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PLANT DISEASE DETECTION AND CLASSIFICATIONUSING MACHINE LEARNING ALGORITHM

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Abstract - The level of agricultural production is crucial to a nation's economic growth. The biggest obstacle to the production and quality of food, though, is plant disease.Early detection of plant diseases is essential for maintaining global health and welfare. The standard method of diagnosis entails a pathologist visiting the location and visually evaluating each plant. However, due to lower accuracy and limited accessibility of human resources, manual examination for various plant diseases is limited. To address these problems, it is necessary to develop automated methods that can quickly identify and classify a widerange of plant diseases. The presence of low- intensity information in the image background and foreground, the extreme colour similarity between healthy and diseased plant areas, the presence of noise in the samples, and changes in the position, chrominance, structure, and size of plant leaves make it difficult to accurately identify and classify plant diseases. We have developed a reliable plant disease classification system using an InceptionV3 Architecture to address the aforementioned issues. In this research, we suggested a deep learning strategy based on InceptionV3 Architecture to identify leaf diseases in a variety of plants. Finding the plant disease and its classification is our aim. The referenced dataset is taken from the well-known public source kaggle. The dataset consists of 70,295 Plant images of Apple, Blueberry, Cherry, Corn (maize), Grape,Orange, Peach, and Pepper bell, Potato, Raspberry, Soybean, Strawberry and Tomato.The suggested method has the capacity to handle complex situations from a plants areaand can successfully identify various forms of diseases.

Keywords – Plant disease, Feature extraction, Handcrafted, Machine learning, deep learning, Transfer learning, Classification.

I. INTRODUCTION

Agribusiness has grown to be a crucial supply of financial improvement and about 80% of the population depends on farming in India. Rancher chooses the proper harvest dependent on the type of soil, climate circumstance of the place, and financial value. In most cases,farmers commit suicide due to production loss because they are not able to pay the bank loans taking for farming purposes. We have noticed inpresent times that the climate is changing persistently which is harmful to the crops and leading farmers towards debts and suicide. These risks can be minimized when various

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mathematical or statistical methods are applied to data and by using these methods, we canidentify the disease of plants to the farmer for his agriculture land so that it helps him to get maximum profit.

Due to the growing population, changes in climate, and weakness in governmental issues, the agricultural businesses initiated searching fornew methods to increase the production of food. Researchers are trying to develop new capable and unique technologies for generating high-efficiency results. In this methodology, one of the CNN related technique is utilized for plant diseases detection and image processing technique is utilized for plant diseases classification. In the CNN learning method is InceptionV3, used for detection of plant disease training & testing and InceptionV3 & image processing technique, used to understand user input related data to give detection & classification for plants.

II. EXISTING SYSTEM

Crop disease is a serious concern for safety of food, but its fast detection still remains difficult in different parts of the world because of the lack of proper infrastructure. Automatic identification of plant diseases is necessary for food security, yield loss estimation and management of disease. With the worldwide increase in digital cameras and continuous improvement in computer vision domain, the automated techniques for detection of diseaseare highly in demands in precision agriculture, highly productive plant phenotype, smart greenhouse and much more.

Working on an open dataset which includes 15200 images of crop leaves, a Residual Network (ResNet34) was trained to perform this task of classification. The proposed ResNet34 model accomplished a highest accuracy on a test set, illustrating the viability of the proposed model.

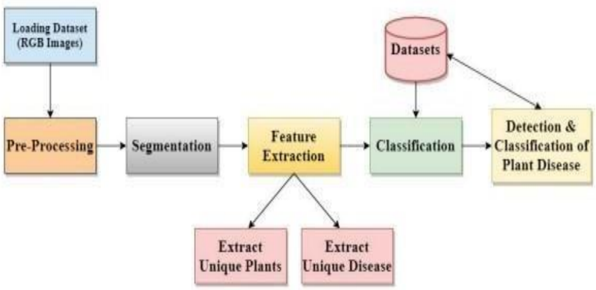
III. PROPOSED SYSTEM

The main objective of this research is simpleand clear which is to build a model that can be classified between healthy and unhealthyharvest leaves and also if the crop has any disease, predict which disease is it. This paper worked on 54,306 images which include unhealthy and healthy plant leaves images and trained a model with the help of a convolution neural network to recognize different crop species, different diseases, and various classes. This trained model achieves accuracy greater ona held-out test set. In this methodology, a InceptionV3 Architecture model are used. The types of the leaf can be recognized by the first layer and possible diseases that could happen in the plant can be checked by the accompanying layer. Deep learning gives better accuracyresults that could help for diagnosis of diseases in crops and analyze down to the smallest unitof an image, a pixel.

IV. V. SYSTEM DESIGN:

System Design deals with the various UML [Unified Modelling language] diagrams for the implementation of project. Design is a meaningful engineering representation of a thing that is to be built. Software design is a process through which the requirements are translated into representation of the software. Design is the place where quality is rendered in software engineering.

Architecture Diagram of Proposed Framework.



