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Role of Artificial intelligence (AI) in Agriculture

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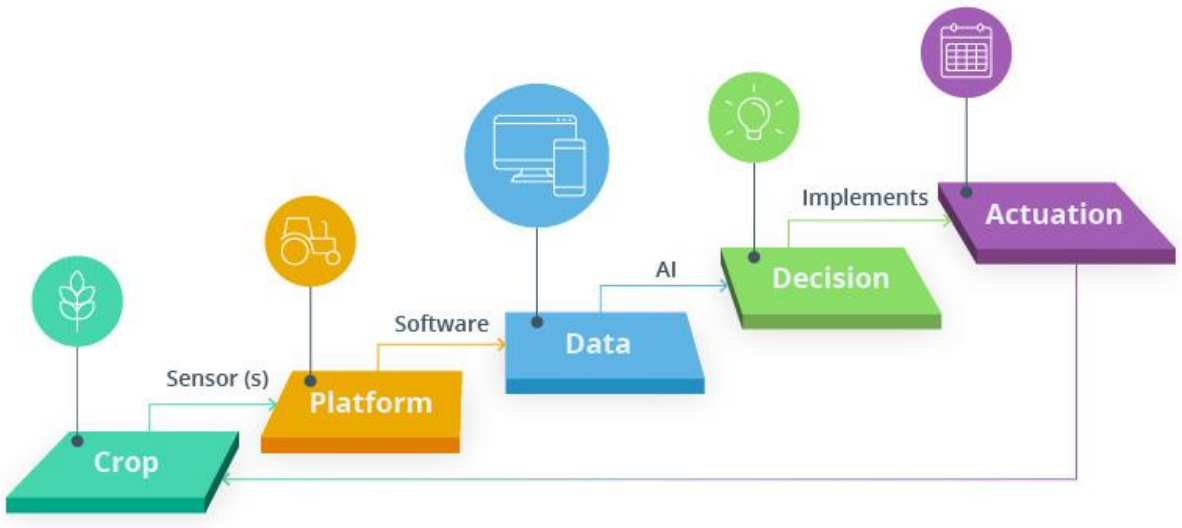
In the past, India has performed tremendously in the agriculture sector, despite a tough challenge like Covid. Now turn is to make the agriculture high-tech with the adoption of new techniques without hesitation. In 21st century artificial intelligence has the power to completely changed the scenario of agriculture. Artificial intelligence has been a part of our lives for longer than many of us realize. If you've asked Siri a question, told Alexa to turn off the lights, you've experienced artificial intelligence in action. From agricultural robotics to soil and crop monitoring to predictive analytics, AI is becoming an integral part in the agriculture industry's fight to feed the future sustainably in the face of climate change.

What is artificial intelligence?

AI is commonly defined as a machine's ability to perform cognitive functions we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, and even exercising creativity. Some of the emerging technologies that enable AI to solve agricultural problems include robotics, computer vision, and machine learning.



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Practical application of AI in agriculture

The use of AI in agriculture has the potential to revolutionise the industry by allowing farmers to produce more with less work while reaping numerous additional advantages. But AI is not a self-contained piece of technology. AI can be used to enhance currently in use technology as the next stage in the transition from conventional to innovative farming. We'll examine some of the most innovative AI developments that are reshaping the agricultural industry, which are listed below:

Crop and soil monitoring:

Micro and macronutrients in the soil are critical factors for crop health and both the quantity and quality of yield. Then, once crops are in the soil, monitoring the stages of growth is also essential to optimizing production efficiency. It's vital to understand interactions between crop growth and the environment in order to make adjustments for improved crop health. Now, traditionally soil quality and crop health were determined by human observation and judgment. But this method is neither accurate nor timely. Instead, we can now use drones (UAVs) to capture aerial image data, and train computer vision models to use this for intelligent monitoring of crop and soil conditions. Visual sensing AI can analyse and interpret this data to:

- track crop health
- make accurate yield predictions.
- detect crop malnutrition much faster than humans

Overserving and estimating crop growth and maturity is hard, labour-intensive work for farmers. But AI is proving capable of handling much of that work with both ease and impressive accuracy.

Insect and plant disease detection

Farmers can find it challenging to identify the correct pathogens, as well as to decide the economical threshold that requires a treatment program. Using image recognition technology based on deep learning, we can now automate detection of plant diseases and pests. This works using image classification, detection, and image segmentation methods to build models that can "keep an eye" on plant health.

Livestock health monitoring

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So far we've focused mainly on plants, but there's more to agriculture than wheat, tomatoes, and apples. Animals are another major component of our agriculture systems, and they tend to need a bit more tracking than plants. Closely monitoring animal health using sensors with smart interpretation of data using artificial intelligence enables real-time monitoring of livestock. Alerts are sent to the farmer to resolve any problems, ultimately improving welfare with improved management.

Intelligent spraying

UAVs equipped with computer vision AI make it possible to automate spraying of pesticides or fertilizer uniformly across a field. Drone imagery enables targeted action on nutrient and pesticide applications. With real-time recognition of target spraying areas, UAV sprayers are able to operate with high precision both in terms of the area and amount to be sprayed. This significantly reduces the risk of contaminating crops, humans, animals, and water resources. While the potential here is great, currently some challenges still exist. For example, spraying a large field is much more efficient with multiple UAVs, but assigning specific task sequences and flight trajectories for individual crafts can be tricky.

Automatic weeding

Intelligent sprayers aren't the only AI getting into. There are other computer vision robots taking an even more direct approach to eliminating unwanted plants. Now, spotting a weed in the same way that computer vision can spot an insect or oddly-behaving chicken doesn't actually eliminate very much work for the farmer. To be of even greater help the AI needs to both find and remove the weed. Being able to physically remove weeds not only saves the farmer quite a bit of work, but also reduces the need for herbicides and thus makes the whole farming operation much more environmentally friendly and sustainable.

Aerial survey and imaging

AI can analyse imagery from drones and satellites to help farmers monitor crops and herds. That way they can be notified immediately if something looks amiss without having to constantly observe the fields themselves. Aerial imaging is also useful for boosting the precision and efficiency of pesticide spraying. As mentioned previously, ensuring that pesticides only go where they're intended saves money as well as the surrounding environment.

Produce grading and sorting

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Finally, AI computer vision can continue to help farmers even once the crops have been harvested. Just as they are able to spot defects, disease and pests as the plants are growing, imaging algorithms can also be used to sort "good" produce from the defective. By inspecting fruit and vegetables for size, shape, colour, and volume, computer vision can automate the sorting and grading process with accuracy rates and speed much higher than even a trained professional.

Market demand analysis and risk management

AI can simplify crop selection and help farmers identify what produce will be most profitable. Farmers can use forecasting and predictive analytics to reduce errors in business processes and minimize the risk of crop failures.

Conclusion: With considerable changes occurring in our climate, environment, and global food needs, AI has the ability to transform 21st century agriculture by:

- Increasing efficiency of time, labour, and resources.
- Improving environmental sustainability.
- Making resource allocation "smarter".
- Providing real-time monitoring to promote greater health and quality of produce.

Of course, this will require some shifts in the agricultural industry. Farmers' knowledge of their "field" will need to be translated into AI training, and this will depend on greater technical and educational investments within the agricultural sector.