The Development of a Holistic System for Broad-Spectrum Crop Disease Diagnosis and Treatment

Srivastava, Shreshth (School: duPont Manual High School)
Senthilvel, Pranav (School: duPont Manual High School)

Globally, 842 million people suffer from malnourishment, over 10% of the global population. Unfortunately, poor agricultural practices have only exacerbated this problem. Studies have shown that disease-related yield losses have cost the world 60% of global agricultural productivity. According to the University of Nebraska-Lincoln, “The most critical issue for profitable management of plant diseases is obtaining a correct diagnosis.” However, in large-scale commercial farms, proper monitoring is difficult due to the number of crops. This leads farmers to use widespread application of pesticides, harming the environment in the process. To combat this problem, we implemented a three-pronged solution. Firstly, we developed a machine learning algorithm that can screen images of crop leaves for disease with an accuracy of 97.1%, significantly greater than that of current diagnostics. We trained it using the PlantVillage dataset, featuring 54,309 crop images across 38 classifications and 14 species. Secondly, we developed a semi-autonomous vehicle capable of surveying acres of farmland, capturing images of the crops, and providing treatment to those that are identified as diseased by the machine learning algorithm. Finally, this information was presented to the end-user in an open-source mobile application. This app allows farmers to monitor large-scale commercial farms with the touch of a button. Furthermore, it uses weather patterns, amongst myriad other factors, to optimize the efficacy of crop diagnosis and treatment. Overall, our system will serve as an important semi-autonomous crop disease screening tool, boosting food production and helping to fight world hunger one step at a time.

Awards Won:
First Award of $3,000
Association for the Advancement of Artificial Intelligence: Second Award of $1,000
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: $21000 Scholarship for Machine Learning in Real-World Bio-engineering Applications