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AI-POWERED SYSTEM TO DETECT PESTS, AUTOMATIC WEEDING, ARIEL SURVEY, AND IMAGING

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Abstract: Artificial intelligence (AI) is the development of computer systems that can think and learn likehumans. It has the potential to revolutionize the way of our living and working. One of the most significant benefits of AI is its ability which is used to process large amounts of data. Deep learning is a subset of machine learning that is based on artificial neural networks, it's particularly well-suited for tasks such as image recognition, speech recognition, natural language processing, and decision-making. Deep learning models are composed of layers of interconnected "neurons," which process and transmit information, and have been applied in various fields such as healthcare, finance, retail, and transportation. Deep learning is a great tool for analyzing large amounts of data and computational resources to train, providetechniques to reduce pests, and helps in automatic weeding. Overall, automatic weeding techniques canprovide a cost-effective and efficient way to control weeds, reducing labor costs and increasing crop yields. However, the choice of technique to use depends on the crop, the weed species, and the farm conditions.

Index Terms - Artificial Intelligence (AI), Pests, Ariel survey, Deep learning, Automatic weeding.

I. INTRODUCTION

1.1 Artificial Intelligence (AI):

Artificial intelligence (AI) is one of the most exciting and rapidly developing fields intechnology today. At its core, AI is the development of computer systems that can perform tasks that would normally require human intelligence, such as visual perception, speech recognition, decision- making, and language translation. The goal of AI is to create machines that can think and learn like humans, and it has the potential to revolutionize the way we live and work. One of the most significantbenefits of AI is its ability to process large amounts of data quickly and accurately. This allows for theautomation of tasks that would be time-consuming and error-prone for humans to perform, such as dataanalysis, image recognition, and natural language processing. This can lead to improved efficiency andcost savings in a wide range of industries, including healthcare, finance, and manufacturing. Another major benefit of AI is the ability to make some predictions and identify the patterns in data that humans may not be able to see. In healthcare, AI can be used to identify early signs of disease or predict which treatmentswill be most effective for a given patient.AI can be useful in the agricultural industry to control pests and prevent diseases in plants and optimize the conditions for healthy growth of the plant.

1.2 Machine Learning (ML):

Machine learning is a part of Artificial intelligence (AI) that gives computers the capacity to learn without being explicitly programmed. Machine learning utilizes the patterns found in existing data to predict the outcomes of future unknown data. Machine learning uses statistical models to develop predictions. There are three types of Machine learning:

1.2.1 Supervised learning:

The machine is trained with labeled data and gives the output based on the input data; this typeof machine learning is known as supervised learning. Continuous training is performed on the trainingdata sets until the desired level of output is achieved. [3] Supervised learning is classified into two typesthey are Regression and Classification.

y=f(x), where y is the dependent variable and x is the independent variable.

1.2.1.1 REGRESSION:

Continuous variables are commonly predicted using regression algorithms. Linear regression, regression trees, non-linear regression, Bayesian linear regression, and polynomial regression, are someof the popular regression algorithms.

1.2.1.2 CLASSIFICATION:

Classification algorithms are used when the output is absolute. The most common algorithms areRandom Forest, Decision trees, Logistic Regression, Support vector machines, etc.,

1.2.2 UNSUPERVISED LEARNING:

In this type of Machine learning, the machine is trained with unlabeled data and predicts the output without any supervision. The purpose of this algorithm is to divide and group the data into clusters of similar properties and features.[4] Some approved unsupervised algorithms are K-means clustering, KNN (k-nearest neighbors), Hierarchal clustering, Anomaly detection, Neural networks, Principal component analysis, independent component analysis, Apriori algorithm, Singular value decomposition, etc.,

1.2.3 REINFORCEMENT LEARNING:

In this type of Machine learning, the machine is instructed based on trial and error to make decisions. In this type of learning the machine learns from mistakes. For every good decision the machine is rewarded and for every mistake, it is punished. Some of the popular reinforcement algorithms are Q-learning, SARSA (State-Action-Reward-State-Action), DQN (Deep Q Network), DDPG (Deep deterministic policy gradient), etc.

