IMPROVED SENSOR-ANALYTICAL POINT SOLUTIONS (SNAPS) FOR E. COLI IN IRRIGATION WATER BY INTEGRATION OF STATISTICAL MACHINE LEARNING

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Reuse of alternative water sources (AWS) for irrigation has potential to reduce agricultural water shortage gaps. However, use of AWS, particularly for fresh produce, has increased risk of bacterial contamination. Thus, rapid and accurate identification of *Escherichia coli* in AWS (a classic biomarker for contamination) is crucial for resource management. Impedimetric biosensors are one of the most common tools for rapid pathogen detection but suffer from poor selectivity in complex media (where signal-to-noise ratios are low). We applied a laser-inscribed graphene (LIG) biosensor for measuring *E. coli* in AWS. Equivalent circuit model, which is one of the most powerful method to analyze the impedimetric data, may have limitation for complex examples. We developed a statistical machine learning framework to predict the *E. coli* concentration in AWS. The results show that using statistical machine learning algorithms to fit the biosensor data can reduce the prediction error 20% to 70%, compared with standard equivalent circuit models (ECM; Randles-Ershler). Furthermore, we find that the ECM prediction ability can be improved when it is coupled with some SML algorithms. Our research will nicely bridge SML with biosensor and ECM, and this tool could enable growers who lack access to analytical lab services to meet regulatory requirements with high confidence.

PRESENTER BIO: Mr Qian is a Ph.D. student of agricultural and biological engineering at the University of Florida Agricultural and Biological Engineering department. Much of his work focus on applying machine learning methods to analyze biosensor data. His study area, much like his research interests, is split between Statistics and Machine learning.