

# Fertilizers Recommendation System For Disease Prediction :

- Agriculture is more important in our daily life
- There are plants get caught by heterogeneous diseases that effect on less amount of agriculture production and compromises with quality as well.
- The identification of plant disease is an higher and best quality.
- Automated system is used to identify the diseases on plant and checking on the leaves on the plant.
- Deep learning can identify the diseases
- Detection and recognition of plant diseases using machine learning are very efficient in providing symptoms of identifying diseases at its earliest. Plant pathologists can analyze the digital images using digital image processing for diagnosis of plant diseases.
- Application of computer vision and image processing strategies simply assist farmers in all of the regions of agriculture. Generally, the plant diseases are caused by the abnormal physiological functionalities of plants.

## ***Objectives:***

- Preprocess the image and apply CNN dataset. And it can detect the diseases.
- And we find the accuracy of model and we able to build application by using framework.
- Therefore, the characteristic symptoms are generated based on the differentiation between normal physiological functionalities and abnormal physiological functionalities of the plants.
- Mostly, the plant leaf diseases are caused by Pathogens which are positioned on the stems of the plants. These different symptoms and diseases of leaves are predicted by different methods in image processing.
- These different methods include different fundamental processes like segmentation, feature extraction and classification and so on.
- Mostly, the prediction and diagnosis of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.

## ***Flow:***

- Farmers where interact with portal, and interface to upload images of diseased leaf. And

suggests the farmer with fertilizer.

- Download the dataset, and into train and test sets and add network layers, load the images and fit the model.
- Test and save the model and dependencies by using this application the model will built.
- A digital camera or similar devices are used to take images of different types, and then those are used to identify the affected area in leaves.
- Then different types of image-processing techniques are applied to them, the process those images, to get different and useful features needed for the purpose of analyzing later-Plant leaf disease identification is especially needed to predict both the quality and quantity of the First segmentation step primarily based on a mild polygonal leaf model is first achieved and later used to guide the evolution of an energetic contour.
- Combining global shape descriptors given by the polygonal model with local curvature

### **Structure:**

- Fruits and vegetable are two dataset folders and it contains a test and train folder it as different diseases images.
- The flask folder as necessary to build flask application.
- The static folder has images, style sheets, scripts these are used to building the web page.
- Template folder has HTML pages.
- Upload folders has uploads made by the user.
- h5 files are model files it is used to save model building.
- Fruit- Training.ipynb, Vegetable-Training, and Plant-Disease-Testing.ipynb are the training and testing notebooks.
- IBM folder contains IBM files.
- The proposed method **uses SVM to classify tree leaves, identify the disease and suggest the fertilizer.**
- The proposed method is compared with the existing CNN based leaf disease prediction.
- The proposed SVM technique gives a better result when compared to existing CNN.

### **Collection:**

- For each train and test folder having subfolders with leaf images of different plant diseases.
- We can collect dataset from different sources like kaggle. com, data.gov, UCI machine learning repository, etc.
- The folder provides in project structure section and link can download datasets used for

taining.

- Two datasets will be used, it will create two models one for detect vegetable leaf diseases like tomato, potato, and pepper plants and another one is for fruits diseases like corn, peach and apple.
- Implements Guided active contour method. Unconstrained active contours applied to the difficult natural images.
- Dealing with unsatisfying contours, which would try and make their way through every possible grab cut in the border of the leaf.
- The proposed solution is used the polygonal model obtained after the first step not only as an initial leaf contour but also as a shape prior that will guide its evolution towards the real leaf boundary.
- Recommend the fertilizer for affected leaves based on severity level. Fertilizers may be organic or inorganic.
- Admin can store the fertilizers based on disease categorization with severity levels. The measurements of fertilizers suggested based on disease severity.

### ***Image Preprocessing:***

- Preprocessing image includes import image data generator library, configure image data generator class and trainset and test test .
- The data generator accepts original data and it transforms and returns the new transformed data.
- Leaves are affected by bacteria, fungi, virus, and other insects. Support Vector Machine (SVM) algorithm classifies the leaf image as normal or affected.
- Vectors are constructed based on leaf features such as color, shape, textures.
- Then hyperplane constructed with conditions to categorize the preprocessed leaves and also implement multiclass classifier, to predict diseases in leaf image with improved accuracy.
- The purpose of image preprocessing is improving image statistics so that undesired distortions are suppressed and image capabilities which are probably relevant for similar processing are emphasized.
- The preprocessing receives an image as input and generates an output image as a grayscale, an invert and a smoothed one.
- Therefore rearranging the above equations  $bm(w.am) + c0 - 1 \geq 0$  for points into dataset to in the gutter.
- i.e on the decision boundary  $bm(w.am) + c0 - 1 = 0$ .

