

Role of Artificial Intelligence in Insect Pest Management

Shraddha Tare, Naveen and Neeraj Kumar

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Introduction

According to the contemporary psychologist Robert Sternberg- Intelligence is the mental activity directed towards purposeful adaptation, selection, and shaping of real world environments relevant to one's life. If we add the word artificial to it, Artificial Intelligence (AI) can be understood as a machine programmed to adapt, select and shape the real environment relevant to a specific purpose. AI is the revolution of 21st century, and the agriculture industry is one among the most influenced sectors. This particular article is about the role of AI in insect pest management.

Why Artificial Intelligence?

The shoulders of the agriculture sector are heavier than ever before. Ever-increasing population, drastic climate changes, rapid urbanization, unpredictable pest outbreaks and disease pandemics are all at once creating tremendous pressure on the agriculture sector to produce more



and better yield in less time and on lesser area. Long term shifts in temperature (global warming) and random weather patterns are driving severe pest outbreaks on regular basis. According to FAO estimates, we are losing 20-40 percent crop production annually due to insect pest outbreaks. Traditional technologies are falling short. In resolving problems of such high caliber, another revolution in agriculture sector is inevitable. Implementing AI in the agriculture sector on a global basis can prove to be the most promising opportunity.

How to Artificial Intelligence?

Effective insect pest management requires correct identification, monitoring and examining sensitive stages of pest, so that specific control tactics can be implemented. Meanwhile this requires intensive field observations and data mining. Applying AI algorithms can help achieve this by using AI techniques such as machine learning and big data.

Applications of Artificial Intelligence

1. Drones:

A drone is a flying robot which can either be controlled by remote or flies autonomously using software-controlled flight plans in its systems that work in association with onboard sensors and a



Global Positioning System (GPS) which helps in efficient crop monitoring, in-depth field analysis and long distance spraying.

Types of drones:

- Sensing drones: Detection of pest hotspots, which could reduce the time required to scout pests.
- Actuation drones: Precise spraying of solution, which could reduce the area, where pesticide applications are necessary.

2. Autonomous Early Warning System for Oriental Fruit Fly (*Bactrocera dorsalis*) Outbreaks:

This system, made on wireless sensor and GSM networks, effectively captures long-term and up-to-the-mark environmental fluctuations in fruit farms. Self-organizing maps and vector machines are also incorporated to perform adaptive learning and automatically issue a warning message to farmers and government officials via GSM networks when the population density of *B. dorsalis* crosses a particular limit.

3. Smartphone Applications like Farm shorts:



Your farm in your hands”- an application which derives high resolution images via satellite or drones to locate damage caused by pests, disease and nutritional deficiencies in crops. Enabling farmers to efficiently fix the respective problem before it's too late. It has also come up with the advantage of surveying fields’ right from the smartphone. Anytime Anywhere

4. Plantix:

An app powered by the Strey’s Berlin-based startup PEAT GmbH, applies machine-learning and scientific image data supplied by ICRISAT and local research institutions to bring 75,000 daily users information about pests and diseases with accuracy in detection of 85 percent and helps diagnose pest damage, plant disease and nutrient deficiencies by taking a photo of their affected crop and help farmer minimize their crop loses.



Implementation of AI: Government initiatives

Since AI is an integrated and interconnected approach, only large scale government initiatives can implement it successfully in the present scenario.

1. Kisan Drones: Custom hiring centers provide drones on rental basis at nominal price.
2. Giving training to farmers and youth via extension activities about the operation of drones.
3. Ongoing projects of government for AI implementation:
 - CROPSAP- Crop Pest Surveillance and Advisory Project, Maharashtra
 - HortiSAP- Horticulture Pest Surveillance and Advisory Project, Maharashtra
 - OPMAS- Online Pest Monitoring and Advisory Services.
 - Pest and disease dynamics in relation to climate change.
 - e-National pest reporting and alert system for Pigeon pea and chickpea.

Benefits of Artificial Intelligence in pest management:

- Resource conservation through precision farming.
- Saves time in identification and taking action against notorious pests.
- Informed decision making based on real time data and scientific algorithm.

- Proper resource utilization cuts cost manifold and ensure better yield.



Challenges with Artificial Intelligence:

- Comparatively high initial cost, which will reduce over time as more and more farmers will embrace the new technology.
- Lack of technical knowledge and systematic training for farmers.
- Ignorance towards new knowledge and fear in adopting new technology.
- Privacy and security issue.

Conclusion:

Technological breakthrough like artificial intelligence is indeed revolutionizing every industry and agriculture is also one such domain. Global scenario of climate change is acquainting agriculture with massive insect pest outbreaks demanding an intelligent approach and execution of innovative methods. Artificial intelligence helps farmer in accurate decision making by providing real time solution to specific problem making it economically feasible and environment friendly. This is how AI is going to reshape agriculture sector into new dimensions and have the potential to open new pathways towards a better and brighter future.