

AI in Agriculture using Predictive Analytics

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Abstract: *Artificial intelligence is intelligence build by machines, unlike the natural intelligence reflected in humans and animals, which involves consciousness and emotionality. The comparison between the former and the latter categories is often disclosed by the acronym chosen. Artificial intelligence is the ability to perform tasks similar to those of a digital computer or computer - controlled robot. The term is frequently used to refer to a project to develop systems with human characteristics, such as finding meaning, generalizing, or learning from past experiences. Predict the future of your business using data is called Predictive analytics. For example, you can use predictive analytics to answer questions like, "What is the probability that the sale increased in the next month as per the performance, or "What is the total value of students get admission in the next month?". Prescriptive, descriptive, and predictive analytics maintain specific activity information.*

Keywords: Predictive Analytics, AI, AI Application, Farming Industry, Technology, Crop Yield, Merits,etc.

I. INTRODUCTION

Artificial Intelligence (AI) is one of the main areas of research in computer science. AI solves problems very rapidly because of its robust applicability, rapid technological advancement and vast area of application in the problems particularly that cannot be solved well by humans as well as traditional computing structures.

Farming and agriculture are most standard and intelligent professions in the world. Humanity has come a long way for developing farms and growing crops with the introduction of various technologies. As the world population continues to grow and land becomes scarcer, people have needed to get creative and become more alert and efficient about how we farm to produce more crops in less land and increasing the productivity and yield of those farmed acres.

Predictive analytics is one of the most exciting technologies presently being used, transformed and developed. These methods are used for verification of what has happened in the past, present and future on the farm, predict the future and make decisions using data that impact the root and end use of on-farm products.

Predictive analytics is the reality to make decisions on data and information to improve agronomic opportunities, such as timing of applications, product decisions, amounts of products, and profitability of decision making not just a buzz word and are all being utilized today with innovations coming constantly.

By learning from historical and future data based on measured variables, management and outcomes of decisions greatly impact efficiencies and processes. This is very hard task, true datasets are required to take decisions and recommendations about the future that have high confidence from field to field, even acre to acre, and within acre variability.

II. LITERATURE REVIEW

Many researchers have analyzed different data classification algorithms in various aspects. PA AI technology is used to help detect plant diseases, pests and poor plant nutrition on farms. AI sensors can detect and target weeds while deciding which herbicides to apply within the correct buffer - preventing the application of herbicides and herbicide resistance.

D. G. Panpatte, Artificial Intelligence in Agriculture: An Emerging Era of Research, Anand Agricultural University, 2018. agriculture plays a significant role in the economic sector. Automation in the agricultural sector is an emerging problem around the world[1].

<https://www.forbes.com/sites/cognitiveworld/people/kathleenwalch/?sh=303a19126ee5a> leading analyst firm focused on application and use of artificial intelligence (AI) in both the public and private sectors[2].

Agrawal et al. (1980) Weekly data using climatic parameters describe the phenomena of time limit regression models for predicting paddy yield in Raipur district.[3].

"Agricultural technology". Encyclopedia Britannica. Retrieved 2020-12-23. Agricultural technology is the use of technology in agriculture, horticulture and aquaculture with the aim of improving yields[4].

Y. Radhika and M. Shashi,[6],analyze the "Atmospheric temperature prediction using support vector machines,".Management-decisions business/2021/01/09[5],help farmers for business decision making.

www.analyticssteps.com/blogs/7-advantages-ai-agriculture,Introduce the merits followed by in agriculture[9]

E. Rich and Kevin Knight. "Artificial intelligence", New Delhi: McGraw-Hill, 1991, AI is becoming pervasive very rapidly because of its robust applicability in the problems particularly that cannot be solved well by humans as well as traditional computing structures [10].

D.N. Baker, J.R. Lambert, J.M. McKinion, -GOSSYM: A Simulator of Cotton Crop Growth and Yield, Technical Bulletin,

The application of computers in agriculture was first reported in 1983 [11].

P. Martinello, "Development of a database computer management system for diversified field evaluation of agriculture and retrieval of plant breeding information," Computers and Electronics in Agriculture, Vol 2 no. 3, pp. 183-192, 1988.Different approaches have been suggested to solve the existing problems in the agriculture starting from the database[12].

