PROJECT REPORT

FERTILIZER RECOMMENDATION SYSTEM FOR DISEASE PREDICTION

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I. INTRODUCTION

Overview

Agriculture is the most important sector in today's life. Most plants are affected by a wide variety of bacterial and fungal diseases. Diseases on plants placed a major constraint on the production and a major threat to food security. Hence, early and accurate identification of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques.

An automated system is introduced to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases.

Purpose

To identify the presence of disease in crops by using Deep learning technique. This will help farmers to identify the fertilizer to be used if the fruit/vegetable crop is prone to various diseases. Early identification of disease will lead to limited use of fertilizers and high crop yield.

II. LITERATURE SURVEY

Existing problem

Farmers find it very difficult to identify the degree of infection of crops and the amount of fertilizers to be used by conventional visual inspection of crops. Conventional image processing techniques do not provide high accuracy in identification of disease due to limited resources.

Proposed solution

Deep learning techniques is highly efficient in learning the images through datasets. Efficient data collection is crucial to the model development. Artificial Intelligence produces high accuracy with minimum computational period.

A web application is built where :

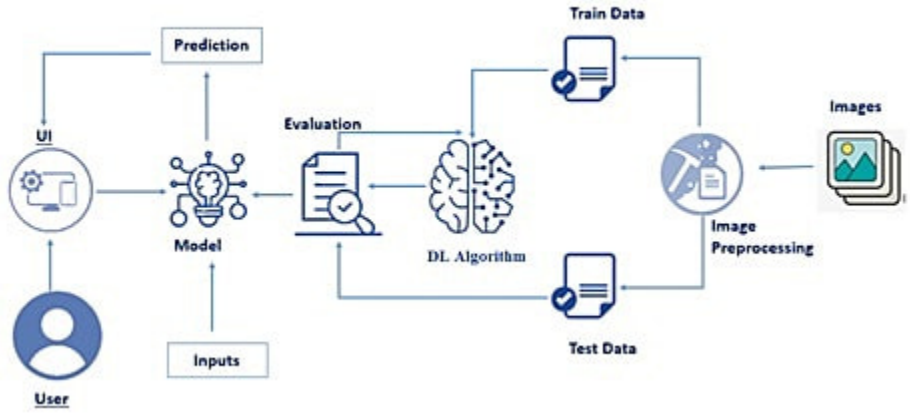
Farmers interact with the portal build

Interacts with the user interface to upload images of diseased leaf

Our model built analyses the Disease and suggests the farmer with fertilizers are to be used

III. THEORETICAL ANALYSIS

BLOCK DIAGRAM



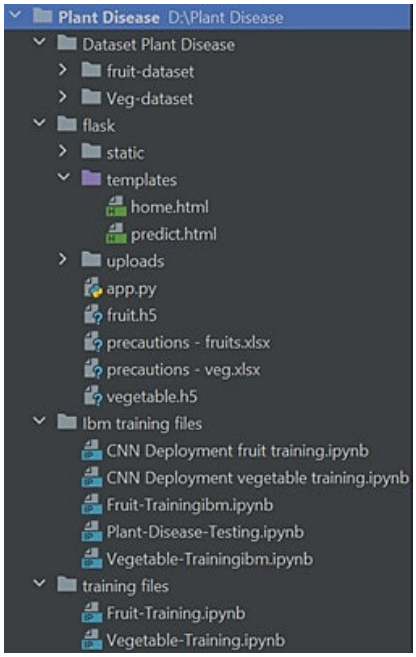
Project Requirements

Anaconda Navigator, Tensor Flow, Keras, Flask

Python,Python Web Frame Works,ANN,CNN,IBM Cloud,IBM Watson Studio,IBM Machine Learning,Python-Flask

IV. EXPERIMENTAL INVESTIGATIONS

Resources :



- The dataset folder contains two folders for the fruit and vegetable dataset which again contains a test and train folder, each of them have images of different diseases.
- The Flask folder has all the files necessary to build the flask application.
- The static folder has the images, style sheets, and scripts that are needed in building the web page.
- templates folder has the HTML pages.
- uploads folder has the uploads made by the user.
- app.py is the python script for server-side computing.
- .h5 files are the model files that are to be saved after model building.
- precautions excel files contain the precautions for all kinds of diseases.
- Fruit-Training.ipynb, Vegetable-Training, and Plant-Disease-Testing.ipynb are the training and testing notebooks.
- IBM folder contains IBM deployment files.

