



Performance of deep learning vs machine learning in plant leaf disease detection

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ABSTRACT

Plants are recognized as essential as they are the primary source of humanity's energy production since they are having nutritious, medicinal, etc. values. At any time between crop farming, plant diseases can affect the leaf, resulting in enormous crop production damages and economic market value. Therefore, in the farming industry, identification of leaf disease plays a crucial role. It needs, however, enormous labor, greater preparation time, and comprehensive plant pathogen knowledge. For the identification of plant disease detection various machine learning (ML) as well as deep learning (DL) methods are developed & examined by various researchers, and many of the times they also got significant results in both cases. Motivated by those existing works, here in this article we are comparing the performance of ML (Support Vector Machine (SVM), Random Forest (RF), Stochastic Gradient Descent (SGD)) & DL (Inception-v3, VGG-16, VGG-19) in terms of citrus plant disease detection. The disease classification accuracy (CA) we received by experimentation is quite impressive as DL methods perform better than that of ML methods in case of disease detection as follows: RF-76.8% > SGD-86.5% > SVM-87% > VGG-19-87.4% > Inception-v3-89% > VGG-16-89.5%. From the result, we can tell that RF is giving the least CA whereas VGG-16 is giving the best in terms of CA.

1. Introduction

Agriculture has been a major source of economic growth in India. The farmer selects the required crop based on the soil type, the location's weather condition, and economic value. As a result of rising populations, weather changes, and political uncertainty, the agricultural industries began to look for new methods to increase food production. This allows researchers to look for new high productivity innovations that are effective and accurate. Through the use of precise agriculture in information technology, farmers may collect information and data to make the right decision on high farm production. Precision agriculture (PA) is a modern technology that offers sophisticated techniques for optimizing farm production. Through making use of these sophisticated technologies, Economic development in agriculture can be achieved. PA can be used for many applications, such as plant pest identification, weed identification, crop yield production and detection of plant diseases, etc. To control pests, avoid diseases, and increase crop yield, a farmer uses pesticides. Crop diseases are causing problems for farmers due to low

output and economic losses and industrial agriculture. Therefore, disease detection and severity are focused on the need to be defined as appropriate [1].

Agriculture assumes a significant part for individuals in India and the economy of the nation.

Regular manifestations include anomalous leaf development, color distortion, hindered development, withered, and harmed units. Even though infections and bug vermin can cause significant yield misfortunes or carry passing to plants and it's likewise legitimately influential to human wellbeing. These require cautious analysis and ideal taking care of to shield the yields from weighty losses [2]. In plants, infections can be found in different parts, for example, natural products, stem, and leaves. Leaf presents a few points of interest over blossoms and natural products at all seasons around the world [3–5].

Next-generation technologies, for instance, ML and DL have been used to grow the acknowledgement rate and the precision of the results. Distinctive investigations have happened under the field of ML for plant contamination acknowledgement and assurance, such traditional ML

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