PLANT DISEASE PREDICTION

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"Artificial intelligence is one of the most profound technologies we are working on, as important or more than fire and electricity,"

-SUNDAR PICHAI, Google CEO

1.Problem Statement

Agricultural productivity is something on which economy highly depends. This is the one of the reasons that disease detection in plants plays an important role in agriculture field, as having disease in plants are quite natural. If proper care is not taken in this area, then it causes serious effects on plants and due to which respective product quality, quantity or productivity is affected. Detection of plant disease through some automatic technique is beneficial as it reduces a large work of monitoring in big farms of crops, and at very early stage itself it detects the symptoms of diseases i.e., when they appear on plant leaves.

2.Market/Customer Need

India is a cultivated country and about 70% of the population depends on agriculture. Farmers have a large range of diversity of selecting suitable crops and finding the suitable pesticides for plant. Disease on plant leads to the significant reduction in both quality and quantity of the plants. The existing method for plant disease detection is simply naked eye observation by experts through which identification and detection of plant diseases is done. For doing so, a large team of experts as well as continuous monitoring of plant is required, which costs very high.

Our aim is to detect the plant diseases in early stages using artificial intelligence (deep learning models) by using images. This reduces the cost and can also be used as a reference to treat it.

3.Target Specification and Characterization:

The proposed system is mainly useful for farmers who does not want to spend more money on plant disease detection but want to spend it on curing it.

It is also helpful for agriculture specialists to identify which from which disease the plant is suffering.

4.External Search:

The dataset is available in Kaggle.

https://www.kaggle.com/datasets/vipoooool/new-plant-diseases-dataset

The dataset consists of about 87K rgb images of healthy and diseased crop leaves which is categorized into 38 different classes. The total dataset is divided into 80/20 ratio of training and validation set preserving the directory structure.

5.Bench Marking:

There are some handful of apps like Agrio, Plant disease identification, Leaf Doctor, Plant scope which are only available for iPhone users. But, most of the farmers do not use iPhone. Some apps like Prude tree doctor are available for android but they do not efficiently use AI.

6.Applicable Regulations:

- Patents on ML algorithms developed
- Protection/ownership regulations
- Being responsible by design.
- Ensuring open-source, academic and research community for an audit of Algorithms.
- Review of existing work authority regulations.

7.Applicable Constraints:

- Requires a lot of research to obtain universal dataset of plant diseases to provide more sophisticated and accurate results.
- There are a greater number of plants diseases which needs to be discovered.
- We should continuously collect and update the data.
- Thorough understanding of dataset and verification of the results must be performed by the agricultural specialists from the machine learning model to provide curing methods and service to the farmers.

8.Bussiness Opportunity:

In general, the plant disease is simply identified by naked eye and it requires lot of experts and time to continuously monitor it to identify the disease. At the same time, in some places, farmers do not have proper

facilities or even idea that they can contact to experts. Due to which consulting experts even cost high as well as time consuming too. To overcome this, we use deep learning models to detect the diseases in no time with high accuracy.

9.Concept Generation:

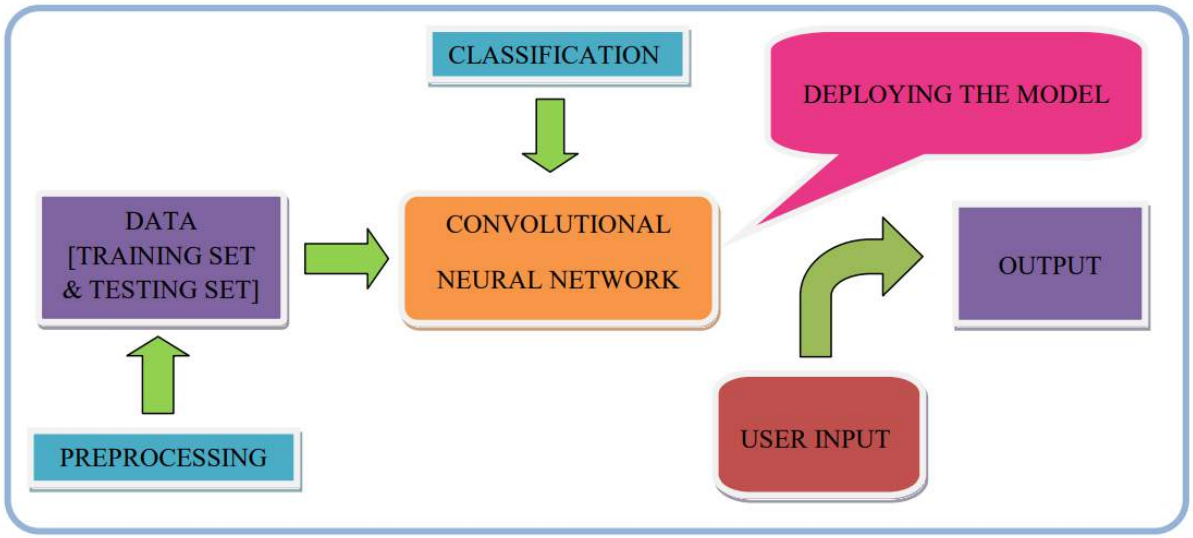
Concept is simple we want to identify the plant diseases as early as possible and helps to cure it in less time which increases the productivity of crops.

