support farmers in maximizing crop yields, forecasting weather patterns, and making frugal use of resources. Consequently, the production and distribution of food are being revolutionized by the use of AI in agriculture. Additionally, AI-powered sensors are a great tool for extracting vital agricultural data. The information will help to improve output. There is a vast application for these sensors in agriculture. It can determine factors such as soil quality, weather patterns, and groundwater levels, which can be used to enhance the farming process. Drones have been used by numerous businesses to monitor production and spot pest assaults of any kind. Numerous instances of success with such initiatives serve as motivation for the development of a system for crop protection and monitoring. Farmers who using AI are now able to manage their crops and allocate their resources with more knowledge. This essay will go over several AI technologies for raising agricultural yields, issues farmers encounter while using AI, AI startups, and the potential applications of AI in agriculture in the future.

AI-based agricultural yield-boosting technologies

Plant monitoring

The most popular techniques for keeping an eye on plant health are time-consuming and labor-intensive. AI is a useful tool for tracking and spotting possible issues with plant health or soil nutrient deficits. Applications are created to examine crop health patterns in agriculture with the use of thorough research. These AI-enabled applications are helpful for improving knowledge of plant diseases, pests, soil health, and pests.

Fertilization

Fertilization is an essential component of preserving sustainable agricultural production systems. Although fertilizers have been used since the dawn of agriculture, it is now widely recognized that, if not properly controlled or over use of them can have a negative impact on the environment. Therefore, in order to provide fertilizer using precise measurements, farmers employ Internet of Things (IoT) sensors to scan and test soil samples for basic testing.

Water and irrigation:

The need for water in agriculture is currently growing globally, particularly in the Mediterranean countries, which puts more pressure on water sources to remain available. Consequently, innovative and successful approaches should be the main emphasis of wise, sustainable agriculture operations.

AI-powered pest detection system

The sensor segmented the plant leaf images into surface areas such as background, diseased area, and non-diseased area of the leaf. After that, the unhealthy or infected region is clipped and sent to the lab for additional testing. This provides further support in identifying pests and detecting nutrient deficiencies.

Decision making

In the past, we haven't been able to make informed choices about when to sow, which crop variety to choose based on field features, whether to use irrigation, whether the soil is nutrient-deficient, where to spray, or how much to use. After implementation of AI, the farmers can be able to decide what to do in their farm with the help of expert guidance.

Accuracy in data collection and analysis:

Without the use of cutting-edge technologies, it is impossible to obtain accurate data on diseases, weeds, and insect pests. By employing precise data to improve agricultural productivity, we can reduce the quantity and applications of pesticides.

Harvesting methods innovations

Harvesting crops is a labor-intensive process. Without the need to engage extra workers, an AI-based computer vision model is useful for monitoring and assessing crop growth maturity. Numerous agribots have previously been created to automate harvesting and reduce food waste, losses, expenses, and environmental impact. AI-powered machines perform faster, harder, and more accurately in agriculture than human laborers.

Monitoring the health of livestock

Animals play a crucial role in our agricultural system and require a little more tracking than plants do. An outstanding example of an AI-first agriculture firm is Cattle Eye. The use of cameras and unmanned aerial vehicles (UAVs) for data collecting makes cowshed management easier. Using overhead cameras and computer vision algorithms makes it easy and accurate to track the health and behaviour of animals and keep an eye on significant events like childbirth. Farmers can gain valuable insights into their livestock's health and access to food and water by using remote tracking and observation of their cattle.

Using a variety of farm machinery and equipment

To complete a range of agricultural activities, contemporary farmers employ a variety of farm machinery and equipment. Tractors are regarded as the most important and unique farm power unit among them. Tractors are without a doubt a crucial component of farm mechanization and continuously contribute to the daily increase in agricultural output. The tractor-implement system's performance monitoring is an essential component of the agricultural mechanization system. Tractors with sensors and an integrated navigation system are already common on farms in developed nations. These devices monitor both macro- and microscopic features in the field. These days, with farms becoming more and more networked and internet-capable, it is possible to fully harness the potential of the internet of things and related technologies to monitor tractor performance.

AI Startups in Agriculture

DeHaat

Through a smartphone app and contact centers, the Gurgaon-based business DeHaat offers farmers access to over 3,200 agricultural products along with personalized crop advice based on artificial intelligence for pest and disease control. Farmers may use real-time data to acquire weather forecasts in advance and plan accordingly.

Cropin

Cropin, offers a variety of players in the agritech ecosystem an AI-based intelligence mechanism for resilient and sustainable agriculture. This involves utilizing AI and data analytics to assist farmers in making decisions, as well as third-party ERP systems, manual input through the SmartFarm app, meteorological data gathered from satellites and earth observation, drones, and other Internet of Things devices.

Fasal : Fasal, a full-stack IoT SaaS platform for horticulture. Utilizing machine learning algorithms and on-farm sensors, the platform offers actionable insights tailored to a given crop—all presented in vernacular languages. It

provides a 14-day micro-climatic forecast ahead of time so that customers may plan ahead for erratic weather using data from their farm. Similar to this, the system tracks the water availability in the soil in real-time and uses Internet of Things (IoT) devices buried in the soil to detect the soil's moisture content. This allows for exact irrigation of crops at all times.

Obstacles farmers encounter while implementing AI

- Reluctance to risk and unwillingness to adapt
- A lack of faith in technology
- A lack of university support for digital agriculture and data digitization
- An inconsistent and intermittent supply of electricity
- Inadequate bandwidth and slow network performance, inadequate internet connectivity, inadequate telecommunication networks
- The language barrier, which includes high rates of illiteracy
- A lack of understanding about the return on investment of AI systems
- There are no programs offering financial support to small farms

Scope

AI is quickly adjusting its different agricultural approaches in the field of agriculture. Computers that mimic human thought processes are said to be using the cognitive computing concept. The technology helps analyze, gather, and respond to various circumstances in order to maximize productivity. Through chatterbot platforms, farmers can receive solutions for clearing land, planting, applying fertilizer, and providing other nutrient supplements for crops. Compared to prior harvests, there has already been an average 30% increase in agricultural yield per hectare. Since many high-tech technologies are only used on large, networked farms, the future of AI in farming will need to be more focused on universal access. Data science and mechanized agricultural products will benefit from increased access and communication with even small farms in remote areas of the world.

CONCLUSION

Even while technology has the potential to completely transform the agricultural industry, one of the biggest problems facing the ecosystem is farmers' lack of technical expertise in operating technology-driven equipment. Developing the digital products, designers must concentrate on the farmers is the best method to address this. The self-governing robots not only increase productivity but also lessen the requirement for needless herbicides and insecticides. In addition, farmers may use drones to efficiently apply pesticides and herbicides on their farms, and plant monitoring is no longer a hardship. that being said, not everyone has benefited equally from the digital economy When it comes to user interface. One potential approach is to offer solutions in the local languages. When it comes to implementing cutting edge technology, small-scale farmers are mostly concerned with the cost and quality of the equipment and sensors.

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