INTEGRATION OF SENSOR, IOT, AND MACHINE LEARNING (ML) IN PRECISION IRRIGATION AND NUTRIENT MANAGEMENT

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The world's agricultural and water resources enterprises have been facing formidable challenges of optimizing crop yields with reducing water inputs while minimizing environmental degradation. Adequate amount of crop yield to feed the rapidly growing population largely depends on the irrigated agriculture and fertilizer inputs. However, climate variability and water scarcity along with intensification of agricultural practices has resulted in a dramatic change in water and fertilizer inputs in agriculture sector around the world. Successful advancements in precision agriculture sensor technologies along with IoT and Machine learning in the last two decades have enabled the optimization of water and nitrogen application to manage spatial and temporal variabilities within agricultural fields. For example, the acquisition of real-time irrigation and nitrogen (N) nutritional status is of utmost importance for effective crop production. However, the current standard methods for reliable and accurate measurement are to collect leaf or soil samples and transport samples from field sites to laboratory for assessment and experimentation. Such an invasive approach does not allow timely measurements and prevents us from accurately characterizing and modeling processes occurring in plant and soils. Thus, there is a need for real-time in-situ information from agricultural fields through continuous sensing along with the development of IoT to automate the process. This presentation will focus on two independent studies (i) Integration of sensor technologies and IoT framework to automate the strawberry irrigation scheduling during plant establishment based on leaf, mulch, and air temperature, and (ii) to establish a machine learning (ML) technique for predicting the leaf nitrogen content (LNC) and crop yield of maize through the utilization of unmanned aerial vehicles (UAVs)-based imagery.

PRESENTER BIO: Dr. Vivek Sharma is an Assistant Professor in the Agricultural and Biological Engineering Department at the University of Florida. His research and extension program addresses the application and development of precision agricultural water management technologies and strategies to enhance water-use efficiency while reducing the impacts of agricultural management practices on water quality.

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