Leaf Disease Detection using Deep Learning

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ABSTRACT

- Plant diseases causes many significant damages and losses in crops around the world. Appropriate measures on disease identification should be introduced to prevent the problems and minimize the losses.
- Technical approaches using machine learning and computer vision are actively researched to achieve intelligence farming by early detection on plant disease.
- An application is obviously desirable to aid the farmers or garden enthusiasts in diagnosing what sorts of diseases a plant has. Although some similar applications exist, most of them achieve the function by submitting the image to a team of plant pathologists or expert garden advisers to get possible identification results and some advise.

Problem Statement and Objectives

An expected 70% to 80% indian economy relies on agribusiness. There is developing Indian population, which is increasingly dependent on the agricultural yield. The end goal is kept in mind to develop progressively the diseases need to be examined in earlier. Diseases are investigated utilizing different image processing techniques and diagnosed so that Farmers can overcome from yield and financial loss.

Modules Description and Implementation

- Pass the image through selective search and generate region proposal.
- Calculate IOU (intersection over union) on proposed region with ground truth data and add label to the proposed regions.
- Do transfer learning using the proposed regions with the labels.
- Pass the test image to selective search and then pass the first 2000 proposed regions from the trained model and predict the class of those regions.

Challenges to address

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- The background often contains elements that can make it very difficult to correctly segment the region of interest where the symptoms are manifest.
- Capture conditions are difficult to control, which may cause the images to present characteristics that are difficult to predict and make the disease identification more challenging.
- Most symptoms do not have well defined boundaries, rather gradually fading into normal tissue, making it difficult to clearly define which are the healthy and diseased regions.
- A given disease may possess very different characteristics depending on its stage of development, and sometimes on where it is located on the plant.
- Symptoms produced by different diseases may be present simultaneously, manifesting either physically separated or combined into a “hybrid” symptom that may be difficult to identify.
- Symptoms produced by different diseases may be visually similar, which forces the methods to rely on very tenuous differences to discriminate among them.

LITERATURE SURVEY

- The feature extraction is done in RGB, HSV, YIQ and Dithered Images. The feature extraction from RGB image is added in the suggested system.
- A new automatic method for disease symptom segmentation in digital photographs of plant leaves. The diseases of different plant species has mentioned.
- Classification is done for few of the disease names in this system. The disease recognition for the leaf image is performed in this work.

Serial No.	Author name and year of publication	Inference	Drawbacks
1	M. Ghosal et al. (2020)	Deep learning has shown promising results in detecting plant diseases using leaf images. The accuracy achieved is high, which could be used in real-time disease monitoring in agricultural settings.	The approach is limited by the availability of high-quality training data and the need for sophisticated algorithms.
2	S. Mukherjee et al. (2021)	Pre-trained CNN models can be used to achieve high accuracy in plant disease detection using leaf images.	The approach is limited by the availability of high-quality training data and the need for sophisticated algorithms.
3	M. Raza et al. (2021)	Deep learning-based plant disease detection using leaf images is an active area of research, with many different approaches being explored.	The approach is limited by the availability of high-quality training data and the need for sophisticated algorithms. Additionally, the use of deep learning for plant disease detection may require significant computational resources, which could be a barrier in some settings.
4	D Hughes and M Salathe(2015)	Increase in food production by human society	Infectious diseases reduce the potential yield

