Leveraging Convolutional Neural Networks, Deep Learning, and Computer Vision in a Novel Approach to Rapid Banana Disease Detection

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During the 1950s, the Gros Michel species of bananas were nearly wiped out by the incurable Fusarium Wilt, also known as Panama Disease. Originating from Southeast Asia, Panama disease is a banana pandemic that has been threatening the multi-billion-dollar banana industry worldwide, equivalent to the impact of Covid-19. The disease is caused by a fungus that spreads rapidly throughout the soil and into the roots of banana plants on farms. Currently, the only way to stop the spread of this disease is for farmers to manually inspect and remove infected plants as quickly as possible, which is a time-consuming process. Remote sensing is an approach that has been used to detect this disease; however, it is mainly used for detecting large-scale infections and lacks the capability for early detection of the fungus. The objective of the project was to build a Convolutional Neural Network (CNN) using a transfer learning approach and implement the predictive AI model on a remotely piloted UAV to detect individually diseased banana crops. This system will function as an early detection system for Panama disease. The ResNet50 architecture was chosen as the base layer for this model. After training, the CNN model achieved near-perfect accuracy of 0.98 and was exported to the UAV system to scan the banana plants. ResNet50's distinctive residual block structure could be the reason behind these results. When banana leaves were scanned by the UAV system, the system correctly identified infected Banana plants about 98% of the time ,and thus, the project achieved the engineering goal.

Awards Won:

Central Intelligence Agency: Second Award: $300