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Agriculture Disease Classification Using U-Net Architecture

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Abstract: *Understanding and determining the existence of disease in agriculture is important for food security and sustainable agriculture practice. Agricultural activities such as visual inspection is subjective and requires endless hours of work looking over meticulous details which makes it impractical in larger settings. With the development of precision agriculture, automated disease detection systems are gaining popularity as they reduce dependency on manual work and monitoring. This research aims to develop a scalable and robust framework based on deep and traditional machine learning for classifying and detecting diseases in plants.*
As the basis of the method, a U-Net based segmentation model which was designed for biomedical imaging is applied with a segmentation model for capturing spatial precision which needs pixel-level segmentation of fine-grained disease affected spatial details. The segmentation partitions diseased pixel regions to improve subsequent classification. Features of interest, colored histograms, shapes, and textures are extracted, and classification is performed by SVM, RF, and k-NN. Assessment is done based on the amount of accuracy, precision, recall, F1-score, and IoU measurable intersection over union. Using the Plant Village dataset that contains over 54,000 annotated images, experiments run.

Keywords: Plant disease detection, deep learning, U-Net segmentation, image classification, convolutional neural networks (CNN), machine learning, Support Vector Machine (SVM), Random Forest (RF), k-Nearest Neighbors (k-NN), PlantVillage dataset, precision agriculture, feature extraction

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