1.3 DEEP LEARNING:

Deep learning is a subset of machine learning that is based on artificial neural networks. Machine learning is a technique of teaching computers that how to learn from data, without being explicitly programmed. Deep learning, in particular, involves the use of neural networks with multiple layers, also called deep neural networks (DNN), that can learn and represent data with multiple levels of abstraction. Deep learning models are trained using large amounts of data, often called big data, and can find patterns andfeatures in the data that were previously not possible. This makes deep learning particularly well-suitedfor tasks such as image recognition, speech recognition, natural language processing, and decision- making. Deep learning models are composed of layers of interconnected "neurons," which process andtransmit information. The layers closest to the input data are called the input layers, and the layers closest to the output are called the output layers. In between the input and output layers are hidden layers, which extract features and patterns from the input data.

There are several types of deep learningarchitectures, such as feedforward neural networks, convolutional neural networks, and recurrent neuralnetworks. Each architecture is suitable for different types of tasks and data. One of the most significantbenefits of deep learning is its ability to learn from unstructured data, such as images, videos, and audio.This has led to breakthroughs in computer vision, speech recognition, and natural language processing.Deep learning has also been used to improve the performance of other machine learning algorithms, such as decision trees and random forests. This is known as ensemble learning, where multiple models are combined to improve performance. Deep learning has been applied in various fields such as healthcare, finance, retail, and

transportation. It's been used to analyze medical images, predict stock prices, improve customer service, and optimize logistics. However, deep learning models require largeamounts of data and computational resources to train, which can be a significant challenge. Additionally, the interpretability of deep learning models can be limited, making it difficult tounderstand how the model is making its decisions.

Data is meaningless until it is considered and prepared into useful information. Machine learning allows the implementation of systems to draw and generate facts from lower-level data by filtering, processing, categorizing, condensing, and considering details.

1.2 PESTS:

Pests in agriculture refer to any organism that causes damage to crops and other plants grown for food, fiber, or ornamental purposes. These pests can include insects, diseases, weeds, and mammals. Pest management in agriculture is critical for ensuring a stable and reliable food supply, as well as maintaining the economic viability of agricultural operations. One of the most significant insect pests in agriculture is the aphid, which feeds on plant sap and can spread plant viruses. Other common insectpests include moths, beetles, and caterpillars. These pests can cause significant damage to crops, reducing yield and quality. Diseases are also a major concern in agriculture, with fungal and bacterial infections being among the most common. These diseases can spread quickly and can be difficult to control, leading to significant crop loss. Weeds are another major pest in agriculture, competing with crops for nutrients, water, and sunlight. They can also harbor pests and diseases, making them even more detrimental to crop health.

Common weeds include grasses, broad leaves, and woody plants. Mammals such as rodents and deer can also be pests in agriculture, feeding on crops and damaging equipment. To manage pests in agriculture, farmers and researchers use a variety of techniques, including cultural, mechanical, biological, and chemical methods. Cultural methods involve practices such as crop rotation, soil management, and crop selection to reduce pest populations. Mechanical methods include the physical removal of pests and barriers to protect crops. Biological methods involvethe use of natural predators and parasites to control pests. Chemical methods include the use of pesticides and herbicides. The use of the Integrated Pest Management (IPM) approach is essential in controlling pests, this approach employs multiple control methods, including the use of pesticides, to reduce pest populations and prevent crop damage.

