

IMPROVING PLANT DISEASE RECOGNITION WITH GENERATIVE ADVERSARIAL NETWORK UNDER LIMITED TRAINING SET

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ABSTRACT

Traditionally, plant disease recognition has been carried out visually by human. It is often biased, time-consuming, and laborious. Borrowing from the success of machine learning in computer science, methods based on deep learning have been proposed to improve the disease recognition process. Convolutional neural networks (CNNs) have been adopted and proven to be very effective in plant disease recognition. Despite the good recognition accuracy achieved by CNNs, the issue of limited training data is often overlooked. In most cases, the training dataset is often small since data collection and annotation require significant effort. In this case, CNN method tends to have the overfitting problem. In this paper, a generative adversarial network (GAN) based method has been proposed to improve the prediction accuracy and address the overfitting problem under limited training data. Different from the traditional GAN, our GAN is combined with a regularization

kernel. The proposed method has been tested on a public dataset from www.plantvillage.org, which includes images of 14 crop species and 26 diseases. Experiments show that compared to using the real dataset only, the proposed GAN enhanced recognition method can improve the overall classification accuracy of plant diseases by 6%.