### ***Preprocess Image:***

- Preprocess Image for deep Learning.

- Resize Image Using rescaling and cropping.
- Augment images for Training with random geometric Transformations.
- Perform additional image processing operations using Built-in Datastores.
- Apply custom image processing pipelines using combine and transform.
- There are five types of data augmentation techniques.
- Image shifts via the width-shift-range and height-shift-range arguments.
- The image flips via the horizontal\_flip and vertical flip arguments.
- The image rotates via the rotation-range argument.
- The image brightness via the brightness-range arguments.
- The image zooms via the zoom-range arguments.
- Xception is a convolutional neural network that is 71 layers deep. We can stack a pre-prepared form of the network prepared on in excess of a million images from the ImageNet data set.
- The pretrained network can characterize images into 1000 object classifications, like console, mouse, pencil, and numerous creatures.
- Subsequently, the network has learned rich feature portrayals for a wide scope of images.
- The network has a picture input size of 299-by-299.
- MobileNetV2 is a convolutional neural network design that looks to perform well on mobile gadgets.
- It depends on a rearranged residual construction where the residual associations are between the bottleneck layers.
- The transitional extension layer utilizes lightweight depthwise convolutions to filter features as a source of non-linearity.
- All in all, the design of MobileNetV2 contains the underlying completely convolution layer with 32 filters, trailed by 19 residual bottleneck layers.

### ***Model Building For Fruit Disease Prediction:***

#### **1. Import the libraries:**

- It create a different layer for neural network model.
- From the dataset which is being used in this project we have segregated the images into two sets:
- Training set and Testing set. For every architecture model we have used firstly, we train the architecture model using the images in our training set and after gaining impressionable results, we test the model using images in our testing set.

We continue to test the model till we get the desired result. The results are observed and recorded for comparison with other architectures.

- For all the other architectures the same process takes place and the results are recorded. In addition to this we have trained our own model with 3 convolution, 3 Pooling and 2 Dense Layers.
- For all pretrained models as well as our model we have done data augmentation using Image data generator.
- All other parameters like number of epochs , optimizer , activation function are kept the same to correctly analyse all the models.

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## 2. Initializing the Model:

- Sequential and Function API
- The process of specifying the necessary model for parameters, such as the basic value, the trend value and the seasonal indices for the selected forecast model.
- The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer.
- The proposed method is compared with the existing CNN based leaf disease prediction.
- The proposed SVM technique gives a better result when compared to existing CNN.
- For the same set of images, F-Measure for CNN is 0.7 and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.
- This further research is implementing the proposed algorithm with the existing public datasets.
- Also, various segmentation algorithms can be implemented to improve accuracy.
- The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.
- True Positive is an outcome where the model correctly predicts positive class.False Positive:
- False Positive is an outcome where the model incorrectly predicts positive class.True Negative:
- True Negative is an outcome where the model correctly predicts negative class.False Negative:
- False Negative is an outcome where the model incorrectly predicts negative class.
- The purpose of Agro-Farm care is for research purposes which can be helpful in the agricultural sector.
- It contains several models that describe which crop be grown based on different

conditions, it also suggests fertilizers be used also the other feature is that it can detect the disease from which crop is suffering.

- All these features can be helpful in research purposes which can directly or indirectly benefit the farmers, not only it gives the results but also it provides the suggestion based on three results,

### 3. Add CNN Layer:

- There are three layers in CNN layer Convolution layer, pooling layer and Flattening layer.
- Deep learning is a very significant subset of machine learning because of its high performance across various domains.
- Convolutional Neural Network is powerful image processing deep learning type often used in computer vision that comprises an image and video recognition along with a recommender system and natural language processing.
- Future operation are performed on summarized features created by the pooling layer. Instead of precisely positioned features generated by the convolution layer.
- We have pooled feature map.
- We are now flattening our output after two steps into a column. Because we need to insert this 1-D data into an artificial neural network layer.