1.3 WEEDS:

Weeds are unwanted plants that grow in gardens, lawns, and agricultural fields, where they competewith desirable plants for resources such as water, nutrients, and sunlight. They can also harbor pests and diseases, making them even more detrimental to crop health. Weeds can be annual, biennial, or perennial plants, with a wide range of growth habits, such as creeping, climbing, or bush-like. Some examples of common weeds include dandelions, thistles, poison ivy, and crabgrass. Weed managementis an important aspect of maintaining a healthy and productive garden, lawn, or agricultural field. In agriculture, weeds can reduce crop yields and quality, causing significant economic losses. In gardens and lawns, weeds can be unsightly and can make it difficult to maintain the desired appearance. There are various approaches to weed management, including cultural, mechanical, biological, and chemicalmethods. Cultural methods involve practices such as crop rotation, soil management, and crop selectionto reduce weed populations.

Mechanical methods include hand-weeding, hoeing, and using mulch or other barriers to prevent weed growth. Biological methods involve the use of natural predators and parasites to control weeds. Chemical methods include the use of herbicides, which can be selective or non-selective, targeting specific weed species or killing all vegetation they come in contact with. In recent years, there has been an increasing interest in using organic methods of weed management, suchas crop rotation, cover cropping, and the use of mulch, which can help to suppress weed growth while preserving the environment and human health. It's important to note that the use of herbicides should be done with caution, as they can hurt the environment, such as killing beneficial insects, pollinators, and other non-target organisms. Moreover, the overuse of herbicides can also lead to the developmentof resistant weeds, which can be much harder to control.

1.4 ARIEL SURVEY:

An aerial survey refers to the collection of data and images of the earth's surface from a platform above the ground, such as an airplane or a drone. This type of survey allows for the collection of largeamounts of data and images quickly and efficiently, providing a comprehensive view of an area that would be difficult or impossible to obtain from the ground. Aerial surveys are used in a wide range of fields, including agriculture, urban planning, natural resource management, and disaster response. In agriculture, the aerial survey can be used for precision farming, providing detailed information about crop health and growth, soil moisture, and other factors that can affect crop yields. This information can be used to optimize planting and harvesting times, improve water management, and identify areas that may be experiencing pest or disease problems. In natural resource management, the aerial survey can be used to monitor and map the health of forests, wetlands, and other ecosystems, providing information on the distribution and abundance of plant and animal species, as well as changes in land cover. Aerial surveys can be done using various platforms such as airplanes, helicopters, drones, and satellites, each platform has its advantages and limitations, for example, using a drone allows for lowerflight altitudes and more precise control over the flight path, while using a satellite allows for global coverage and can be useful for remote areas.

2.AI-POWERED SYSTEMS TO DETECT PESTS:

Artificial intelligence (AI) can be used to detect pests in various ways. One common approachis through image recognition, where AI algorithms are trained on a dataset of images of pests and thenused to identify pests in new images. Another approach is through the analysis of sensor data, such as infrared or ultrasonic data, to detect the presence of pests. In agriculture, AI-based pest detection systems can be used to monitor crops for signs of pests and diseases, allowing farmers to take action before the pests cause significant damage. These systems can include cameras and sensors that are installed in fields to continuously monitor the crops. The data collected is then analyzed using AI algorithms to identify any potential pests or diseases. In addition, AI-based pest detection systems canalso be used in other areas such as public health, where they can help to detect and monitor the presenceof mosquitoes and other disease-carrying pests. Overall, AI-based pest detection systems can provide acost-effective and efficient way to detect and monitor pests, allowing for early intervention and preventing significant damage.

3.AUTOMATIC WEDDING:

Automatic weeding is a technique for removing weeds from crops using various technologies. There are several different techniques for automatic weeding that are currently being developed and used in agriculture. One common technique is called "mechanical weeding," which involves using machines or robots to physically remove weeds from the soil. This can be done using a variety of toolssuch as tines, blades, or flails. The machine or robot can be controlled manually or through automation,using sensors and AI algorithms to identify and target weeds. Another technique is called "thermal weeding," which involves using heat to kill weeds. This can be done using a variety of methods such asflame weeding, infrared radiation, or steam. Thermal weeding is a selective method, meaning it can target only weeds without harming the crops. A third technique is "herbicide-free weeding" which useslasers or other technologies to target weeds with intense light, causing the plant to die. This method is selective and environmentally friendly, as it does not use herbicides. Finally, "Biological Control" which involves introducing a predator or parasite of the weed species to control the population of weeds.