Comparison of Existing methods with merits and demerits

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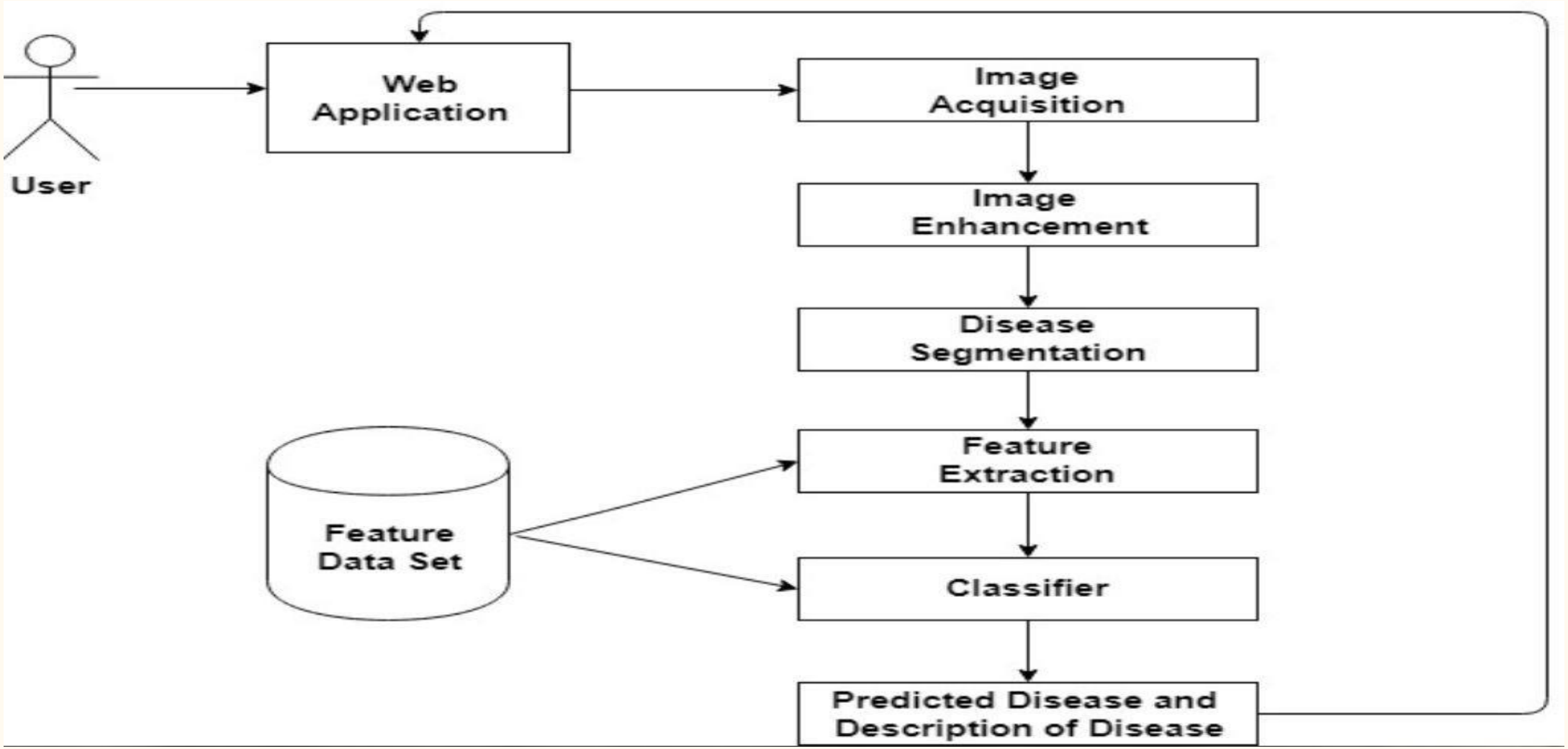
EXISTING SYSTEMS	MERITS	DEMERITS
Visual inspection is a traditional method for identifying leaf diseases that involves human experts examining the leaves visually and identifying any symptoms or signs of disease.	• **Simple and low-cost:** Visual inspection is a simple and low-cost method that does not require expensive or expert equipments.	• **Limited accuracy:** Visual inspection may not always detect diseases that are not visible to the naked eye or in the early stages of development.
Spectroscopy is a non-destructive method for detecting leaf diseases that involves using light to measure the physical and chemical properties of leaves.	• **Non-destructive:** Spectroscopy is a non-destructive method that does not harm the plants or the environment. It can be used repeatedly to monitor the plants' health over time.	• **Limited accuracy:** IoT-based sensors may not be as accurate as other detection methods, such as spectroscopy or machine learning, and may miss subtle changes in plant health.

Architecture/Block Diagram of the Proposed model



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