### 4. Add Dense Layer:

- Dense layer is the regular deeply connected neural network layer. It is most common and frequently used layer. Dense layer does the below operation on the input and returns the output.
- Dense layer is used to classify image based on output from convolutional layers. Each layer in the Neural Network contains neurons, which compute the weighted average of its input and this weighted average is passed through a non-linear .
- Adding dense layer will increase the number of weights. And it is recommended to use the least number of hidden neurons that accomplish the task.
- Using more hidden neurons than required will add more complexity.
- By providing their soil details like nitrogen, phosphorus, potassium, pH level farmer gets the idea of which crop is best for their soil.
- By providing their soil details like nitrogen, phosphorus, potassium farmer gets the idea of which fertilizer is best for their crop.
- By providing an image of a leaf farmer gets an idea of which disease caught their crop and they also suggest how you can prevent it.
- The Dataset used in this project is imported from Kaggle 6. The dataset consists of 20 different types of crops Each row has Nitrogen, Phosphorus, Potassium, and other details.
- The system consists of three major features that are
  - The crop recommendation application .
  - The fertilizer recommendation application.
  - The plant disease prediction application.

### 5. Train and Save the Model:

- After adding the layer it will be complied.
- The whole architecture, weights and the optimizer state. This command saves the details needed to reconstitute your model.
- It contains a complete Tensor flow program, including trained parameters and computation.
- Jupyter Notebook is an open-source software program this is an interactive computational environment, wherein you could integrate code execution, wealthy text, mathematics, plots, and wealthy media, it's far used for modifying and walking the application, additionally it turned into first-rate appropriate for us to broaden our challenge, we're the usage of Jupiter Notebook for appearing a diverse set of rules on the information we take a look at the accuracy of every set of rules.
- The last and one of the main sections is a disease that includes crop disease, prediction model.
- Here, the user has to upload the photograph of the crop then the model will predict the disease also it will provide the additional suggestion to take precautions and how to cure the disease .

### ***Test the Model:***

- Create the development, validation and Testing Data sets.
- Use the training Data Set to Develop your Model.
- Compute Statistical Values identifying the model Development performance.
- An application of model-based design for designing and optionally also executing artifacts to perform software testing or system testing.
- There are more types of software in testing model like waterfall model, V model, Agile model, Spiral model, Iterative Model.
- Data series is described because the system of collecting, measuring, and reading correct insights for studies the usage of fashionable proven techniques.
- A researcher can compare their speculation on the premise of amassed facts.
- In maximum cases, facts series is the number one and maximum crucial step for studies, regardless of the sphere of studies.
- The technique of facts series is extraordinary for extraordinary fields of study, relying on the specified information.
- The crop section consists of crop recommendation model, the crop recommendation model takes details from the user then processes the information and provides a page that has the output and suggestions.

### ***Appilication Building:***

- Application development is the process of creating a computer program or a set of

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- From calculating monthly expenses to scheduling sales reports, applications help businesses automate processes and increase efficiency.
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- From calculating monthly expenses to scheduling sales reports, applications help businesses automate processes and increase efficiency.
- Every app-building process follows the same steps:
- Gathering requirements, designing prototypes, testing, implementation, and integration.
- The power to improve crop management using information obtained from a methodical program of nutrient monitoring was recognized several decades ago by Harry F. Clements and incorporated into his crop log system for sugarcane production. Today, similar techniques are applied in monitoring the nutrient status of many crops—for example, macadamia nuts.
- To improve the accuracy of fertilizer recommendations, farm managers should keep records of their fertilization program and crops' responses to it.
- A good soil fertility management record would consist of:
- Soil and plant tissue analyses at the beginning of the fertilization cycle .
- Measurements of crop yields .
- Records of fertilizer inputs (amounts and times) associated with the crop yields.
- Soil and plant tissue analyses after the cropping cycle.

### ***Build Python Code:***

- Brush Up on the Basics. Distribute Your Python Code.
- Build a Basic Python Web Application. Set Up Your Project.
- Deploy Your Python Web Application.
- Convert a Script Into a Web Application.
- Improve the User Interface of Your Web Application.
- Conclusion.
- It is not as near to hardware as C or C++ because it is a high-level coding language.
- Instead of using a compiler, Python code is executed using an interpreter.
- The interpreter runs the code line by line, which slows things down.
- Python is a dynamically typed programming language



