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A REVIEW :

Artificial intelligence - The promise for an agricultural revolution in new era

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SUMMARY : Agriculture is slowly becoming digital. The adoption of Artificial Intelligence (AI) and Machine Learning (ML) both in terms of agricultural products and in-field farming techniques are increasing. Artificial Intelligence in agriculture is emerging in three major areas, namely agricultural robotics, soil and crop monitoring and predictive analytics. The use of sensors and soil sampling techniques are increasing day by day which helps in gathering of data. In turn, this data is stored in farm management system which is better processed and analysed. Thus, the data available along with other related data paves a way to successfully deploy AI in agriculture. AI in agriculture is emergingin cognitive computing and it has all the scope to become the most disruptive technology in agriculture services as it is able to understand, learn and respond to different situations (based on learning) to increase efficiency. The areas where the use of cognitive solutions can benefit agriculture are growth driven by IOT, image-based insight generation, identification of optimal mix for agronomic products, health monitoring of crops and automation techniques in irrigation and enabling farmers. In addition, the drone based solutions have significant impact in terms of productivity gains, coping with adverse weather conditions, yield management and precision farming.The emergence of new age technologies like Artificial Intelligence (AI), Cloud Machine Learning, Satellite Imagery and advanced analytics are creating an ecosystem for smart farming. Fusion of all this technology is enabling farmers achieve higher average yield and better price control.

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BACKGROUND AND OBJECTIVES

The domain of agriculture faces many challenges such as disease and pest infestation, improper soil treatment, inadequate drainage and irrigation and many more. These leads to serious crop loss along with environmental hazards due to excessive use of chemicals. The field of artificial intelligence with its rigorous learning capabilities have become a key technique for solving different agriculture related problems. Systems are being developed to assist the agricultural experts for better solutions throughout the world. This paper addresses the application of artificial intelligent techniques in the agriculture.

Importance of artificial intelligence:

Artificial intelligence is applied in agriculture nowadays and we can see how it

has affected the perception of farmers towards farming. The introduction of artificial intelligence have helped farmers to carryout efficient monitoring of crops, resulting in high quality output and ensuring better market opportunities.The artificial intelligence coupled with digital tools provide the way for uplifting the farming community through the opening of new entrepreneurship by enabling them to run smart farms.

IOT (Internet of Things) :

IOT technologies involves the process of data collection and these data is related to the historical data on weather pattern, soil reports, new research, rainfall, pest information, images from drones and cameras and so on. Cognitive IOT solutions can serve all this data and provide strong insights to improve yields.

Artificial intelligence in agriculture:

Agriculture is slowly becoming digital. The adoption of Artificial Intelligence (AI) and Machine Learning (ML) both in terms of agricultural products and in-field farming techniques are increasing. Artificial Intelligence in agriculture is emerging in three major areas, namely agricultural robotics, soil and crop monitoring, and predictive analytics. Farmers are increasingly using sensors and soil sampling to gather data and this data is stored on farm management systems that allows for better processing and analysis. The availability of this data and other related data is paving a way to deploy AI in agriculture. AI in agriculture, is raising in cognitive computing and it is all set to become the most disruptive technology in agriculture services as it can understand, learn, and respond to different situations (based on learning) to increase efficiency.

Agricultural robotics:

Agricultural robots automate slow, repetitive and dull tasks for farmers, allowing them to focus more on improving overall production yields.Some of the most common robots in agriculture are used for harvesting and picking, weed control, autonomous mowing, pruning, seeding, spraying and thinning, phenotyping, sorting and packing and utility platforms.Companies are developing and programming autonomous robots to handle essential agricultural tasks such as harvesting crops at a higher volume and faster pace than human laborers.Harvesting and picking is one of the most popular robotic applications in agriculture due to the accuracy and speed that robots can achieve to improve the size of yieldsand reduce waste from crops being left in the field.