  On Watson-studio and IBM Machine learning platform

  Web Application development – Integrating Flask with Model Built

V. PROJECT FLOW SHOWING CONTROL FLOW OF SOLUTION

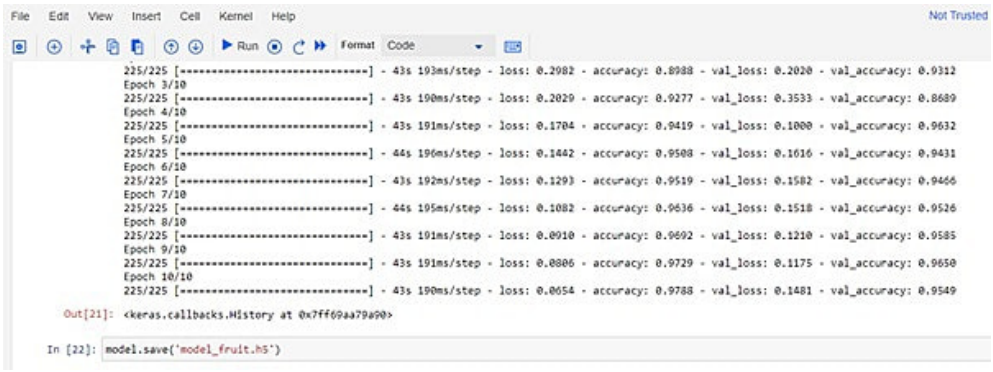
- Download the dataset.
- Classify the dataset into train and test sets.
- Add the neural network layers.
- Load the trained images and fit the model.
- Test the model.
- Save the model and its dependencies.
- Build a Web application using a flask that integrates with the model built.

VI. FINDINGS

A. WATSON STUDIO- MODEL TRAINING & TESTING RESULTS

(i) DEVELOPMENT OF MODEL FILE & PREDICTION OF DISEASE IN FRUIT CROP ON WATSON-STUDIO

Model file :



Load Image for Training:

Predict presence of disease in Fruit crops:

(ii)DEVELOPMENT OF MODEL FILE & PREDICTION OF DISEASE IN VEGETABLE CROP ON WATSON-STUDIO

Model file :

```
0.9221
Epoch 9/10
475/475 [==============================] - 92s 194ms/step - loss: 0
0.8931
Epoch 10/10
475/475 [==============================] - 93s 195ms/step - loss: 0
0.9335
```

Out[36]: <keras.callbacks.History at 0x7fe20ad0e8e0>

```
In [37]: model.save('model_vegetable.h5')
```

Predict presence of disease in Vegetable crops:

```
'Pepper,_bell___healthy': 1,
'Potato___Early_blight': 2,
'Potato___Late_blight': 3,
'Potato___healthy': 4,
'Tomato___Bacterial_spot': 5,
'Tomato___Late_blight': 6,
'Tomato___Leaf_Mold': 7,
'Tomato___Septoria_leaf_spot': 8}
```

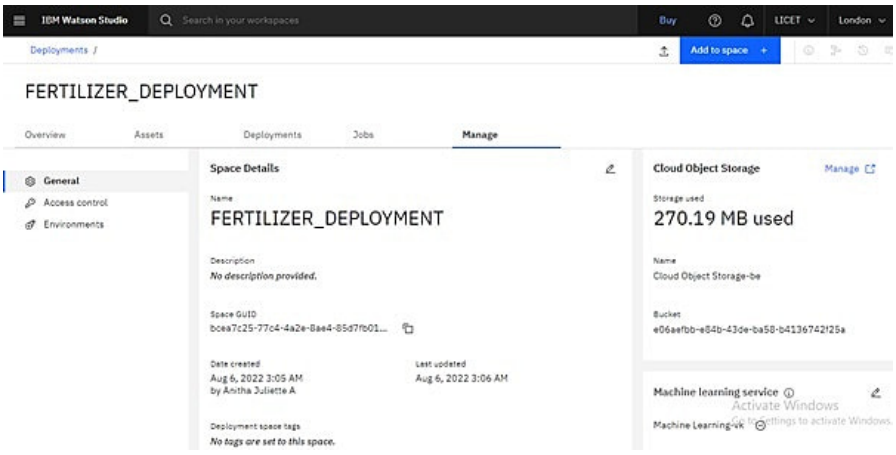
```
In [54]: index= ['Pepper,_bell___Bacterial_spot','Pepper,_bell_
         y','Tomato___Bacterial_spot','Tomato___Late_blight','T

In [55]: index[y[0]]
```

