Section A-Research paper

ARTIFICIAL INTELLIGENCE IN AGRICULTURE : CROP MONITORING AND DISEASE DETECTION

VIDHYA S[1] SAMUNDEESWARI D[2] MAHALAKSHMI M[3]

[1]Assistant Professor,Department of S&H(Mathematics), RMK College of Engineering and Technology, Puduvoyal, India

[2]Assistant Professor, Department of S&H(Mathematics), Panimalar Engineering College, Chennai, India

[3]UG Student ,RMK College of Engineering and Technology,Puduvoyal, India

***Abstract*—Artificial intelligence is having a big impact on all industries. Numerous issues could be solved while minimising harm to the environment thanks to AI.**

In terms of agricultural output, India comes in second. Each crop is susceptible to particular diseases, which can affect the quantity and calibre of the crop's output. Crop diseases account for 42% of crop failures for the bulk of the major food crops. Crop diseases frequently endanger the entire crop's yield. Early disease detection allows for better monitoring and a higher-quality crop yield.

This article provides an in-depth analysis of an AI-based method for identifying and keeping track of pest-infested crops and leaves.

This present work provide research on image processing, sensors, and other methods for crop disease detection and crop health. The suggested approach to crop evaluation saves time and provides more accurate finding. This study will offer a fresh perspective on the current AI-Powered agriculture system .

***Keywords*—Agriculture, Artificial intelligence, Disease Detection, CNN ,Image processing, Sensors**

1.INTRODUCTION (*HEADING 1*)

Agriculture is important since it currently accounts for about 37.7% of the total area under cultivation and contributes significantly to national income during the employment era.

Artificial Intelligence (AI) is one of the most well-liked topics in software programm engineering due to its quick clinical development and excellent applicability area. The key characteristics of AI in agriculture are adaptability, speed, precision, and economic feasibility.

Artificial intelligence in agriculture enables farmers to use more than just their farming skills. AI improves performance in weeding, harvesting, irrigation, crop monitoring, soil content material sensitivity, and establishment. The AI era enables the detection of pests, illnesses, and malnutrition in plants on farms. AI sensors can also detect and become aware of weeds.

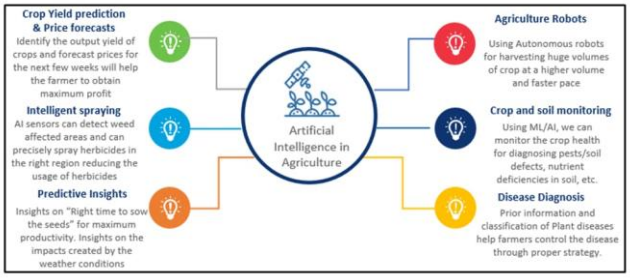


Figure 1: Artificial Intelligence uses in Agriculture, Accessed 16 April 2022.

2 . AI TECHNIQUES USED FOR DETECTION OF DISEASES IN AGRICULTURE

2.1 Image Processing

A picture is turned into a numerical matrix that can be easily read by a computer to be processed. Picture enhancement, image restoration, image compression, and image analysis are just a few of the various forms of processing available. The latter is particularly intriguing since it allows precise information to be extracted straight from a picture. The analysis can be done by looking at the edges of images (image extraction), the colors of the images (texture analysis), and the motions identified as they go from one image to the next. The procedure isbroken down into a few fundamental phases.

(A) Image Acquisition: -

Images of the inflamed leaves are obtained. This database has specific varieties of plant sicknesses, and the pics are saved in JPEG format. These pics are then studied in MATLAB with the use of the study command.

(B) Image Pre-processing:

Image pre-processing is used to erase noise from the photo or different item exclusion, specific pre-processing techniques. Image scaling is used to transform the authentic photo into thumbnails due to the fact the pixel length of the authentic photo is huge and it calls for greater time for the general system for this reason after changing the photo into thumbnails the pixel length gets lower and it's going to require much less time.

