Plant Leaf Disease Detection Using Machine Learning.

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ABSTRACT

The detection of plant leaf is very important factor to prevent serious outbreak. Automatic detection of plant disease is essential research topic. Most plant diseases are caused by fungi, bacteria, and viruses. Fungi are identified primarily from their morphology, with emphasis placed on their reproductive structures. Bacteria are considered more primitive than fungi and generally have simpler life cycles. With few exceptions, bacteria exist as single cells and increase in numbers by dividing into two cells during a process called binary fission. Viruses are extremely tiny particles consisting of protein and genetic material with no associated protein. The term disease is usually used only for the destruction of live plants. The proposed processing scheme uses machine learning and dynamic plants image model to predict disease related to the leaf. Using machine learning makes platform generic and useful. Adding and updating new diseases and datasets is easy if machine learning is use. Using cloud computing for storing retrieving and serving data from machine learning model is efficient choice and both technologies can be used to create system.

Keyword: - *machine learning, cloud computing, morphology .*

1. Inrtoduction

Machine learning is programming computers to optimize a Performance criteria using example data or past experience. An intelligence requires knowledge, it is necessary for the computer to acquire the knowledge. Machine learning is emerging field and can be applied with any software layer "machine learning is a buzzword" according to the Gartner hype cycle of 2016, at its peak of inflated expectations.

Machine learning is closely related to (and often overlaps with) computational statistics, which also focuses on prediction-making through the use of computers. It has strong ties to mathematical optimization, which delivers methods, theory and application domains to the field. Machine learning is sometimes conflated with data mining, where the latter subfield focuses more on exploratory data analysis and is known as unsupervised learning. Machine learning can also be unsupervised and be used to learn and establish baseline behavioral profiles for various entities and then used to find meaningful anomalies.

Machine learning can be divded in supervised and unsupervised learning where supervised learning is learninig from well labled and already classified dataset and do prediction in unsupervised learning classses and dataset is not known proir to processing.

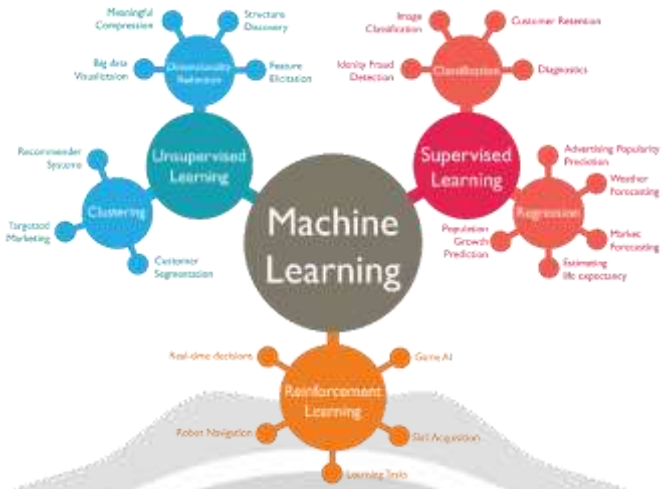

Fig-1 Types of machine learning

Classification: Data is labelled meaning it is assigned a class, for example spam/non-spam or fraud/non-fraud. The decision being modelled is to assign labels to new unlabeled pieces of data. This can be thought of as a discrimination problem, modelling the differences or similarities between groups.

Regression: Data is labelled with a real value (floating point) rather then a label. Examples that are easy to understand are time series data like the price of a stock over time, The decision being modelled is what value to predict for new unpredicted data.

Clustering: Data is not labelled, but can be divided into groups based on similarity and other measures of natural structure in the data. An example from the above list would be organizing pictures by faces without names, where the human user has to assign names to groups, like iPhoto on the Mac.

In this paper, we focus on the classsifying sample image dataset with labled class of diseases using different machine learning aprochese

The contributions of this paper are:

1) Presenting machine learning based approach for detection of plant disease.
2) Implementing model of machine learning model on centralized server.

2. Literature Review

After studying the journal paper, we came across different researches used for plant leaf disease detection. Each methodology has its own benefits. Major techniques are briefed in following section.