VI. METHODOLOGIES IMPLEMENTATION:

- Dataset
- Importing the necessary libraries
- Retrieving the images
- Splitting the dataset
- Building the model
- Apply the model and plot the graphs for accuracy and loss
- Accuracy on test set
- Saving the Trained Model

VII. RESULTS

Features Extracted			
Features	HSV Histogram	Haralick textures	Colour Moments
Number of Features	288	4	6

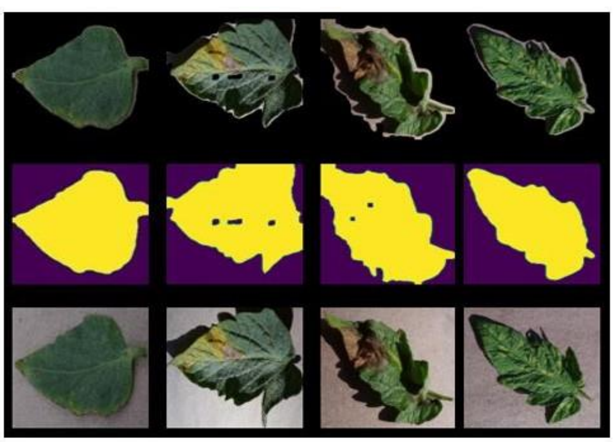


Figure 6. Experimental Images

Table 2. Parameter's Percent Accuracies of ELM

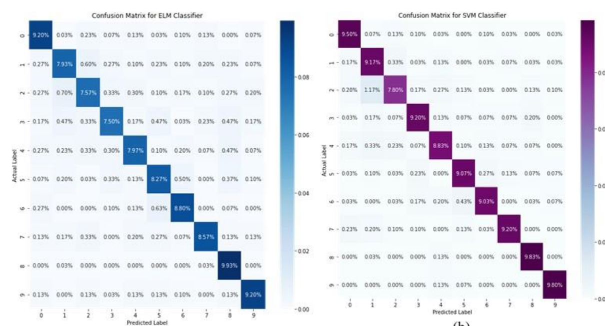
Activation Function	Number of Neurons					
	128	256	512	1024	2048	4096
Linear	71.40	72.60	72.60	72.56	72.63	72.60
ReLU	69.87	76.33	80.43	82.73	81.07	71.43
Sigmoid	72.30	78.30	81.20	**84.94**	83.97	74.03
Tanh	70.96	76.67	82.29	84.43	84.91	74.30

Table 3. Parameters of SVM Model

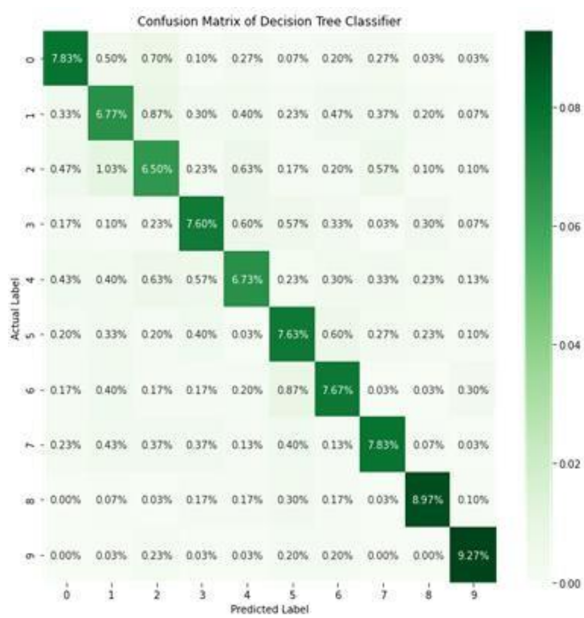
Parameters	*C*	*kernel*	*gamma*
Values	10	poly	1

Table 4. Parameters of Decision Tree Model

Parameters	*criterion*	*max_features*	*Random_state*
Values	entropy	298	1



(a) (b)



(c)

Table 5. Classification Accuracy of ELM, SVM and DT Model

Leaf Disease/ Healthy	Number of Testing Images	Classification Accuracy %		
		ELM	*SVM*	*Decision Tree*
Bacterial spot	100	9.20	9.50	7.83
Early blight	100	7.93	9.17	6.77
Late blight	100	7.57	7.80	6.50
Leaf mould	100	7.83	9.20	7.60
Septoria leaf spot	100	7.97	8.83	7.73
Spotted spider mite	100	8.27	9.07	7.63
Target spot	100	8.80	9.03	7.67
Yellow leaf curl virus	100	8.57	9.20	7.83
Mosaic virus	100	9.93	9.83	8.97
Healthy	100	9.20	9.80	9.27
Overall Result		*84.94*	*91.43*	*77.8*

VIII. CONCLUSION

Plants make up more than 80 percent of the human diet. As a result, they are critical for food security and ensuring that we all have access to enough, cheap, clean, and nutritional food tolead healthy and active living. This research focuses on plant diseases as they create a major threat to food security. Plant protection in organic agriculture is not a simple matter. Itdepends on a thorough knowledge of the plants grown and their likely pests, pathogens and weeds. In our system InceptionV3 Architecture was used for the detection of plant diseases through leaves images of healthy or diseased plants. Our experimental results are able to successfully recognize different categories of diseases in various plants. Pests/diseases are generally not a significant problem in organic systems, since healthy plants living in good soil with balanced nutrition are better able to resist pest/disease attack.

IX. FUTURE SCOPE

In future work will involve increasing the performance of DL in the detection of plant diseases having a multiclass subcategory. As the severity of the disease is supposed to be changing with time, so the DL should be improved to enhance detection and classification of the diseases throughout the wholedevelopment cycle of plant leaves.

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