Identification of Southern Leaf Blight Infected Corn for Remote-Sensing Field Imagery

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The conventional method of crop disease detection, relying on visible symptoms, is time-consuming and often results in the loss of yield. The ability to detect the effects of these stressors early enables growers to mitigate these losses. This research proposes utilizing machine learning algorithms to develop efficient detection and classification models that recognize patterns in infected and noninfected plants from hyper-spectral bands. This research will use hyper-spectral imagery with corresponding plot-wise disease severity scores assigned by an expert breeder based on visual inspection from a single growing season. For the initial processing, we implement unsupervised clustering to extract pixels and features that correspond to the crops, grass, and background and manually segment plot maps. These components are used to determine the correlation between the visual inspection scores to specific features and plots. Preliminary experiments have shown that the crop-focused segmented data has a strong relationship with the ability to detect the disease. Supplementary statistical tests will be run to provide additional understanding of these relationships. We will then use elastic net regression models to identify specific spectral bands that serve as essential features for distinguishing disease severity. Moreover, we will study the change in intensity of the hyperspectral wavelengths at different disease severity levels to identify influential frequencies. These results will contribute to the advancement of crop disease management and reducing crop loss. Furthermore, the development of a model that uses hyper-spectral field imagery and machine learning can be applied to other crops and stressors, improving food security and sustainability.