IJMTST is UGC Approved Journal with Journal Id: 43137

International Journal for Modern Trends in Science and Technology, 8(S05):136-140, 2022

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST08S0523
Available online at: https://www.ijmtst.com/vol8si05.html

Plant Disease Detection and Prevention using Machine Learning

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To Cite this Article
Dr. B. Srinivas Raja, Y.L. Priyanka, P. Satyaram, B. Naveen and P.S.R Kumar. Plant Disease Detection and Prevention using Machine Learning. International Journal for Modern Trends in Science and Technology 2022, 8(S05), pp. 136-140. https://doi.org/10.46501/IJMTST08S0523

Article Info
Received: 26 April 2022; Accepted: 24 May 2022; Published: 30 May 2022.

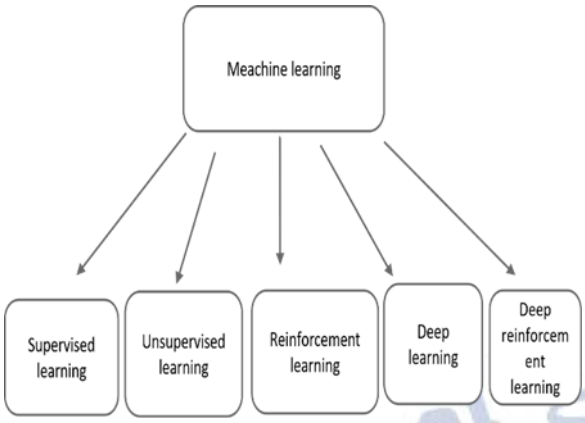
ABSTRACT

Nowadays, technology is advancing at a rapid pace, and farmers are employing a variety of techniques and technologies to better their farming operations. Plants are the most significant source, and when they are infected with illnesses, it results in food shortages and economic losses. The majority of illnesses are first noticed on the plant's leaves and stems. As a result, image processing and machine learning may help to identify ailments and recommend treatments for them. Using the image extraction process, image processing includes procedures such as image acquisition, image processing, image segmentation, and classification. As a result, the man's main goal is to figure out what is causing the disease in order to save the farmers money. Machine learning is a key component of artificial intelligence that produces outcomes without the need for human intervention. This can be done with Python programming we can get the output extremely accurately and quickly using this project.

KEYWORDS : Agriculture,artificial intelligence,image processing,image acquistion,image segmentation,extraction,machine learning.

1.INTRODUCTION

Agriculture is extremely important in today's society. Plant disease is the leading cause of economic food losses in the agriculture sector around the world. Food losses are caused by a variety of plant diseases, including bacteria, viruses, and fungi. We must take some precautions to reduce the risk of other diseases. It is taking less time to identify cures for those plant ailments these days. Because technology advances at a rapid pace. The most frequent plant disease was discovered by farmers have a lot of experience in agriculture, and they simply use a few basic treatments for those ailments.Farmers, on the other hand, are unable to treat some undiscovered ailments.As a result of these experiments, we can "identify and prevent plant disease using machine learning."Machine learning is the concept that a computer program can learn and adapt to new data without human intervention. Machine learning (ML) is the study of computer algorithms that can learn and develop on their own with experience and data. It is considered to be a component of artificial intelligence. Machine learning algorithms create a model based on training data in order to make predictions or judgments without having to actively do so.



Supervised learning: Supervised learning is a method of developing artificial intelligence (AI) that involves training a computer algorithm on input data that has been labelled for a certain output. When provided with never-before-seen data, the model is trained until it can discover the underlying patterns and relationships between the input data and the output labels, allowing it to produce accurate labelling results. Supervised learning excels in classification and regression issues, such as determining the category of a news article or forecasting the number of sales for a future date. The goal of supervised learning is to make meaning of data in the context of a specific problem.

Unsupervised learning: Unsupervised learning is the application of artificial intelligence algorithms to find patterns in data sets with data points that aren't classed or

labelled. As a result, the algorithms are able to categorize, label, and/or group the data points inside the data sets without any external assistance. To put it another way, unsupervised learning enables the system to recognize patterns in data sets without the need for human intervention. Even if no different sorts of catagories are specified, an AI system will group unsorted data according to similarities and differences in unsupervised learning. Compared to supervised learning systems, unsupervised learning algorithms can handle more complex tasks.