10.Concept development:

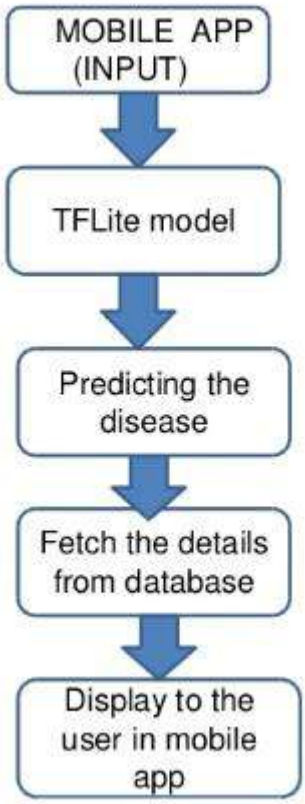
We should collect data and then perform training by using deep learning models and then test it and then use this model to build an app which can be used by people.

11.Final Product Prototype:

The final product is an application-based service which classifies the plant diseases based on the input image given by the user and then classifies it by using CNN architectures and then gives results to the user.



SYSTEM HIGH LEVEL DESIGN:



12.Product Details:

The product is an application-based service which takes image as input and gives the disease as output. We can collect data from Kaggle, different websites and from farmers. We use CNN architectures which are used to classify the images. The architecture of CNN is

Convolution Layer

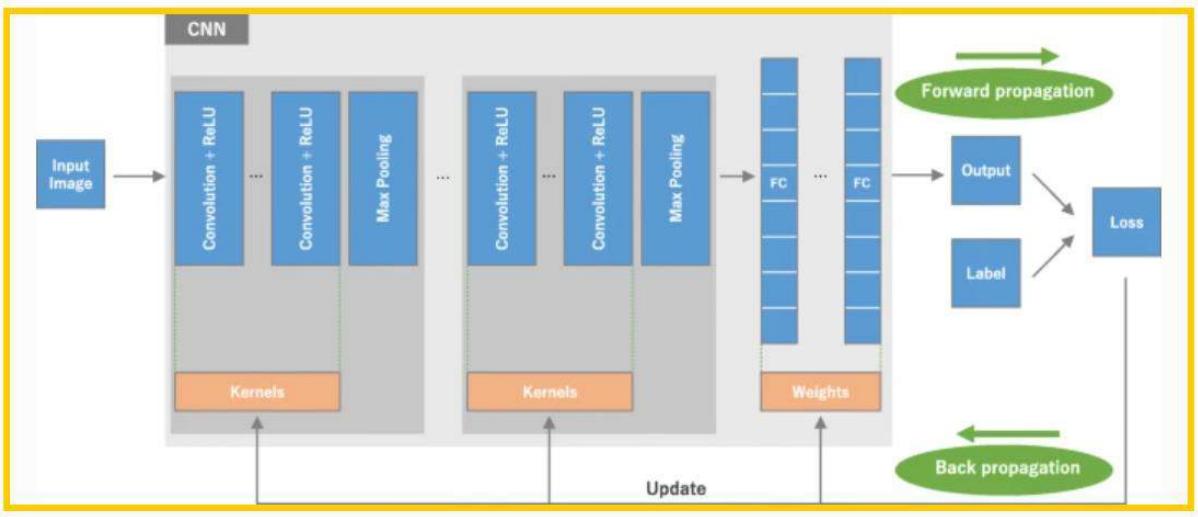
- CNN has a convolution layer that has several filters to perform the convolution operation.

Pooling Layer

- The rectified feature map next feeds into a pooling layer. Pooling is a down-sampling operation that reduces the dimensions of the feature map.
- The pooling layer then converts the resulting two-dimensional arrays from the pooled feature map into a single, long, continuous, linear vector by flattening it.

Fully Connected Layer

- A fully connected layer forms when the flattened matrix from the pooling layer is fed as an input, which classifies and identifies the images



The team required to develop are:

- 1 Data Analyst
- 1 Software Developer
- 1 Agricultural Specialist

13.Conclusion:

- The use of automated monitoring and management system are gaing increasing demand with technological advancement.
- In the agriculture field loss of yield is mainly occurs due to widespread disease.
- Mostly the detection and identification of the disease is noticed when the disease advances to serve stage therefore, causing the loss in terms of time and money.
- The proposed system is capable of detecting the disease at the earlier stage as soon as it occurs on the leaf, hence saving the loss and reducing the dependency on the expert to a certain extent is possible.