Braltz, et al., "An Expert System for the Hydraulic Analysis of Micro Irrigation Systems," Computers and Electronics in Agriculture, Vol. 9 No. 4, pp. 275-287, 1993. This section highlights some researches carried out in soil and irrigation management assisted by artificial intelligent techniques.[13]

III. PREDICTIVE AGRICULTURE

A farmer must make predictions before planting crops or selecting animals for breeding, more than 10,000 years' experience is important to make these predictions and in the last 100 years, scientists have developed many measurement and mathematical insights about the climate and soil drivers of environment and the genetics and physiology of crops.

However, in the digital world, decision-making is increasingly predictive using technologies such as automated planting and harvesting technology that provide more precise information such as genetic markers for breeding values and improving operational efficiencies

Predictive agriculture differs from precision agriculture in its scope.

Predictive agriculture also integrates a vast array of agricultural, biological, climate, and hydrological data and sources into a full system model and using artificial intelligence and algorithms to predict outcomes, manage inputs, and plan for system shocks and changes.

IV. PREDICTIVE ANALYTICS –ENABLE RIGHT DECISION MAKING

A. Predicting the best time to sow

The difference between a profitable year and a failed harvest is information on a simple data point of timing of sowing the seed. Scientists of ICRISAT used a predictive analytics tool to arrive at a precise date for sowing the seeds to obtain maximum yield. It gives insights on soil health and fertilizer recommendations in addition to a 7-day weather forecast.

B. Crop yield predictions and price forecasts

Price fluctuation of the crop is the biggest worry of farmers. Due to unstable prices, farmers are never able to plan a definite production pattern like tomatoes that have very limited shelf time. Companies are using satellite and weather data to monitor crop health on a real-time basis. AI using innovative start-ups in the field of agriculture. Multi-lingual plant disease and pest diagnostic app developed by a Berlin-based agricultural tech start-up, which uses various images of the plant to detect diseases; a smart phone collects the image is matched

to a server image, which then makes a diagnosis of that particular disease and applies it to the crop using an intelligent spraying technique.

V. PREDICTIVE ANALYTICS HELP FARMERS MAKE MANAGEMENT DECISION

A.ST. LOUIS

Developing Predictive Analytics is a way for farmers to make better management decisions for their operations. “Predictive Analytics is really an area where we need to work harder,” said Grant Strom, owner of the Strom Family Farm, which grows on less than 6,000 acres.

“We have done a good work of collecting data for the last two decades,”. Strotm said in a presentation on the entire spectrum of technology of the Agricultural Fertilizer Institute. Many companies have done one marvelous job of helping farmers with data collection for planting, harvesting and fertilizer applications, Strom said. “What has really achieved over the last two or three years is crop health monitoring using the available technology,”Strom said. The last two or three years is crop health monitoring using the most available technology," Strotm said. “Growing days should be checked from the beginning to the end of growth and fertilizers should be applied at specific crop stages.

B.J.R. SIMPLOT

Consumers demand more about the quality of the food they eat, as well as understanding the customs network of that food, including the inputs that went into the collection growing That meal, said Doug Stone, president of Agribusiness at JR. Simplot involves many levels of agriculture and the food supply chain. This desire affects all connections in the agricultural network and touches on food security and discovery and sustainability efforts, said Stone, a third member the discussion group during the conference. In Simplot, we talk about our company's unique mines and their capabilities, and we move forward to understand these connections and needs within our business capture various data through these systems. The amount of data in the agricultural supply chain is monumental, Stone said. Our focus on farm data is to help our crop advisors add more value to our farming customers,” he said. While achieving sustainable and environmental goals, it is in the form of nutritional recommendations, forecast analysis, and precision farming.

Simplot sees the opportunity to use technology and data for efficient distribution of products. We believe this will help the farmer experience while removing costs and waste from the system. Stone said. Today is a very exciting time to be in the agricultural field,”he said. “It's amazing how we grow grains, increase protein, and transform food supply, technology and data into a safer and more accessible food for consumers.

VI.MERITS OF AI IN AGRICULTURE

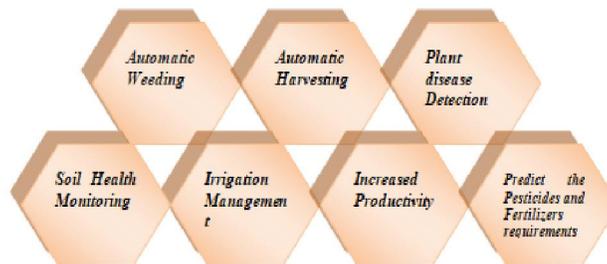


Figure 6: Merits of AI in Agriculture

A. Automatic Weeding

Weeds are wild plants that grow automatically in the field and stunt the growth of the main food crop. By increasing the damage to the main crop, the weeds make the main plant more susceptible to pest attack. In traditional methods, farmers used manpower to remove these weeds. But the advent of AI has opened up another

avenue for farmers, known as automatic weeding. Automatic weed control robots and machines are used to remove weeds from the field. This is done using laser lights. Robots and AI machines survey to the entire field. They are equipped with cameras. These cameras are embedded in weed detection software. Recognized, AI commissioned its high-energy lasers to exterminate these weeds using thermal energy.

