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Detecting Tomato Leaf Disease through Convolutional Neural Networks

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INTRODUCTION

Mexico's economy is fundamentally based on agriculture. A 2.5% of Mexico's total national output is in the horticulture sector. Tomatoes in particular have become the most traded agricultural product in the country. Because of this, there is an increasing need to improve crop yields. One factor that has a considerable impact on agricultural productivity is disease caused by infections, bacteria, and other specialists. Despite this, collecting illness-specific evidence can be expensive and usually tiresome. During the period spent studying plant illness, profound learning techniques have begun to be implemented with encouraging results. In this research, we propose a model based on convolutional brain structures to classify and rank tomato leaf diseases using a public dataset and additional images captured in the country's fields. Generative unfavourable networks were used to create tests with characteristics similar to the preparation data in order to prevent overfitting. The results demonstrate that the suggested model performs admirably when it comes to determining the location and severity of diseases in tomato leaves. In both the training and test datasets, the precision achieved is more than close to 100%.

DESCRIPTION

One of the most popular vegetables farmed worldwide and a significant source of income for farmers is the tomato. According to the Food and Agriculture Organisation Corporate Statistical Database's 2020 statistical report, 186.821 million tonnes of tomatoes were produced globally. The tomato, which is regarded as a fundamental ingredient in both Mexican cuisine and, more broadly, in food from many different regions of the world, is one of Mexico's key crops in terms of national production. Mexico, which produces 4.1 million tonnes of tomatoes annually, is among the top ten nations with the biggest tomato production, according to a report from Our World in Data from 2020. The report on Mexico's AgriFood Trade Balance, which was presented by the Mexican Ministry of Agriculture, Livestock, Rural Development, Fishing, and Food, indicates that tomato is the second most exported agricultural product, with avocado taking the top spot. In addition, the annual fluctuation in tomato output in Mexico from 2011 to 2020 is 5.3%. However, other factors have an impact on productivity. According to the Food and Agriculture Organisation, crop diseases are to blame for losses of 20% to 40% of overall production. Numerous tomato plant diseases can have an impact on the amount and quality of the product, reducing productivity. Generally speaking, there are two primary groups of diseases. The first class of illnesses is linked to contagious microorganisms like bacteria, fungus, and viruses. When the situation is favourable, these diseases can quickly spread from plant to plant in the field. The second category of diseases is brought on by non-infectious chemical or physical factors, such as harmful environmental conditions, dietary or physiological issues, and herbicide damage. Although non-infectious diseases cannot spread from plant to plant, they can if the entire plantation is exposed to the same harmful factor. Plant diseases can be brought on by specific circumstances.

CONCLUSION

The disease triangle is a conceptual model that specifically explains the connection between three crucial factors: The environment, the host, and the infectious agent. The triangle is incomplete and the sickness does not occur if any one of these three conditions is missing. Abiotic elements that can have a big impact on the plant include air flow, temperature, humidity, pH, and watering.