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Paddy Leaf Disease Detection Using an Optimized Deep Neural Network

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Abstract: Precision Agriculture is a concept of farm management which makes use of IoT and networking concepts to improve the crop. Plant diseases are one of the underlying causes in the decrease in the number of quantity and quality of the farming crops. Recognition of diseases from the plant images is an active research topic which makes use of machine learning (ML) approaches. A novel deep neural network (DNN) classification model is proposed for the identification of paddy leaf disease using plant image data. Classification errors were minimized by optimizing weights and biases in the DNN model using a crow search algorithm (CSA) during both the standard pre-training and fine-tuning processes. This DNN-CSA architecture enables the use of simplistic statistical learning techniques with a decreased computational workload, ensuring high classification accuracy. Paddy leaf images were first preprocessed, and the areas indicative of disease were initially extracted using a *k*-means clustering method. Thresholding was then applied to eliminate regions not indicative of disease. Next, a set of features were extracted from the previously isolated diseased regions. Finally, the classification accuracy and efficiency of the proposed DNN-CSA model were verified experimentally and shown to be superior to a support vector machine with multiple cross-fold validations.

Keywords: Leaf classification; paddy leaf; deep learning; metaheuristics optimization; crow search algorithm