Out[55]: 'Pepper,_bell___Bacterial_spot'

B. IBM DEPLOYMENT RESULTS

(i) IBM Results on Watson Machine Learning platform



```
In [68]: model_id = client.repository.get_model_id(model_details)

In [72]: model_id
Out[72]: 'e311b7d2-fe42-4aeb-9d13-930f40621a7c'

In [70]: client.repository.download(model_id,'Vegetable.tar.gb')
         Successfully saved model content to file: 'Vegetable.tar.gb'
Out[70]: '/home/wsuser/work/Vegetable.tar.gb'

In [71]: ls
         'Dataset Plant Disease'/   Vegetable-classification.tgz
          model_vegetable.h5        Vegetable.tar.gb
```

```
In [67]: ls
         'Dataset Plant Disease'/    frunit.tar.gb
          Fruit-classification.tgz   model_fruit.h5
```

(ii) IBM Results on Local machine- Anaconda Navigator-Jupyter Notebook

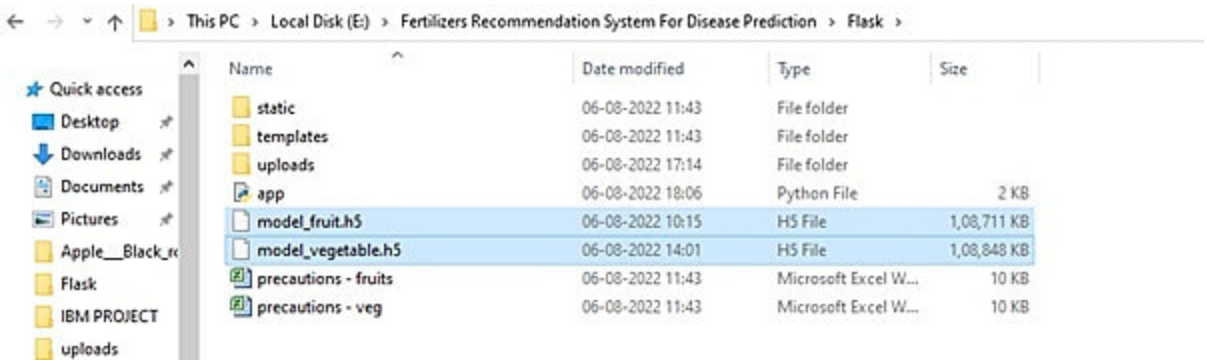
```
In [7]: client.set.default_space(space_uid)
Out[7]: 'SUCCESS'

In [11]: client.repository.download("81c727d1-3116-48c9-8730-95794c805d59","fert_fruit.tar.gz")
         Successfully saved model content to file: 'fert_fruit.tar.gz'
Out[11]: 'E:\\Fertilizers Recommendation System For Disease Prediction/fert_fruit.tar.gz'
```

