A Low-Cost Hyper-Spectral Image-Processing System to Identify Stressed Crops for Improved Harvest Yields

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Over the next 30 years, the United Nations is expecting the world's population to increase by 2 billion people, from the current 7.7 billion, to 9.7 billion by the year 2050. Consequently, more food will have to be produced over the next 30 years than has ever been produced in the history of mankind. "Precision Agriculture" leverages technology (sensors, drones, software, etc.) to increase crop yields while efficiently using resources (water, fertilizer etc.) The economics of Precision Agriculture favor large farms (>2,400 acres) as they can quickly recover their investments by increasing their yields over a larger area. For the ~250,000 small, family-owned farms in the US with an average size of 70 acres, the technology investments required outweigh the economic benefits. This project leverages publicly available NASA satellite imagery and photos taken with a low-cost camera, making Precision Agriculture economically viable for smaller farms. The solution uses visible color and near infrared data extracted from these images to calculate the crop's NDVI (Normalized Difference Vegetation Index), which is a visual representation of plant health based on its reflection of sunlight. NDVI is used to identify areas of farmland that may require corrective action to ensure a successful harvest. The solution identified vegetation stress not visible to the naked eye, such as different moisture levels and leaf turgidity between plant samples. The patent-pending solution leverages tools a farmer may already have (smartphone, drone) and adds NDVI capability for less than $100.

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