B. Automatic Harvesting

Harvesting is the process of collecting important parts of a crop for personal and business gain. But AI uses machines and software for this purpose. The software enables the camera to be identify harvest products. Harvest products include fruits or vegetables. After analyzing the targeted products, the machine commands AI to select and collect them. In recent years, these machines have been used for the collection of peppers, spinach, tomatoes, apples and other fruits.

C. Plant Disease Detection

Another advantage of AI is that it helps to identify plant and crop diseases. Many such AI applications are available online. These applications help in detecting the plant health problems. After analyzing the problems, these applications find solutions to them through the internet. AI follows the technology of image recognition to implement an intelligent farming solution. The image of the plants captured by the camera is operated by an image recognition software. The software generates more information, control methods and treatment.

D. Soil Health Monitoring

Soil is the basic requirement of agriculture. The soil helps in the growth of plants and crops. A healthy nutritious soil enables plants to grow efficiently and profitably. Therefore, it is equally important to find the soil deficiency to prevent net yield loss. Conventional analysis techniques are not efficient enough to give desirable results. But its shortcomings are covered by AI software. AI analysis tools take a pinch of soil samples. The sample is analyzed in the lab using various machines and procedures.

E. Irrigation Management

Irrigation is another essential requirement for agriculture. Different crops have to different water requirements. Excess water is harmful to crops, so inadequate quantities to be reduced. Almost 70% of the total water use is under irrigation. Therefore, it is essential to use this valuable resource efficiently and optimally with technologies and development to ensure minimum waste.

AI solves this problem, and the drones are equipped with software that uses advanced analytics. AI tools collect high-resolution aerial images and collect information about the irrigation systems needed for the fields. AI also helps to reveal problems such as soil blockages and leaks.

It assesses the poor condition of the soil and its condition. Issues related to soil and irrigation management are very important in agriculture. Improper irrigation and soil maintenance can lead to crop failure and poor quality. This section highlights some of the research done on soil and irrigation management with the help of artificial intelligence technologies. Bratz et al. Developed a legal expert system to evaluate the design and performance of micro-irrigation systems

F. Increased Productivity

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G. Predict the Pesticides and Fertilizers Requirements

By studying the features of the field. AI helps to analyze the pesticide and pesticide requirements as per the field. AI can detect even a small change in this area. AI software helps identify pests and plant health problems. This improves soil fertility and saves extra use of pesticides and herbicides depending on the particular field. AI not only monitors the crops but also helps in spraying pesticides and determining weeds in the field. Spraying chemicals with drones not only makes it more effective, but also reduces the effort and manpower of humans.

VII. AI STRENGTHENING THE FUTURE OF FARMING

According to Zion market research smart Agriculture strengthening the future of AI in the farming industry. The world population is expected to grow 9 billion by 2050 and there will be a shortage of food and farming lands are decreasing at a higher rate. AI in farming can generate USD 2,072 by 2024. With the availability of tech applications like agricultural drones, robots for farming, driverless tractors, facial recognition in crop health monitoring systems, and automated irrigation systems have made the agricultural sector the cusp of a technology revolution.

AI can help the farmers in growing healthier crops, pest control, determining soil conditions, and growing conditions. Today's advanced world smart agriculture has the potential to change the chain of the entire food life cycle. AI applications in agriculture are segmented into technology applications, regions, and soil components that are changing the dynamics of farming and used in different regions of the globe.

VIII. CONCLUSION

Before planting crops and selecting animals for breeding every farmer make predictions and it is also a part of agriculture. Artificial Intelligence helps to precise cultivation for higher crop yield and better quality while using fewer resources than helping farmers to automate their farming. Making more innovative machines in this sector helping the world resolve food production issues for the growing population. Companies provide training for agriculture, drone, and automated machine will get technological advancement in the future and improving machine learning or Artificial Intelligence-based products or services.

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