NAPPN Annual Conference Abstract: Detection and Quantification of Tar Spot Foliar Infection in Maize Using Machine Learning, Object Detection, and Application Development Framework

Jordan Manchego, Michigan State University, East Lansing, MI, United States; *Dr. Addie Thompson, Michigan State University, East Lansing, MI, United States*

ORCiD: https://orcid.org/0000-0001-7766-3775

The expanding geographic range of *Phyllachora maydis*, the fungus that induces Tar Spot infection on corn foliage, is increasingly threatening a Michigan industry that contributes over $1 billion to the state's economy annually. Advances in machine learning now enable quantification of crop infection presence and severity using powerful object detection packages such as Tensorflow, Keras, and more. Tensorflow, specifically, has developed Application Programming Interface (API) tools to connect powerful object detection capabilities with streamlined usability. Foliar infection of maize by *P. maydis* is often difficult to detect early. Visible lesions initially appear tiny, ambiguous, and sparse, making them difficult to identify with the naked eye. Both farmers and breeders of corn desperately need better tools that allow early, definitive detection of lesions and provide more time for management decisions. This tool must verify presence of *P. maydis* and quantify infection severity as quickly as possible to allow growers the most options for treatment. I propose a combination of supervised machine learning using Tensorflow for custom object detection, and containerized application-development software such as Docker to create a user interface accessible on desktop or mobile devices. This application will be developed by weaving the transferrable infrastructure of Docker with the powerful machine learning platforms Tensorflow and Tensorflow Lite, thereby allowing users to analyze images using their preferred operating system. By implementing both complementary Tensorflow platforms, farmers and breeders will be afforded the choice of either capturing and analyzing one image at a time, or detecting lesions continuously in real-time.