Reinforcement learning: Machine Learning includes the field of reinforcement learning. It's all about taking the right steps to maximize your reward in a given situation. It is used by a variety of software and computers to determine the best feasible action or path in a given situation. Reinforcement learning differs from supervised learning in that supervised learning includes the answer key, allowing the model to be trained with the correct answer, whereas reinforcement learning does not include an answer and instead relies on the reinforcement agent to decide what to do to complete the task. It is obligated to learn from its experience in the absence of a training dataset. We have an agent and a reward, for example, with several obstacles in between. The agent's job is to find the most efficient route to the reward. The difficulty is better explained in the following problem.

Deep learning: It's a machine learning technique that teaches computers to learn by doing what humans do naturally: by doing. Deep learning is a critical component of self-driving automobiles, allowing them to detect a stop sign or discriminate between a pedestrian and a lamppost. It enables voice control in consumer electronics such as phones, tablets, televisions, and hands-free speakers.

Deep learning has gotten a lot of press recently, and with good cause. It's accomplishing accomplishments that were previously unattainable. A computer model learns to execute categorization tasks directly from images, text, or sound in deep learning. Deep learning models can attain state-of-the-art accuracy, even surpassing human performance in some cases. A vast set of labelled data and neural network topologies are used to train models that has multiple layers

Deep reinforcement learning: Deep reinforcement learning (deep RL) is a machine learning topic that incorporates both reinforcement learning (RL) and deep learning (DL). The challenge of a computer agent learning to make decisions through trial and error is addressed in RL. Deep RL is a solution that includes deep learning into it, allowing agents to make decisions based on unstructured input data without having to manually construct the state space. Deep RL algorithms can process very massive inputs (for example, every pixel presented on the screen in a video game) and determine what actions to take to achieve a goal (eg. maximizing the game score). Robotics, video games, natural language processing, computer vision, education, transportation, finance, and healthcare are just a few of the applications that have used deep reinforcement learning.

2. REQUIREMENTS

Hardware components:

Laptop with i5 processor , 8GB RAM and minimum 500GB ROM.

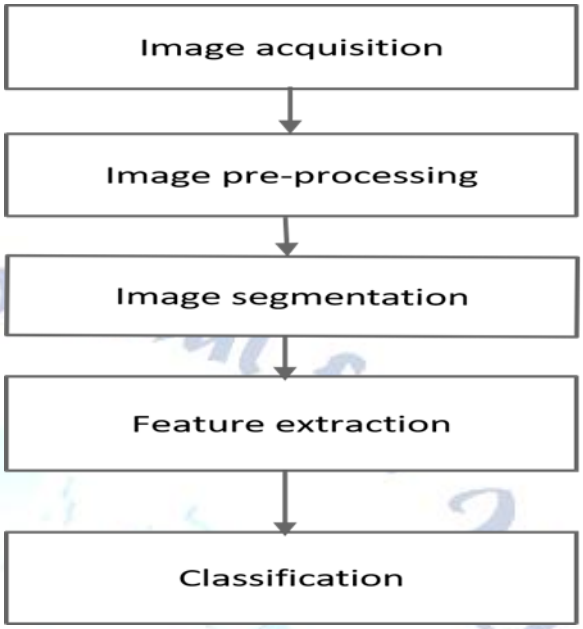
Software components:

CNN: A convolutional neural network (CNN, or ConvNet) is a type of artificial neural network (ANN) used to evaluate visual imagery in deep learning. CNNs (Shift Invariant or Space Invariant Artificial Neural Networks) are built on the shared-weight architecture of convolution kernels or filters that slide along input features and create translation-equivariant outputs known as feature maps. Surprisingly, most convolutional neural networks are only equivariant under translation, rather than invariant. Image and video recognition, Systems, image classification, image segmentation, medical image analysis, natural language processing, brain–computer interfaces, and financial time series are just a few of the applications.

