



Review Article

IMPORTANCE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN AGRICULTURE

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Abstract: Artificial intelligence technologies are the future of agriculture. There is an ocean of opportunities in Artificial intelligence technology in the field of agriculture, from soil testing to crop monitoring. Some of the ongoing projects are doing so well that, some of them can even claim an augment of 30 to 35% in overall yield. Artificial intelligence technologies can be one of the major factors determining the scope of agriculture in the upcoming future. The use of Artificial intelligence is likely to bring about a revolutionary change in the field of agriculture. Machine learning is the current technology which is advantageous for the farmers as it helps them to mitigate the losses by providing methods of effective farming with the use of little manpower to produce high quality yield.

Keywords: Artificial Intelligence, Machine Learning, Agriculture Robotics

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Introduction

The population of the world is increasing very rapidly which ultimately increases the demand of food. AI (Artificial Intelligence), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. With the rapid advancement in technology, artificial intelligence in agriculture has brought a revolution. Artificial intelligence in agriculture not only helps farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality while using fewer resources. Artificial intelligence can improve crop management practice and have potential to solve the challenges farmers face such as climate variation, an infestation of pests and weeds that reduces yields [1]. What makes humans different from other animals is their ability to think, Mould and use tools to get a fringe benefit. Almost all tools that humans have invented till date are nothing but extensions of their own natural senses. Let's take an example of a telescope, which is just an extension of our eyes. Artificial intelligence is also a tool extending our reach to think and store valuable data and information and use them effectively [2].

Now, Computers can do many things, but can they think? The idea of creating a machine that thinks goes back to the 17th century, with the invention of mechanical calculators. If machines could mirror our logical processes, weren't they thinking? With the move to electronic computers, we have been able to model neural structures and create increasingly more complex algorithms that can beat our best minds at strategic games, such as chess, and make novel scientific discoveries. But what do these machines think? What would it mean to have a computer that became sentient, that had an internal life and feelings? Would such a machine become human?

The idea of artificial intelligence is interwoven in contemporary minds with computers, but it predates electronic computing. Possibly the most important name associated with artificial intelligence is that of the British mathematician Alan Turing. The answer to this question is what is known as the Turing test.

According to Turing, the true test of artificial intelligence is to play a sort of game with a computer. A player types questions into a computer and tries to determine whether the responses received come from another human or a computer. If the respondent is a computer but the player is incapable of determining that fact, then artificial intelligence will have been achieved. We can never get inside of other people's minds. The only way we know that other humans are people like us is by the way they react to us and to the world. If a machine could do the same, then just as we attribute a mind to other people, we would have to attribute a mind to the machine. The first generally accepted passing of the Turing test was ELIZA, a computer programme written in 1965 by Joseph Weizenbaum. ELIZA was a complex programme that allowed for conversational exchanges in natural language. It was set up to simulate a conversation between a patient and a psychiatrist, and it was so successful that many of those who interacted with ELIZA were convinced that it could not be a computer program.

For now, there can be two types of artificial intelligence, i.e., strong artificial intelligence and weak artificial intelligence. To understand these concepts clearly, we have to look into the experiments and explanations given by American philosopher John Searle, who reintroduced the mind into the artificial intelligence question with his famous "Chinese Room" example. In this scenario, Bob, who speaks only English, works in a room filled with books. Slips of paper with Chinese writing on them are slid through a slot in the door, and it is Bob's job to write responses. He does this by locating the written Chinese characters in one of the books. The book then tells him what to do; for example, if it is raining, draw this character. Bob jots down the appropriate characters on the paper and slips it back through the slot. The Chinese speakers who wrote the questions and received answers are engaged in a conversation, but with whom? It's clearly not Bob, who speaks no Chinese. And it seems silly to think that the room understands Chinese, because rooms cannot be intelligent.

Searle uses this example to draw a distinction between strong AI and weak AI. Strong artificial intelligence is intelligence as we experience it internally, that is, having thoughts, feelings, and experiences. Weak artificial intelligence is having a machine that can do the sorts of things we do with our intelligence, such as solving problems, making discoveries, interacting with the environment, and being strategic.

Use of artificial intelligence in the agricultural sector can be path-breaking. Although little explored, use of A.I in agriculture has a lot of potential and is the future of agriculture. The artificial intelligence scenario in India can be looked at in two ways: one which is currently in operation and one which can be used in the future. There are many areas where artificial intelligence can be beneficial, like soil testing growth driven by IOT, detecting crop diseases, monitoring crop health, supply market chain and many more such activities. Also, there are some existing models that use artificial intelligence in the agriculture sector, for example the artificial intelligence sowing applications by Microsoft, E-NAM, etc. Further, in this article, we dive deeper into these topics [3].

Successful ongoing projects in India using artificial intelligence in the field of agriculture

Here are some of the ongoing projects in India which are successfully using artificial intelligence suites, IOTs, and other components to create a better agricultural environment. Some of these projects even claim an escalation of approx. 30 to 35 percent in overall yield. Some of these projects go by the names.