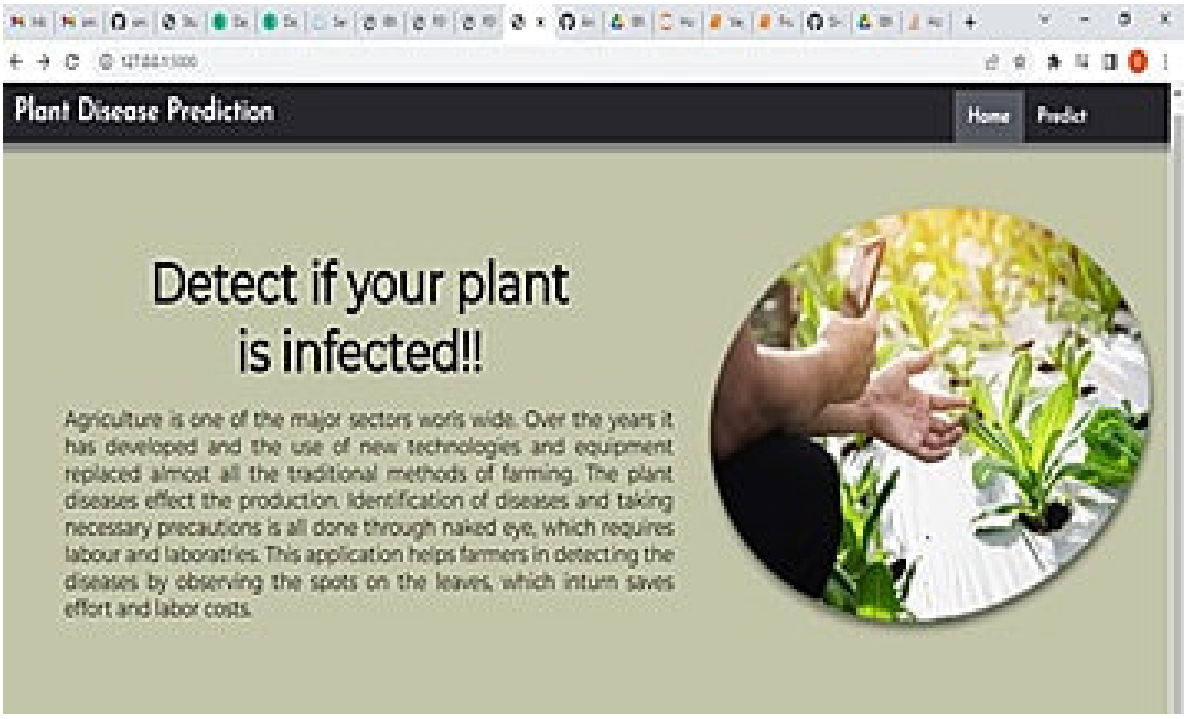
```
In [6]: client.set.default_space(space_uid)
Out[6]: 'SUCCESS'

In [7]: client.repository.download("e311b7d2-fe42-4aeb-9d13-930f40621a7c","fert_Vegetable.tar.gz")
        Successfully saved model content to file: 'fert_Vegetable.tar.gz'
Out[7]: 'E:\\Fertilizers Recommendation System For Disease Prediction/fert_Vegetable.tar.gz'
```

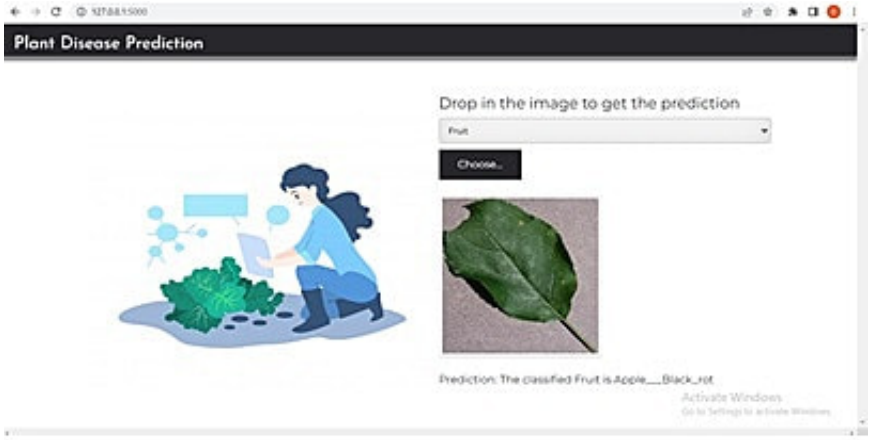
.ipynb_checkpoints	06-08-2022 14:11	File folder	
fert_fruit	06-08-2022 12:03	File folder	
Flask	06-08-2022 18:06	File folder	
fert_fruit.tar.gz	06-08-2022 11:58	GZ File	85,635 KB
fert_Vegetable.tar	06-08-2022 14:08	TAR File	1,08,850 KB
fert_Vegetable.tar.gz	06-08-2022 14:15	GZ File	91,493 KB
Fruit_IBM Deployment model for Fertilizers.ipynb	06-08-2022 12:03	IPYNB File	7 KB
Vegetable_IBM Deployment model for Fertilizers.ipynb	06-08-2022 14:15	IPYNB File	7 KB