(C) Image segmentation:

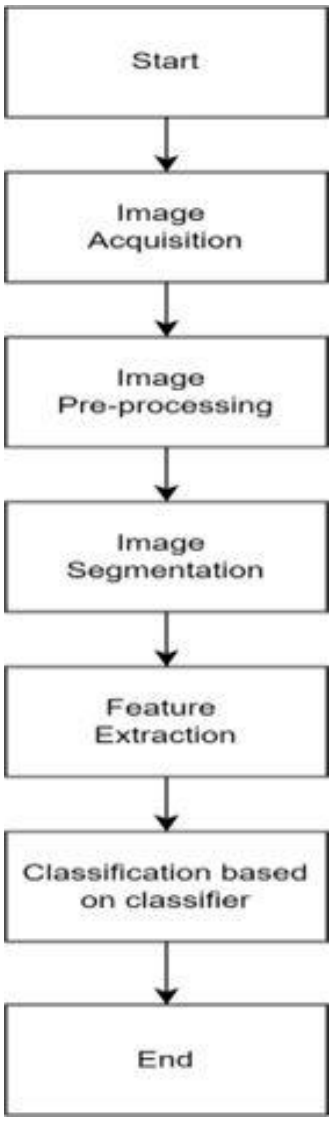
Image segmentation is one of the maximum broadly used techniques to differentiate pixels of pics properly in a focused app. It distributes a photo into several discrete states such that the pixels have wonderful similarities in every region and excessive dissimilarity among areas.

(D) Feature Extraction:

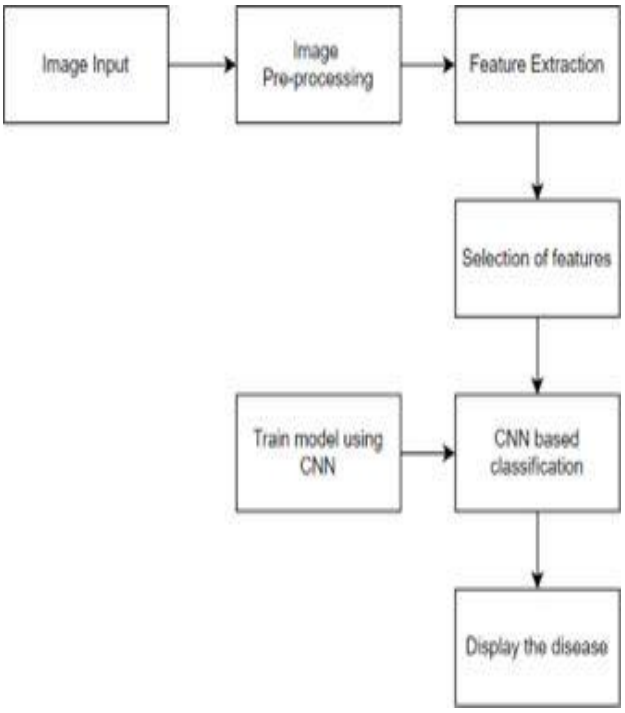
Feature Extraction is a critical part of illness detection. It plays a critical characteristic withinside the identification of an item. Feature extraction is applied in numerous programs in photo processing. Color, texture edges, and morphology are the features, that are applied in sickness detection.

(E) Detection and classification of plant illnesses:

The final phases are the detection of diseases and the classification of plants with disease matches in the given dataset using disease classifiers.



Using basic leaf pictures of healthy and unwell plants, CNN models were built using deep learning methodologies to recognize and diagnose plant illnesses. The first user must take a screenshot of the plant leaf from the app. This image will be sent to our AI system via the application. Preprocessing, feature extraction, feature selection, and other processing stages are performed on the picture. CNN, a deep residue with 97.8% accuracy in recognizing four kinds of insects, was successfully trained using an innovative approach to constructing a visual database. Convolutional neural networks may accept data in any format, including audio, video, pictures, speech, and natural language.