Microsoft's artificial intelligence sowing app

This app makes use of the Microsoft Cortana intelligence suite and Power BI, both of which use A.I-based technology to help burgeon the value of data by converting it into a readily actionable format. It can foresee weather forecasts and connote the approximate upcoming rainfall. According to the local area, it can also envisage the crops which could give a better yield this year by analysing the past data of the area. The app can also generate automated messages which can be directly sent to the farmers on their registered devices. Talking about the data in June 2016, the performance report of the app showed a success rate with satisfactory results. The test was conducted in Andhra Pradesh in which 175 farmers volunteered. The app sent 10 messages in one sowing season to the farmers in their native language about planting time and weather forecasting.

Price forecasting model based on artificial intelligence technologies

The paucity of market knowledge can result in huge loss in farmers' income, since markets are very dynamic in nature it's hard to get every bit of it, so to counter this problem in 2017 tech giant Microsoft and Karnataka agriculture price commission (KAPC) developed a multi-variety commodity price forecasting model by using satellite-imaging and other high level coding, now the question arise how do this model predict the price, so to answer this question Microsoft claims that this model studies the historic sowing data, weather patterns and other relevant data along with GIS and RS data provided by the metrological department of India, it creates a report which gives Karnataka government an idea to set minimum support price in the mandis or the markets, talking about the results, the 2018 harvest season was the first season which this model was used for the first time.

The INFOSYS precision crop management model

INFOSYS pvt.ltd is a Bangalore-based Indian multinational information company that developed a model using IOT (internet of things) which can keep a check on the expeditious growing demand for food in Indian markets. Amalgamated with the data based on changing climate and arable land, the company developed a test bed which will improve crop productivity by studying data collected from the sensors located in the commercial crop fields. Although this technology is still new, it has lots of potential for developing countries like India, where the agriculture sector contributes 13% of total GDP. Now, talking about the agricultural sectors, where the future of artificial intelligence technologies seem quite bright. These are some of the most prominent sectors where we can see the gargantuan impact of artificial intelligence technologies in the subsequent years.

Soil testing and monitoring/ Monitoring soil & Crop Health

Artificial intelligence is an efficient way to identify or monitor possible deficiencies and nutrient deficiencies in the soil. With the aid of these technologies, we can get accurate data on soil testing. While remote sensing requires sensors to be built into an Ariel system to collect data, this can help in determining soil characteristics in a very scrupulous manner.

Crop sowing and crop harvesting

Artificial intelligence can help analyze the sowing and harvesting of crops based on the previous data collected by IOTs and other technologies. We can predict the right time for sowing. It can also estimate the monsoon and send farmers advice on when to harvest [4].

Weed and pest control, as well as crop health

Pest management is one of the most common problems faced by farmers throughout the world. About 75 to 85% of the losses that occur in agricultural practices are due to the lack of weed management and improper pest control. A.I can play a major role in pest control practices, the latest example being the blue river technologies (currently under John Deere & Co) and the "see & spray" in Marianna, Arkansas, USA, which claims to have reduced the expenditure on weedicides by around 90%, mitigating the need for weedicides used per acre from 20 to just 2 gallons.

Image-based insight generation

Drones are the new innovations that are getting popular very rapidly. Drones equipped with IOTs can play an indispensable role in upcoming Indian agriculture. Technologies like thermal scanning can play a very vital role in modern day agriculture. Artificial intelligence based drones can give real-time data to farmers about their crop growth and potential upcoming threats, which are likely to result in a loss of economic yield.

Optimal mixture of agriculture products

To have a better and surplus agriculture yield, it's important to know and have the right proportion of chemicals that are to be applied in the field. One of the most common problems faced by farmers is improper ratios of the mixtures. Artificial intelligence mixing technologies can help us to get the most accurate ratios, which can be effectively used in fields to get the best possible results.

Timely irrigation and helps avoid over irrigation

To have better plant growth along with a good quality production, timely irrigation is a must. But, at the same time over irrigation should be avoided at any cost. The major problem faced by the farmers is- when and in what quantity to irrigate. A.I can play an effective role for the timely irrigation of the crops, by determining the correct time and interval for irrigation, which includes lifesaving irrigation.

Gramophone (Agstack Technologies)

They use image recognition skills to help farmers get the right information, methods & materials at the right time to get the harvest possible. Artificial intelligence can also be used to predict pest and diseases, predict food prices to maximize productivity and recommend farmers to produce.

Some of the benefits of artificial intelligence and machine learning are -

1. A.I accelerates decision making.
2. It reduces costs.
3. It helps to gain deeper insight.
4. It ensures an increase in supply chain agility.
5. It improvises the forecast accuracy.

Conclusion

Although little explored, the use of artificial intelligence in the agricultural sector seems to have a bright future, and the upcoming results could be a pioneering one. Despite being explored very little, the use of A.I. in agriculture has a lot of potential and is the future of agriculture. In terms of employment, A.I. will assist farmers in finding better jobs and thus, improving their quality of life.

Application of research: Artificial Intelligence and Machine Learning in Agriculture

Research Category: Agriculture Artificial Intelligence

Abbreviations: A.I.- Artificial Intelligence, IOT-internet of things

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