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Plant Lead Disease Detection and Smart Spraying Robot using Artificial Intelligence for Precision Agriculture

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Abstract: ***As we all know that India is the biggest agricultural country variety of crops are grown here and many a times these crops are destroyed by the diseases that are settled on the plants leaves so to overcome this we have proposed a model that will detect the diseases in the plant leaves and spray the required medicine for the same.***
Keywords: Species detection, Disease Detection, CNN Algorithm, Image Pre-processing, Medicine spraying.

I. INTRODUCTION

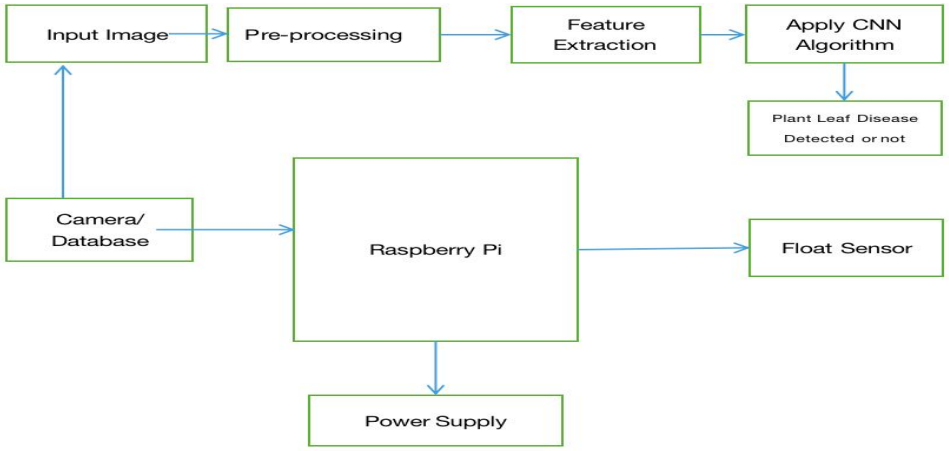
India has a very big sector for its agriculture so there are many crops grown in different areas of the country .However, in recent years, the number of species of the diseases and the degree of harm they cause have increased, mainly due to changes in cultivation systems, the variation of pathogen varieties, and inadequate plant protection measures. The goal of this research is to construct a deep convolutional networks model to achieve fast and accurate automated detection by using sorghum(Jowar), Cotton leaf disease images. Generally, there are five types of common leaf diseases, including leaf blight, Sooty stripe, Leaf rust and grey leaf spot, Bacterial leaf spot and Zonate leaf spot. These leaf diseases have various symptoms. It may be more difficult for inexperienced farmers to detect diseases than for professional plant pathologists. As a verification system in disease detection, an automatic system that is designed to identify crop diseases by the crop's appearance and visual symptoms could be of great help to farmers. Many efforts have been applied to the quick and accurate detection of leaf diseases. By using digital image processing techniques and neural networks, we can detect and classify leaf diseases. Deep learning has made tremendous advances in the past few years. It is now able to extract useful feature representations from a large number of input images. Deep learning provides an opportunity for detectors to identify crop diseases in a timely and accurate manner, which will not only improve the accuracy of plant protection but also expand the scope of computer vision in the field of precision agriculture.

II. METHODOLOGY

The below image shows the simple work flow diagram for the proposed system. Here we first take leaf image as an input and further pre-processing on that image is done. Pre-processing of the image consists of some basic steps such as RGB to grey conversion, edge detection etc. After that feature extraction of the same image is carried out. In this system, we have data set of images of which 80% of images are used for training and 20% are used for testing purposes. Then depending upon the machine learning algorithm classification and detection of normal and abnormal images is done and the abnormal images are identified as per the predefined diseases.

III. BLOCK DIAGRAM

The below block diagram shows how the proposed system works based on the given input.