C.APPLICATION BUILDING USING PYTHON FLASK

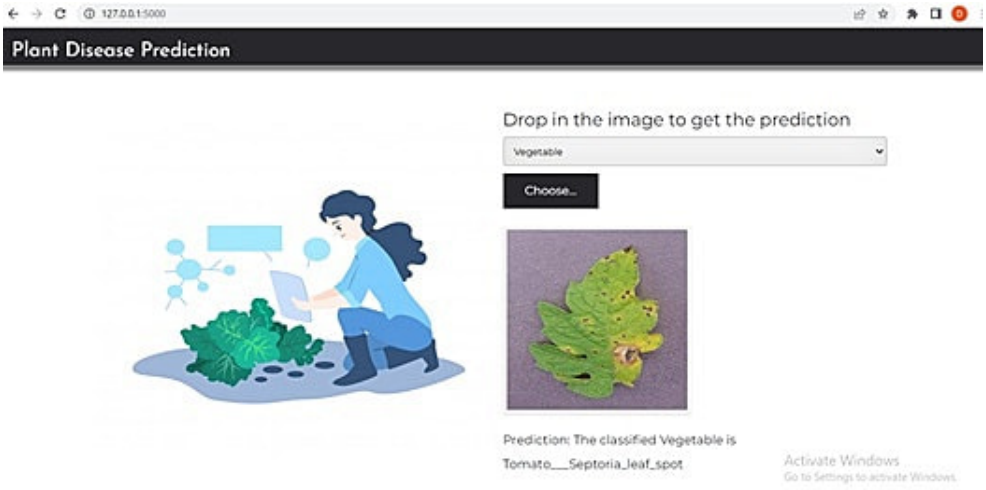


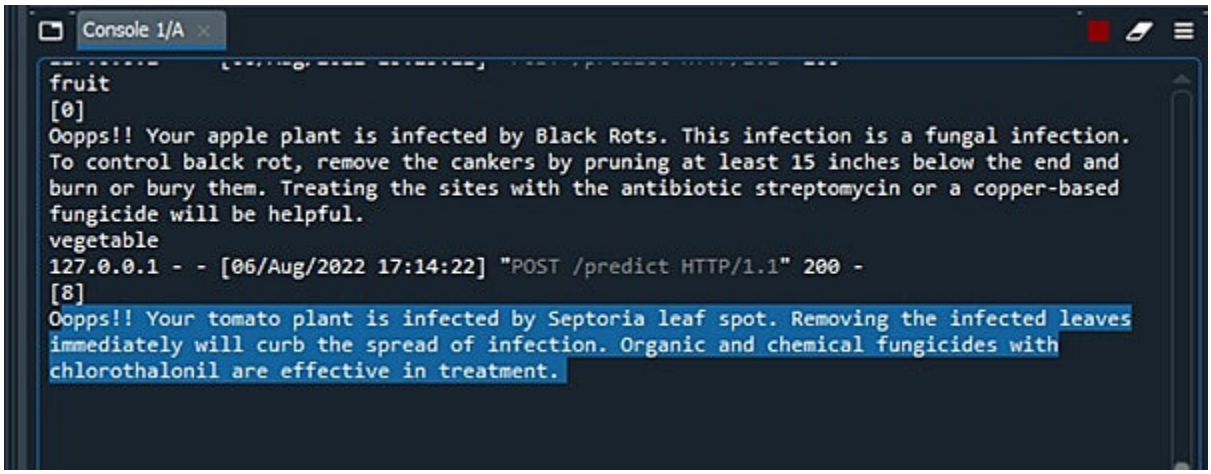
Fruit disease prediction:




```
 * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
127.0.0.1 - - [06/Aug/2022 15:25:01] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [06/Aug/2022 15:25:11] "POST /predict HTTP/1.1" 200 -
fruit
[0]
Oopps!! Your apple plant is infected by Black Rots. This infection is a fungal infection.
To control balck rot, remove the cankers by pruning at least 15 inches below the end and
burn or bury them. Treating the sites with the antibiotic streptomycin or a copper-based
fungicide will be helpful.
```

Vegetable disease prediction:





VII. CONCLUSION :

Deep Neural Networks have been deployed to detect the disease in fruit and vegetable crops. Web application interface has been developed for easy user interface.

VIII. SOURCE CODE

Model development,Training,Testing & IBM Deployment on IBM machine

https://drive.google.com/file/d/10fJc76fBLuKZMwRJp2Dl0CdODTlImlCI/view?usp=sharing

https://drive.google.com/file/d/1ed2e7YZj9R9hlW4q334Gpgtja0a1HrBh/view?usp=sharing

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IBM Deployment on Local machine with Anaconda Navigator- Jupyter Notebook

https://drive.google.com/file/d/1cL8eqbvdHhsCoEkEV3mATYDNXAVWxaO5/view?usp=sharing

https://drive.google.com/file/d/1FzF_vJGhfhWMWVhiwrKhYPQwzpWQTgLP/view?usp=sharing

Complete project codes and files

https://drive.google.com/drive/folders/1yZKaE6tN2DqsKdLlFGK7cmq9WZrwO57M?usp=sharing