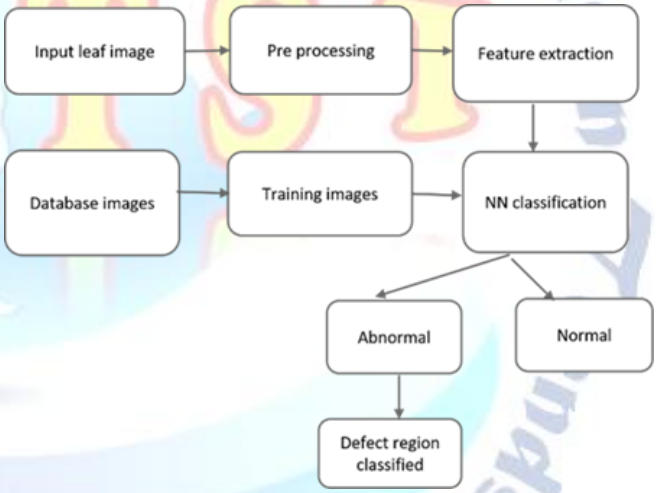
Keras offers various implementations of commonly used neural-network building blocks such as layers, objectives, activation functions, optimizers, and a slew of other tools to make dealing with picture and text data easier and to reduce the amount of coding required to write deep neural network code. The code is maintained on GitHub, and community support forums include a Slack channel and a GitHub problems page. Convolutional and recurrent neural networks are supported by Keras in addition to regular neural networks. Other popular utility layers supported include dropout, batch normalisation, and pooling.

TensorFlow: It's a machine learning platform that's open source from start to finish. It features a large, flexible ecosystem of tools, libraries, and community resources that allows researchers to advance the state-of-the-art in machine learning while also allowing developers to quickly construct and deploy ML-powered apps. TensorFlow is a set of procedures that allow both novices and experts to develop machine learning models in a variety of languages using intuitive, high-level APIs. Models can be deployed on a variety of platforms, including servers, thecloud, mobile and edge devices, browsers, and a variety of other JavaScript platforms. This makes it considerably easier for developers to move from model creation to training and deployment.

3. FLOW CHART

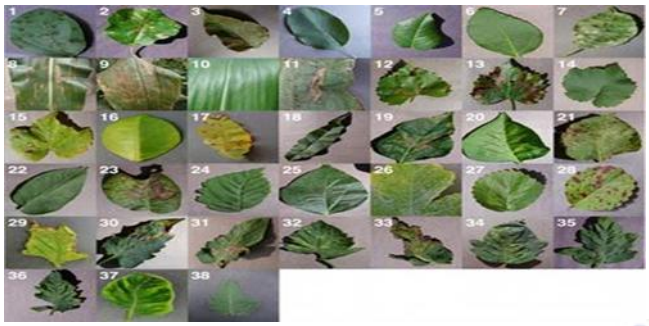


4. BLOCK DIAGRAM



5. DATA SET

The Plant Village collection contains 54,306 photos of various plant leaves organised into 18 types. There are 13 types of plant species and 26 types of plant illnesses in the dataset. Both healthy and diseased crop photos are included in the dataset. Apple, blueberry, cherry, grape, orange, peach, pepper, potato, raspberry, soy, squash, strawberry, and tomato are among the 14 crops depicted. Each class contains two fields: the plant's name and the disease's name. For preprocessing and further categorization, each image is scaled and segmented.



Images of leaves as an example from the PlantVillage dataset, representing every crop-disease pair used. (1) Apple Scab, Venturiainaequalis (2) AppleBlack Rot, Botryosphaeriaobtusa (3) Apple Cedar Rust, Gymnosporangiumjuniperi-virginianae (4) Apple healthy (5) Blueberry healthy (6) Cherry healthy (7) CherryPowdery Mildew, Podoshaera clandestine (8) Corn Gray Leaf Spot, Cercosporazeae-maydis (9) Corn Common Rust, Pucciniasorghi (10) Corn healthy (11) CornNorthern Leaf Blight, Exserohilumturcicum (12) Grape Black Rot, Guignardiabidwellii, (13) Grape Black Measles (Esca), Phaeomoniellaaleophilum, Phaeomoniellachlamydospora (14) Grape Healthy (15) Grape Leaf Blight, Pseudocercosporavitis (16) Orange Huanglongbing(Citrus Greening), CandidatusLiberibacter spp. (17)Peach Bacterial Spot, Xanthomonascampestris (18) Peach healthy (19) Bell Pepper Bacterial Spot, Xanthomonascampestris (20) Bell Pepper healthy (21) Potato Early Blight, Alternariasolani (22) Potato healthy (23) Potato Late Blight, Phytophthorainfestans (24) Raspberry healthy (25) Soybean healthy (26) Squash Powdery Mildew, Erysiphecichoracearum (27) Strawberry Healthy (28) Strawberry Leaf Scorch, Diplocarponearlianum (29) Tomato Bacterial Spot, Xanthomonascampestrispv. vesicatoria (30) Tomato Early Blight, Alternariasolani (31) Tomato Late Blight, Phytophthorainfestans (32) Tomato Leaf Mold, Passalorafulva (33) Tomato Septoria Leaf Spot, Septorialycopersici (34) Tomato Two Spotted Spider Mite, Tetranychusurticae(35)Tomato Target Spot, Corynesporacassiicola (36) Tomato Mosaic Virus(37) Tomato Yellow Leaf Curl Virus (38) Tomato healthy.