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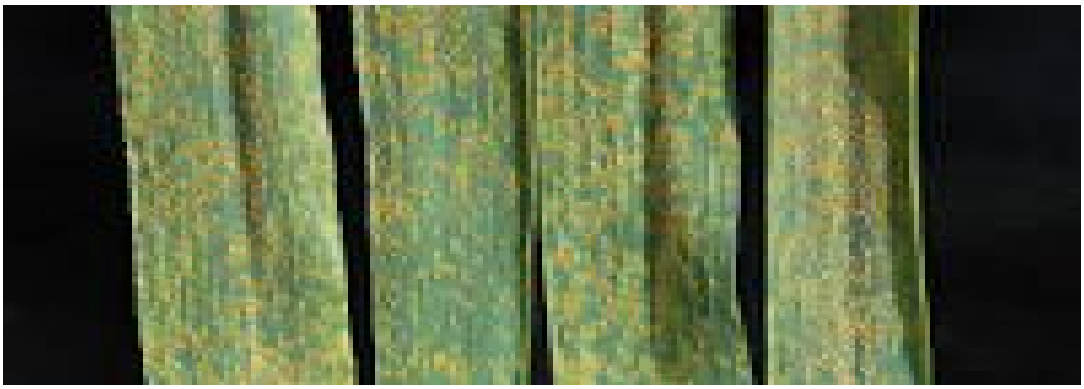
The Data that we have collected is from the specific plants that are grown mostly in India and based on the plant diseases that occur in them. There are different types of plants that we are going to check in this project.

The Diseases that we are going to detect using this model are as follows: leaf blight,

1) *Sooty Stripe*



2) *Leaf Rust*



3) *Grey Leaf Spot*



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4) Bacterial Leaf Spot



5) Zonate Leaf Spot



6) Apple_scab



A. Pre-processing of Image

The aim of pre-processing is that the image is been processed and any of the distortion or that the image is not clear is processed by the image processing I.e pre-processing.

B. Feature Extraction

Feature Extraction starts from an initial set of major data and builds derive features intended to be informative and non-redundant facilitating the subsequent learning and generalization steps and some cases leading to better human interpretation. Feature. Feature Extraction of the leaf is used to spot the spots of the leaf that are affected by the diseases and are supposed to be fertilized.

Ex. The feature Extraction technique on the leaf works in the way where it will spot the spots that are affected by the diseases. It will spot the spots that are supposed to be fertilized in try form of gray color.

C. Image Processing

One very important area of application is image processing in which algorithms are used to detect and isolate various desired portions or

IV. EXPERIMENTAL RESULT

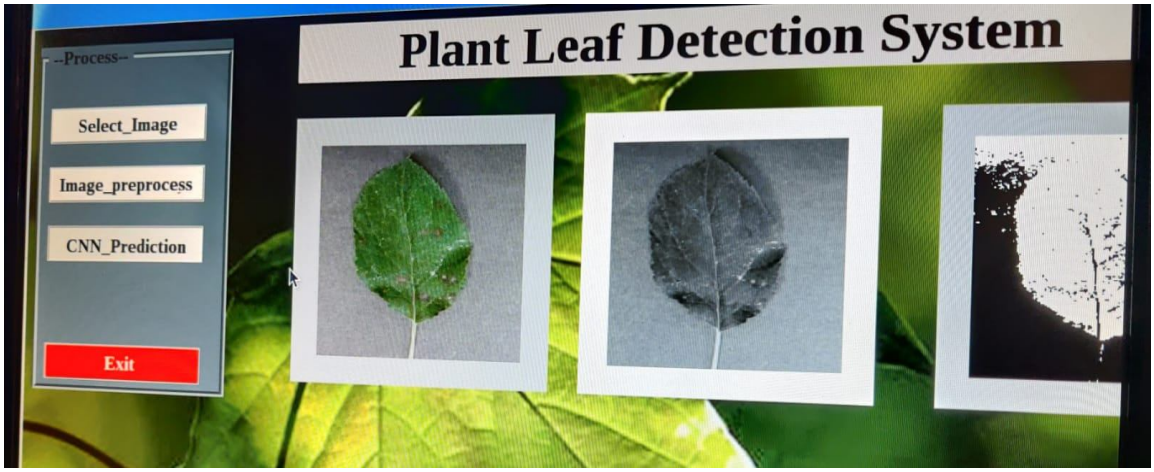
Following mentioned are the results of the proposed system:

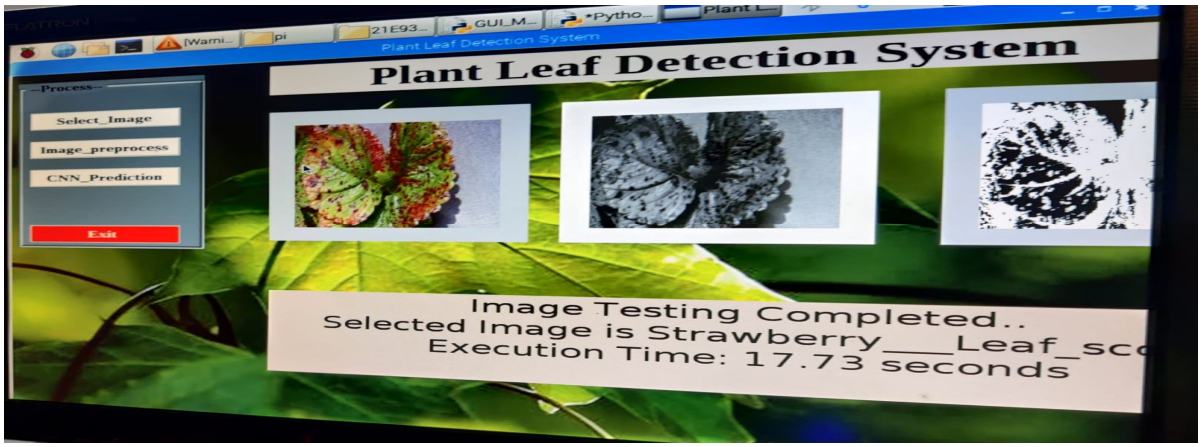
To detect the images we have taken the database of around 16 plant leaves. A gray scale image is one in which the value of each pixel is a single sample representing only an amount of light, that is, it carries only intensity information. Gray scale images, a kind of black-and-white or gray monochrome, are composed exclusively of shades of gray. The contrast ranges from black at the weakest intensity to white at the strongest.

Image segmentation is the most important task in many image processing systems, such as pattern recognition, image retrieval and small surveillance. The result of segmentation is mainly used for image content understanding and visual object recognition through the identification of regions of interest. Image segmentation is used to locate objects and boundaries (lines, curves, etc.) in images and assigns a label to every pixel in an image, in a manner that pixels with the same label share certain visual characteristics. Also, The result of image segmentation is a set of regions that collectively cover the entire image, where each pixel in a region is similar concerning some characteristic or computed property, such as color, intensity, or texture.We have attached below some of the images that show how our project works.

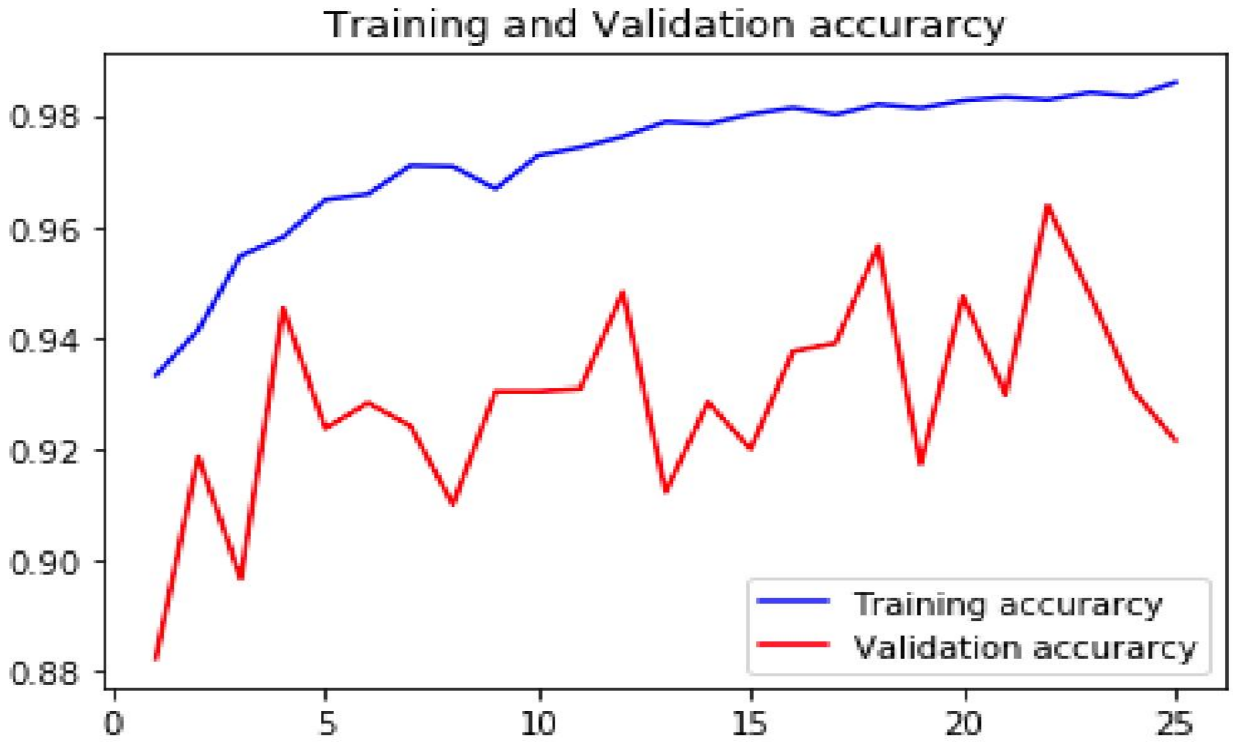
The below images shows the output of how the disease and the species of the plant leaves is detected after we extract the image of the given leaves.

