Identifying the diseases on brinjal leaves using machine learning – A Sri Lankan study

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Abstract: The spread of plant diseases has a substantial negative impact on the quality and yield of agricultural output, which results in significant economic losses. Because of the economic crisis and the emphasis on organic farming practices, plant disease automation in agricultural science is the main worry for our nation. Additionally, the efficiency and precision of identifying disease leaves have improved due to the growing use of smart technologies. This paper aims to design a system that can classify the diseases in brinjal leaves using image processing and machine learning to improve accuracy. The diseases of Tobacco Mosaic Virus, Collar Rot, Bacterial Wilt, and Cercospora Leaf Spot were chosen for the classification with healthy leaves. Images of thirty-five leaves from Thirunelveli Purple Brinjal (*Solanum melongina* L.) were captured in-house for each disease in Atchuveli (Northern Province of Sri Lanka), including healthy leaves for this work. Histogram Oriented Gradients and Principal Component Analysis based features were employed to classify the pictures using the KNN approach, and the resulting accuracies were 0.95 and 0.97, respectively. The images were later tested with a Convolutional Neural Network technique to increase the accuracy, but the optimum result was 0.92. Due to the enormous number of parameters that a learning algorithm must optimize, deep learning necessitates a lot of training data. Increasing the training data is necessary to achieve high accuracy in both techniques. The proposed system will provide an opportunity for farmers to identify the correct disease. However, the complete system with the classification system, hardware, and camera that will be used in the field is the ultimate aim of this study. Our future work will consider designing this complete system with automatic detection.

Keywords: Convolutional Neural Network, Histogram of Oriented Gradients, K-nearest Neighbours, Principal component analysis