



An integrated Approach Artificial Intelligence (AI) in Botany

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Manuscript details:

Received: 09.04.2026

Accepted: 25.05.2026

Published: 30.05.2026

Cite this article as:

Yogita S. Patil (2026) An integrated Approach Artificial Intelligence (AI) in Botany, *Int. J. of Life Sciences*, 14 (1A): 367-369.

<https://doi.org/10.5281/zenodo.20685520>

Available online on <http://www.ijlsci.in>

ISSN: 2320-964X (Online)

ISSN: 2320-7817 (Print)



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ABSTRACT

Artificial Intelligence (AI) is progressively changing the field of botany by enabling quicker, more exact, and data-driven examination of plant systems. Through methods such as machine learning, deep learning, and computer vision, AI supports automated plant identification, disease and pest detection, phenotypic characteristic investigation, and prediction of plant development and efficiency. The integration of AI with inaccessible detecting, genomic information, and natural checking has upgraded exactness farming, accelerated plant breeding programs, and moved forward biological system management. Besides, AI-based models help in understanding plant reactions to climate change and in conserving endangered species by analyzing large-scale environmental datasets. In spite of challenges related to data quality, model interpretability, and availability, AI presents significant opportunities to advance botanical investigate and advance economical plant management.

Keyword: Artificial Intelligence (AI), Botany

INTRODUCTION

Botany, the scientific study of plants, plays a crucial part in agriculture, environmental conservation, medicine, and ecosystem sustainability. With the quick development of advanced innovations, Artificial Intelligence (AI) has risen as a effective instrument for improving botanical research and plant management practices. AI refers to computer frameworks capable of performing assignments that regularly require human intelligence, such as learning, pattern recognition, and decision-making.

In later a long time, the application of AI in botany has extended essentially due to progresses in machine learning, deep learning, and information analytics. These technologies enable the productive examination of large and complex datasets generated from plant pictures, genomic arrangements, climate records, and inaccessible detecting stages. As a result, conventional botanical forms that were time-consuming and labor-intensive can presently be performed with more prominent speed and accuracy.

AI-driven systems are being utilized for plant species distinguishing proof, early discovery of illnesses and bothers, checking of plant development, and expectation of edit surrender. In expansion, AI underpins accuracy agribusiness by optimizing the utilize of water, fertilizers, and other assets, in this manner advancing economical rural hones. The innovation too contributes to plant breeding and preservation endeavors by recognizing alluring characteristics and anticipating plant reactions to natural changes.

Overall, the integration of AI into botany speaks to a critical headway in plant science. It not as it where upgrades inquire about effectiveness but moreover addresses worldwide challenges such as nourishment security, climate alter, and biodiversity preservation.

Applications of AI in Botany

Plant identification & classification:

AI models especially computer base can identify plant species from leaf, flower, seed or algae images—often faster and more accurately than humans. AI systems identify plants by analysing visual and biological patterns and matching them to known species in botanical databases. Once identified, the plant is placed into biological hierarchy. Popular AI-powered plant ID tools as PlantNet, iNaturalist, Picture This, Leaf Snap, Flora Incognita, algae base etc.

Disease and pest detection: AI systems analyse detect early symptoms of plant diseases like fungal, bacterial. Commonly image-based detection most widely used. Using photos of: Leaves Stems, Fruits, Insects for detects plant diseases. AI looks for Texture changes, Color deviations (yellowing, browning), Pattern irregularities in the plant. AI can spot early signs of disease, nutrient deficiencies, or pest damage—sometimes before symptoms are obvious to the eye. This helps farmers and researchers act early and reduce crop loss.

Precision agriculture:

Precision agriculture uses GPS, sensors, drones, satellites, and AI to monitor field variability and manage crops on a site-specific basis instead of treating the whole field the same. AI can figure out how plants grow, how much they will produce, and the best time to harvest them by looking at information about the environment and the soil. Sensors placed in

the soil and on leaves send data to AI systems, which then help use water, fertilizer, and light more effectively. This helps farmers grow plants in a more sustainable way by reducing waste and keeping the plants healthier.

Environmental Monitoring:

Using satellite pictures along with artificial intelligence, we can keep an eye on forests, the health of plants, and the variety of living things in an area.

This helps in finding out when trees are being cut down, when harmful plants take over, and when the environment is under stress because of climate changes. It also helps us understand how plants might change or adapt as the weather and surroundings change over time. Its Real-time environmental monitoring and Large-scale data analysis. By used AI early detection of environmental threats and Cost-effective and accurate

Plant Phenotyping and Genetics:

AI helps look at genetic traits and connect them to how plants act. High-throughput phenotyping uses AI to measure things like how tall a plant is, how big its leaves are, and when it starts flowering, all from pictures without needing people to do it manually. This makes breeding plants that can handle tough conditions or produce more crops faster.

CONCLUSION

AI works as a powerful helper in botany by recognizing plants, checking their health, making sure they grow well, supporting research, and helping keep ecosystems safe. This is made possible by combining computer vision, machine learning, robotics, and data analysis. Robots powered by AI can take care of crops by planting, trimming, or picking them with very little help from people. Some examples include robots that cut leaves in greenhouses, machines that remove weeds on their own, or drones that help with pollination.

Conflict of interest

The authors declare no competing interests.

Data Availability Statement: Not applicable.

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