Below I have attached the images to show the results in detail.

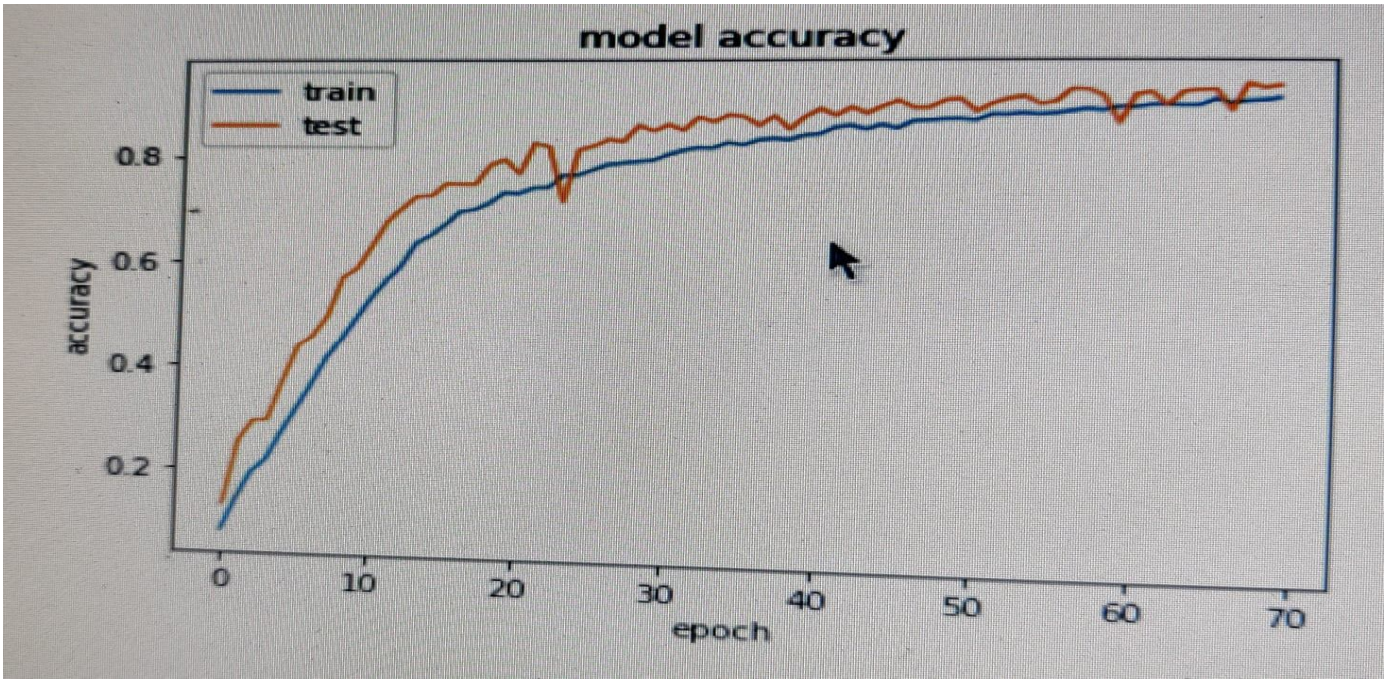




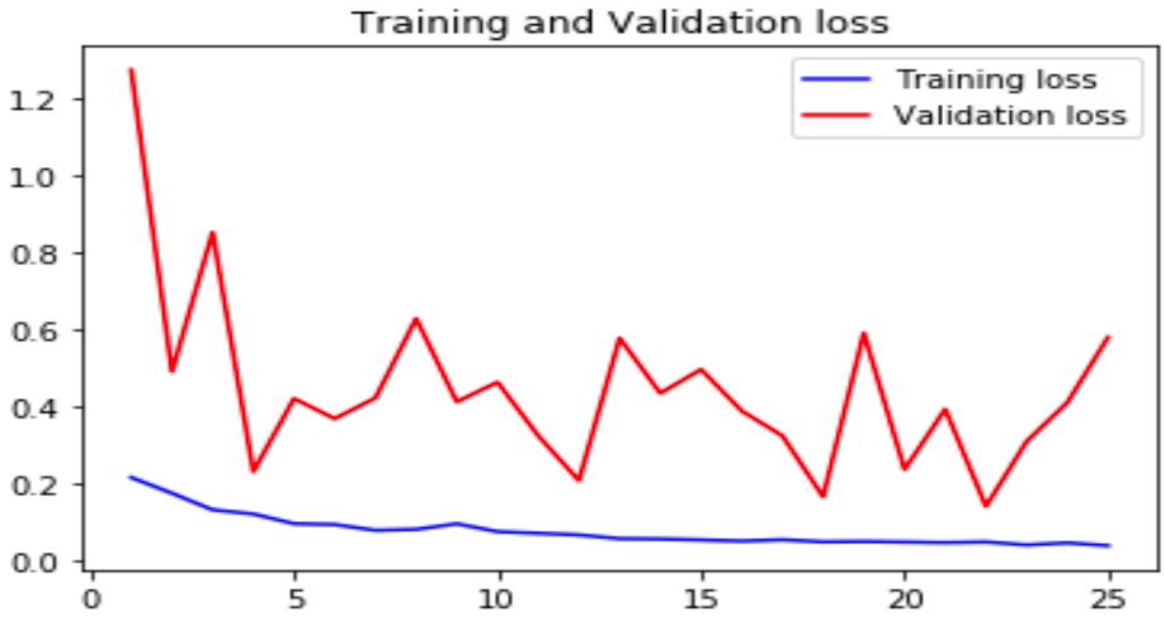
