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Sooty mold effect on cassava yields using convolutional neural networks

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Whiteflies have been observed to cause two forms of damage to the host cassava plants that is feeding damage and sooty damage. The secondary damage, referred to as sooty mold damage, is a result of honeydew dropped by the feeding whiteflies on lower leaves. It is characterized with a sooty darkening of the lower leaves that affect chlorophyll content levels, because chlorophyll is an indicator of plants nutritional stress, photosynthetic capacity and the healthy status of plants. Plants need much possible levels of chlorophyll content to absorb enough light that is to be used during photosynthesis for them to make their own food. Sooty mold damage with its black-darkening-effect abstract the leaves from getting direct light rays during the photosynthesis process which leads to low cassava yields. The use of machine learning for surveilling the health of crops has been looked at in a number of related settings, including the segmentation of diseased leaves and disease-related dis-coloration in citrus fruit. The study will be aimed at understanding the effect of sooty mold on chlorophyll content in cassava plants and see how we can improve and raise on the cassava yields. Five cassava varieties that are narocass 1, nase 14, mkumba, njule and bamunanika will be considered during the research. We shall determine the level of infestation by sooty mold on these cassava varieties and tell which variety is most affected. We shall analyze and relate spectral reading data with chlorophyll content to measure how much of chlorophyll is affected by sooty mold damage in cassava images. We shall develop a Convolutional Neural Network (CNN) model to estimate pigment (chlorophyll) content based on spectrometer readings. Using our model, we shall determine the percentage of the plant being affected and the extent covered by sooty mold. We shall use field spectrometer to take spectral field measurements and also carry out remote sensing analysis of the data. This data will be related to the chlorophyll content to determine the levels of sooty mold effect. The research will lead to increase in cassava yields as a result to a more accurate detection of sooty molds. This will improve the response time for whiteflies and sooty mold infected cassava care. This will no longer be need for handcrafting/manually extracting features.

Biography

Semakula Abdumajidhu is currently pursuing his Master of Science degree in Computer Science at the College of Computing and Information Sciences (CoCIS), Makerere University. His major is Computer Vision and Image Processing with his current research on crop diseases.

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