Image Acquisition:

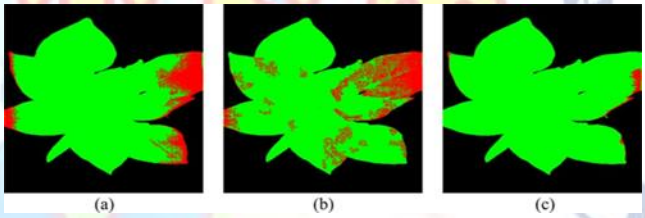
In any image processing system, it is the first step. The goal of any image capture is to convert an optical image (real-world data) into a numerical data array that can then be edited on a computer. Appropriate cameras are used to capture images.

Image preprocessing:

These are the stages involved in preparing photos for use in model training and inference. This covers resizing, orienting, and colour corrections, among other things.

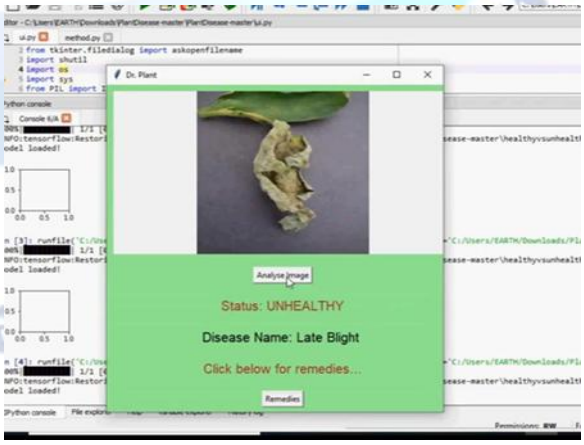
Image augmentation:

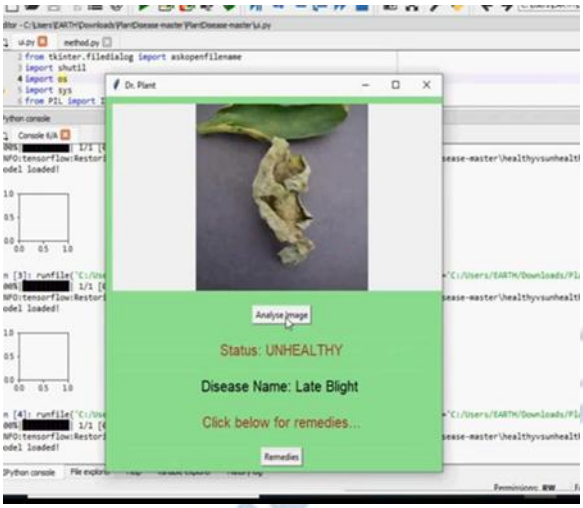
These are visual alterations that are used to create different versions of the same content in order to expose the model to more training instances. Randomly changing the orientation, brightness, or size of an input image, for example, need a model that considers how an image topic appears in a number of conditions.



Comparison of segmentation results of a typical healthy plant. (a)direct CNN model. (b)AC-GAN model. (c)the proposed OR-AC-GAN model.

6. RESULT





7. CONCLUSION

We can increase future agriculture by using this research because we are finding and telling farmers about the cures for so many undiscovered diseases. Accuracy can be raised by increasing or decreasing the number of convolution layers, which has several medicinal and agricultural uses

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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