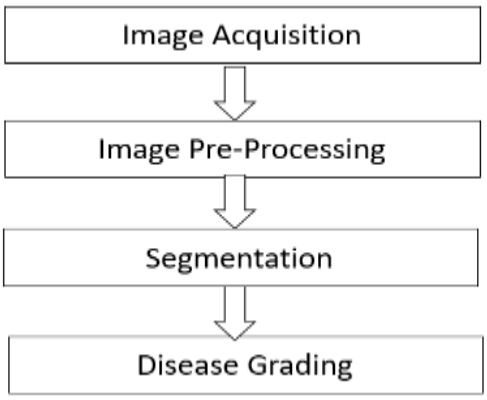

Fig-2 Traditional Image Processing Approach

Image Acquisition: First stage of any vision system is the image acquisition stage. The digitization and storage of an image is referred as the image acquisition. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement.

Pre-processing images: commonly involves removing low frequency background noise, normalizing the intensity of the individual particles images, removing reflections, and masking portions of images. Image pre-processing is the technique of enhancing data images prior to computational processing.

Image Segmentation: Image segmentation refers to the process of partitioning the digital image into its constituent regions or objects so as to change the representation of the image into something that is more meaningful and easier to analyze. The level to which the partitioning is carried depends on the problem being solved i.e. segmentation should stop when the objects of interest in an application have been isolated.

This model has good accuracy but is not generic approach to solve problem as different algorithm will be used to solve different problems. In real world where information is processed.

3.Proposed Methodology

Supervised learning is the machine learning task of inferring a function from labeled training data.[1] The training data consist of a set of training examples. In supervised learning, each example is a pair consisting of an input object (typically a vector) and a desired output value (also called the supervisory signal). A supervised learning algorithm analyzes the training data and produces an inferred function, which can be used for mapping new examples. An optimal scenario will allow for the algorithm to correctly determine the class labels for unseen instances. This requires the learning algorithm to generalize from the training data to unseen situations in a "reasonable" way. In Our case unseen situations are images of plants unidentified by the model.

we present a mathematical model for kNN algorithm For a given query instance xt , kNN algorithm works as follows:

$$y_t = \underset{c \in \{c_1, c_2, \ldots, c_m\}}{\arg\max} \sum_{x_i \in N(x_t,k)} E(y_i, c)$$

Where yt is the predicted class for the query instance xt and m is the number of classes present in the data. Also

N(x,k) =Set of k nearest neighbours, Where p(cj) (xt,k) is the probability of occurrence of j^{th} class in the neighborhood of xt . Hence Equation becomes

$$y_t = \arg\max\{p(c_1)_{(x_t,k)}, p(c_2)_{(x_t,k)}, \ldots, p(c_m)_{(x_t,k)}\}$$

4.Adding Neural Networks

We have a very large number of state-action pairs in classification of the plant leaf images diverse dataset is the key to good processing model, it is not feasible to store every feature separately.Then, it makes sense to store the features for a given action within one neural network.When a feature is needed, it is fetched from its neural network to make it modular and reliable.When s feature is to be updated, the new feature is used to update the neural network itself.

Now, while dealing with neural network we use batch updating or incremental updating.

The batch updating neural networks require all the data at once, while the incremental neural networks take one data piece at a time.

In our case, we need batch neural networks since all data is available at once, we obtain a new piece of data that must be used to update some neural network.

Neurons are the basic building block of the neural network which form the networks as shown in fig 3

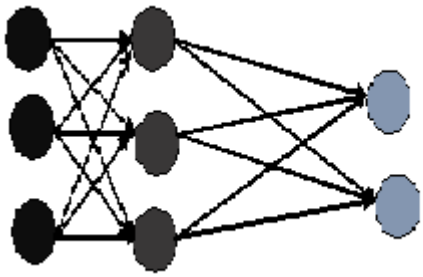

Fig-3 Multilayer Neural Net

Neurons are used for fitting linear forms, e.g., y = a + bi where i is the input (the state in our case). Also called adrenaline rule or Widrow-Hoff rule.

4.1Algorithm

Step 1: Initialize the weights of the neural network.
Step 2: Compute the output o using

$$output = \sum_{j=0}^{k} w(j)x(j)$$

where
w(j) is the jth weight of neuron and x(j) is the jth input.

Step 3: Update each w(i) for i = 0,1,...,k using:

$$w(i) \leftarrow w(i) + \mu[target - output]x(i)$$

Step 4: Increment iteration while I <iter_max

5. CONCLUSIONS

This research presented a machine learning with neural network approach for plant leaf disease detection in cloud data centers where prediction is done on the basis of the predefined dataset. We have achieved,

- Developing scalable system which will scale and evolve exponentially over period of time. Using machine learning allows us to use any dataset without changing dataset.
- Regression analysis we can find new trends and data by location of user and using crowdsourcing results will be influenced

This paper so far shows approach to solve plant leaf disease detection using supervised machine learning algorithms.

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