CNN is a type of deep, feed-forward artificial neural network (ANN) that has been effectively used in computer vision applications. CNN achieved great precision in the vast majority of the cases in which it was utilized, outperforming other prominent image-processing approache

2.2 Convolutional Neural Network (CNN)

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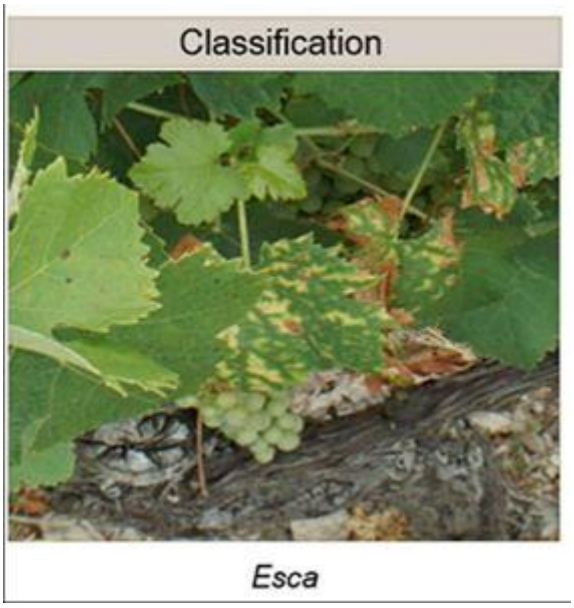

Figure 2: Convolutional Neural Networks for the Automatic Identification of Plant Diseases Accessed 17 April 2022

2.3 Sensors

Agricultural sensors are sensors that are utilized in smart farming. These sensors give information that helps farmers monitor and optimize crops by allowing them to adjust to changes in the environment. Weather stations, drones, and agricultural robots all have these sensors attached. They can be controlled using dedicated smartphone applications. They may be controlled directly through WiFi or via cellular towers and operated using mobile phones and also used in weather stations. Sensors in this system provide information on soil temperature at numerous depths, air temperature, rainfall, etc. They are employed in a variety of agro-based companies' equipment (e.g., dendrometers) for agricultural or farming purposes such as measuring trunk diameter, leaf wetness, and so on. In agriculture drones, they're utilized to spray insecticides and pesticides. Because of the lower cost of electricity, solar-powered mobile pumps have become increasingly popular. E-fences, which assist protect crops from animals such as elephants, have become popular in rural INDIA.

Fig 3: Types of Sensors Accessed 17 April 2022

3 . CONCLUSION

The current review study covers the various applications of artificial intelligence in agriculture. The primary goal of this research was to provide an overview of the uses and existing techniques of artificial intelligence to help farmers achieve the desired output. The report also covers numerous pieces of literature that reflect various approaches to detecting agricultural diseases. In line with the literature, artificial intelligence is an extraordinary device for a country's agronomics. As a result, future researchers should compile a comprehensive dataset spanning all aspects of agriculture and improve present technology to boost primary sector production. In this paper, a well-timed correct evaluation of plants is being finished with the assistance of Image Processing and CNN. This can result in development withinside the agriculture field. Data Augmentation in this situation has provided super results for the model as it reduced the over fitting.

4. SCOPE

India's population is expected to acquire more than 1.6 billion through manner of approach of 2030. With this big hike in the populace, you'll be able to anticipate a large call for agricultural intake as well. With the development withinside the carrier zone, there may be a massive migration of a team of workers from the number one zone to the tertiary zone. In addition, the lack of awareness of growing illnesses in plants is lowering the yield of cultivation as well. Food being the primary necessity of human life, future researchers need to take the course for reviving the agriculture arena. Artificial Intelligence must be the foremost gear for the researchers to cope with the above-stated issues. With the exceptional variety in agronomy species, an in-depth database desires to be acquired for numerous quantities of agriculture. With the usage of the right gear of synthetic intelligence and with the right dataset, farming may be made greater green for farmers. These techniques may be taken into consideration because the foremost implementation is to clear up the destiny crisis.

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