V. COMPARISION BETWEEN OLD MODELS AND NEW MODEL



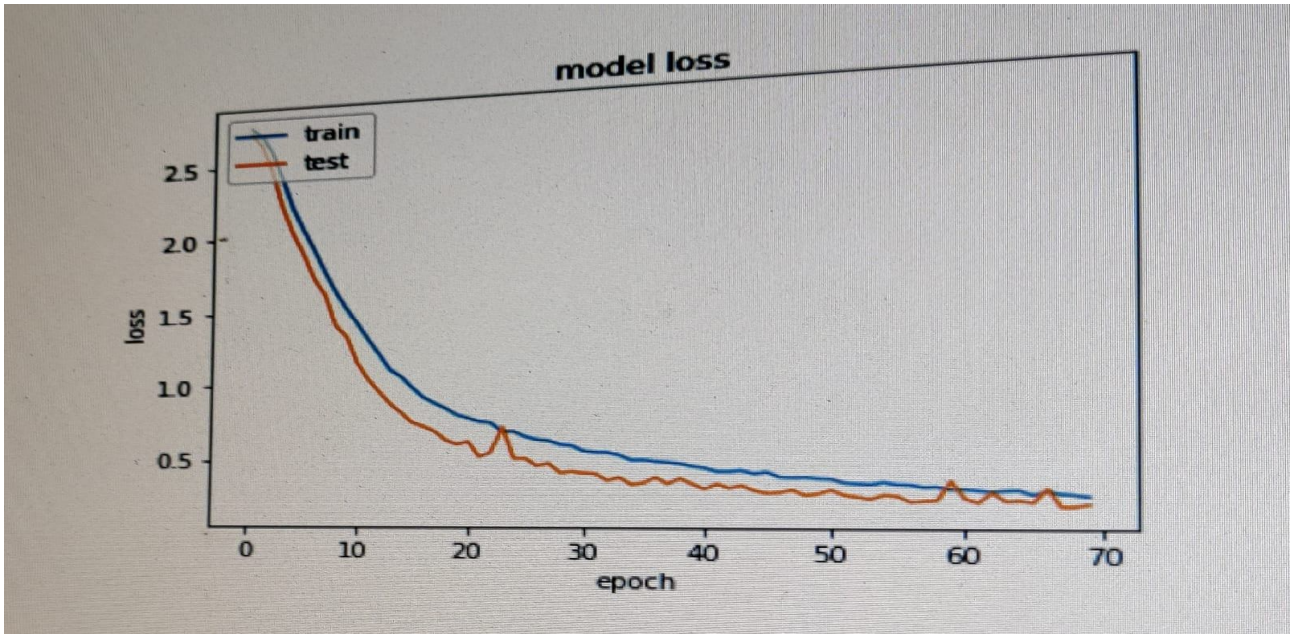
The above image shows the Accuracy and Training of previous model.