4.ARIEL SURVEY AND IMAGING:

Aerial survey and imaging is a technique for detecting pests in crops using aerial vehicles such as drones or airplanes. The aerial vehicles are equipped with cameras and other sensors that can be used to capture images and other data about the crops. The images and data are then analyzed using AI algorithms and other techniques to identify any potential pests or diseases. This can include identifyingspecific pests or their damage, such as holes in leaves or discoloration. The data can also be used to create maps of the crops that show the location and extent of any pests or diseases. Aerial surveys and imaging can be especially useful for monitoring large areas of crops, such as those found in industrial-scale agriculture. The high-resolution images and data captured by the aerial

vehicles can provide detailed information about the health of the crops, allowing farmers to quickly identify and respond to any potential pest or disease issues. Additionally, by using thermal imaging, farmers can detect the temperature of the plants, which can help identify pests and diseases that are not visible to the human eye. Some pests and diseases cause changes in the temperature of the plants, which can be used as an early warning sign of their presence. Overall, aerial survey and imaging provide a cost-effective, efficient, and non-destructive way to detect pests, helping farmers to maintain healthy crops, increase yield, and reduce the use of pesticides.

5.CONCLUSION:

In conclusion, pests in agriculture are a significant concern for farmers and researchers, as they cancause significant damage to crops and reduce yield and quality. A variety of techniques, including cultural, mechanical, biological, and chemical methods, are used to manage pests in agriculture, with the Integrated Pest Management (IPM) approach being the most effective. It is crucial to strike a balancebetween controlling pests and preserving the environment and human health. Weeds are unwanted plants that can reduce crop yields and quality, and make it difficult to maintain the desired appearancein gardens, lawns, and agricultural fields. A variety of techniques, including cultural, mechanical, biological, and chemical methods, are used to manage weeds, with an increasing interest in using organic methods. It's crucial to strike a balance between controlling weeds and preserving the environment and human health. An aerial survey is a powerful tool that allows for the collection of large amounts of data and images quickly and efficiently.

It is used in a wide range of fields, includingagriculture, urban planning, natural resource management, and disaster response. The use of different platforms such as airplanes, helicopters, drones, and satellites, each with its advantages and limitations,allows for a comprehensive view of an area and can provide valuable information for decision-making.Deep learning is a part of machine learning which is based on artificial neural networks, it's particularly well-suited for tasks such as image recognition, speech recognition, natural language processing, and decision-making. Deep learning models are composed of layers of interconnected "neurons," which process and transmit information, and have been applied in various fields such as healthcare, finance, retail, and transportation. Deep learning requires large amounts of data and computational resources totrain, and interpretability can be limited, making it difficult to understand how the model is making itsdecisions. Overall, automatic weeding techniques can provide a cost-effective and efficient way to control weeds, reducing labor costs and increasing crop yields. However, the choice of technique to usedepends on the crop, the weed species, and the farm conditions.

REFERENCES:

[1] Deep Neural Networks to Detect Weeds from Crops in Agricultural Environments in Real-Time: AReview

[2] Deep learning-based computer vision approaches for smart agricultural applications

[3] D.-KK Chengjuan Ren and Dongwon Jeong, “A Survey of Deep Learning in Agriculture: Techniques and Their Applications,” Journal of Information Processing Systems, vol. 16, no. 5, p. 1015–1033, Oct.2020.

[4] A Deep-Learning-Based Real-Time Detector for Grape Leaf Diseases Using ImprovedConvolutional Neural Networks

[5] https://www.mdpi.com/2673-2688/1/2/21