LEAF DISEASE AND NITROGEN DEFICIENCY DETECTING MACHINE LEARNING MODEL

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Abstract: This project consists of a machine learning model that could detect and identify leaf diseases. It could provide information on the diseases. The model is based on Convolutional Neural Networks. It could provide aid to people who are just getting into farming and information at their fingertips.

I. INTRODUCTION

A major component of an efficient farming strategy is the precise detection and characterization of plant deficiencies followed by the proper deployment of fertilizers. Through the thoughtful utilization of modern computer vision techniques, it is possible to achieve positive financial and environmental results for these tasks. This work introduces an automation framework that attempts to address the three main drawbacks of existing approaches: 1) lack of generality (methods are tuned for specific data sets); 2) difficulty to apply in variable field conditions; and3) lack of tool sophistication that limits their applicability. State of the art procedures in the agriculture industry regarding the generation of actionable information currently require excessive labour that is based on heuristics and inadequate field measurements. Automating certain procedures of the crop production pipeline is imperative due to the increased demand for food by an ever-increasing population and the social pressure on limiting the environmental impact of pesticides and fertilizers. The ubiquity of its cultivation makes it an ideal candidate to highlight the large economic benefits from even a small improvement in nutrient deficiency detection. The proposed methodology utilizes drone collected images to detect nitrogen deficiencies and leaf diseases in different crops and assess their severity using low-cost RGB sensors. The proposed methodology is proved to be very reliable and efficient in promoting and supporting responsible farming increasing production rate and profit for users without causing much harm to the environment.

2. PROPOSED SYSTEM

The proposed system involves the implementation of Convolutional Neural Network in image detection so as to identify and detect the presence of leaf diseases in crops. Knowledge of a fields' phytosanitary conditions is a decisive factor in limiting the use of pesticides while protecting harvests. Indeed, it enables farmers to carry out proper practices in the right place and at the right time. However, assessing the healthiness of fields is not simple, and it requires a high level of expertise. Indeed, a disease can be expressed differently from one plant species to another, or even from one variety to another. This work introduces an automation framework that attempts to address the three main drawbacks of existing approaches: 1) lack of generality (methods are tuned for specific data sets) 2) difficulty to apply in variable field conditions 3) lack of tool sophistication that limits their applicability.

3. SYSTEM DESIGN

The required datasets are selected and obtained so as to use them to train our machine learning model. This includes pictures of leaves of a variety of crops containing leaves that are diseased, leaves that are healthy and so on. Digital image processing is the use of a digital computer to process digital images through an algorithm. Image processing is used to find out various patterns and aspects in images.Image segmentation is a method in which a digital image is broken down into various subgroups called Image segments which helps in reducing the complexity of the image to make further processing or analysis of the image simpler. Segmentation in easy words is assigning labels to pixels.

3.1DATASET

We analyze 54,306 images of plant leaves, which have a spread of 38 class labels assigned to them. Each class label is a crop-disease pair, and we make an attempt to predict the crop-disease pair given just the image of the plant leaf. one example each from every crop-disease pair from the Kaggle dataset. In all the approaches described in this paper, we resize the images to 256 × 256 pixels, and we perform both the model optimization and predictions on these downscaled images. Across all our experiments, we use three different versions of the whole Kaggle dataset. We start with the Kaggle dataset as it is, in color; then we

experiment with a gray-scaled version of the Kaggle dataset, and finally we run all the experiments on a version of the Kaggle dataset where the leaves were segmented, hence removing all the extra background information which might have the potential to introduce some inherent bias in the dataset due to the regularized process of data collection in case of Kaggle dataset.

Segmentation was automated by the means of a script tuned to perform well on our particular dataset. We chose a technique based on a set of masks generated by analysis of the color, lightness and saturation components of different parts of the images in several color spaces (Lab and HSB). One of the steps of that processing also allowed us to easily fix color casts, which happened to be very strong in some of the subsets of the dataset, thus removing another potential bias. This set of experiments was designed to understand if the neural network actually learns the "notion" of plant diseases, or if it is just learning the inherent biases in the dataset. Figure 2 shows the different versions of the same leaf for a randomly selected set of leaves.

4. Conclusion

In this work, a complete stand-alone computer vision tool for the detection of N deficiency and leaf diseases in plants has been presented and validated on a data set. The high resolution of the images allows several neigh boring pixels to collectively express the colour of an area as opposed to low-resolution images where each pixel consists of a collection of neighbouring colours. This collective expressiveness is harvested by the SLIC and the multicluster. Finally, the goal as stated previously, is to efficiently automate, create and use a deep neural network to identify leaf diseases which provides a broader field of knowledge and information to people who are just getting into farming and also experienced farmers. The bulk of our effort was concentrated on how to minimally interact with fields and to provide a platform to bring together the farming and agriculture community under one place and to enable and inform them with new policies, innovations, technologies etc.

5. FUTURE Scope

Further future improvements can be brought to keep up with upcoming technologies. Since farming and agriculture is the only way to provide us with food, this model will stay relevant as long as farming remains relevant. More and more people can be introduced to changing ways and innovations further broadening the community.

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