Crop monitoring:

Remote sensing techniques along with hyper spectral imaging and 3rd laser scanning are essential to build crop metrics across thousands of acres. It has the potential to bring in a revolutionary change in terms of how farmlands are monitored by farmers both from time and effort perspective.The entire crop life cycle can be monitored with this technology which includes report generation in case of anomalies. By scanning a crop using both visible and near-infrared light, drone-carried devices can help track changes in plants and indicate their health and alert farmers to disease. It can be expected that one day UAVs may consist of autonomous swarms of drones, collecting data and performing tasks.The biggest obstacle to that becoming a reality is sensors capable of collecting high-quality data and number crunching software that can make that high-tech dream a reality. By producing precise 3-D maps for early soil analysis, drones can play a role in planning seed planting and gathering data for managing irrigation and fertilizer levels.To monitor soil and crop health, companies are leveraging computer vision and deep-learning algorithms to process data captured by drones and/or software-based technology.

Predictive analytics:

It consists of numerous different statistical abilities from modelling, machine learning and data mining. The method here is analyzation of what has happened in the past on the farm, as well as what currently is happening and is going to happen, to make use of the data to predict the future and make decisions that results in the better application of different technologies. Predictive analysis to be successful, it requires good data. The data provided from the field sensors, collection of input data at each level and economic functions of decisions will continue to be critical for success of predictive analytics.

Predictive analytics approach helps to handle a wide range of issues on inputs and spatial variation. Factors that must be considered when developing a predictive analytics solution for agriculture.

Understand the entire crop production process:

Farming is a process which involves a lot of dynamic

variables, particularly weather. That's why there is no single magical bullet for farming. So for any analytics solution, there is a need to understand the entire process and workflow.

Determine the most valuable insights:

The vivid idea on crop production, will help to point out the factors of alternatives in decision making, *viz.,* time, cost and potential impact of each decision.

Build a broad dataset:

A broad array of crop, soil, climate, agronomic practices and real-time data from in field sensors are required by the solution providers to exploit predictive analytics.

Generate insights that are actionable:

Insights should be actionable/ practical. The ways and means of implementation of insights should be accounted properly.

Keep refining the models:

The agriculture is carried out in different seasons - dry or wet, hot or cold, early or late.The weather continually changes as do the seed varieties and available data sources.This is where big-data and machine-learning methods come into play and allow continuous improvement of the models as more information becomes available.

Currently used AI technologies in agriculture :

Blue river technology:

It is a California-based startup. Here the computer vision identifies each individual plant, decides how to treat each individual plant and robotics enables the smart machines to take action.The use of sensors that detect weeds, the type of weeds and the right herbicides to apply within the right buffer around the plant. Precision spraying can help prevent herbicide resistance.

Farmbot:

In Farmbot, ranging from seed plantation to weed detection and soil testing to watering of plants, everything is taken care of by this physical bot using an open source software system.

Harvest CROO robotics – Crop harvesting:

Harvest CROO robotics has developed a robot to help strawberry farmers pick and pack their crops.Strawberries need to be picked in a certain time period and hence qualified pickers are needed.

Plant diseases diagnosis app – Plantix:

The Berlin-based agricultural tech startup PEAT developed the Plantix app that identifies potential defects and nutrient deficiencies in soil.In the app, images are used to detect plant diseases wherein a smart phone collects image which compares with a sever image and the diagnosis of the plant health is done.Thus, application provides solution for the plant diseases by the use of AI and machine learning.

Conclusion:

Global population is expected to reach more than nine billion by 2050 which will require an increase in agricultural production by 70 per cent in order to fulfil the demand. Only about 10 per cent of this increased production may come from availability of unused lands and rest of 90 per cent should be fulfilled by intensification of current production. In this context, use of latest technological solutions to make farming more efficient, remains one of the greatest necessities. Artificial intelligence helps to develop smart farming practices to reduce loss of farmers and improve the yield in terms of quality and quantity.

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