The above image shows the graph of the Accuracy of the model that we have proposed.



The above image shows the Loss and Training Loss of previous model.



The above image shows the graph of the loss of the model that we have proposed.

VI. CONCLUSIONS

The algorithm that we have used helps us to powerfully identify the disease on the leaves that cause lesser growth of crops and hence to fully and correctly process the extracted features.

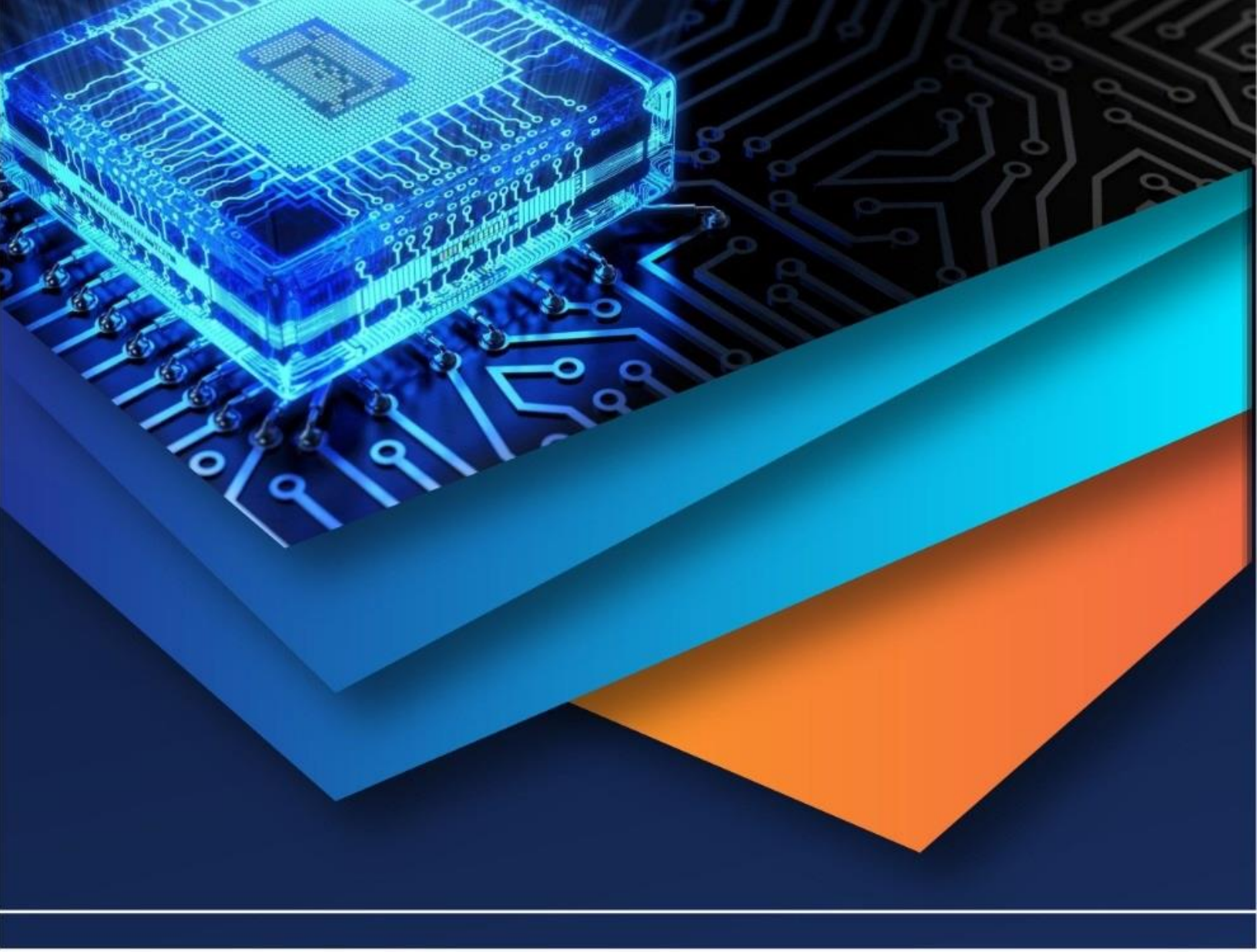
1) Designing a completely automated system where remote sensing techniques for acquisition of spectral image by satellite imagery, airborne images from chartered or model planes are used.

2) A prediction approach based on support vector machines for developing weather-based prediction models of plant diseases.

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