

CONVOLUTIONAL NEURAL NETWORK BASED PEST
AND DISEASE RECOGNITION

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Summary. *In recent years, convolutional neural network, as one of the most representative algorithms of deep learning, has good generalization and accuracy. Crop pest and disease identification combined with image technology is an inevitable trend of future agricultural development, which plays a very important role in maintaining ecological balance, guaranteeing China's food security as well as improving the quality of China's food.*

Data set establishment and preprocessing: preprocessing mainly consists of four steps. Optimization of dataset is to screen the image dataset; image transformation is to adjust the size of the image by interpolation; image standardization is to convert the values of pixels on the three channels of the RGB image to form standard values according to certain rules; data enhancement is to randomly sort the read-in images.

Constructing Convolutional Neural Networks: This part contains four parts: defining the structure of the convolutional neural network, defining the loss function, iterative training, and accuracy evaluation. Defining the network structure, that is, defining the algorithmic formula for the forward calculation of the neural network; the loss function is essentially the calculation of the error between the predicted value and the true value; the iterative operation is to use the principle of back-propagation to update the weight of the convolutional neural network until the end of the training; and the accuracy assessment is to evaluate and improve the recognition correctness of the convolutional neural network.

Training convolutional neural network: the training process is mainly divided into two stages. The first stage forward propagation link, extract feature data to realize the propagation from low level to high level. The second stage is the back-propagation stage, the weights of the propagation during the training process are randomly assigned, and when there is an error between the output data and the desired data, the error is labeled and propagated back to the upper level to start the back-propagation training.

Model accuracy testing of neural networks: multiple comparison tests are designed to verify the recognition accuracy of convolutional networks. Divide the dataset into training set, validation set and test set, change the ratio of the training set with the type of pests and diseases, observe the demonstrated accuracy and analyze the problem.