A multi-scale data assimilation framework for layered sensing and hierarchical control of disease spread in field

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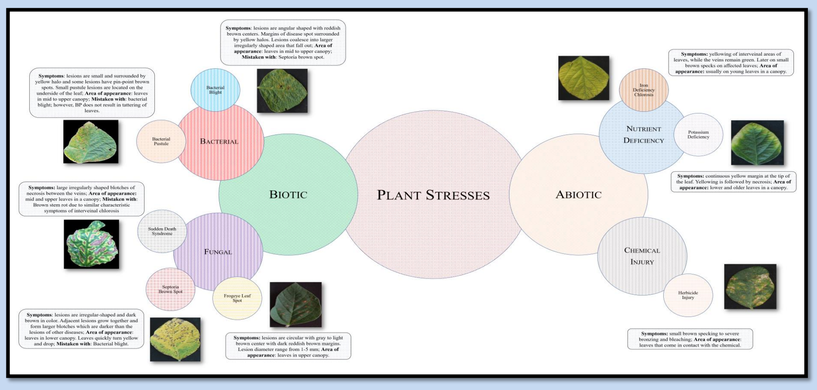
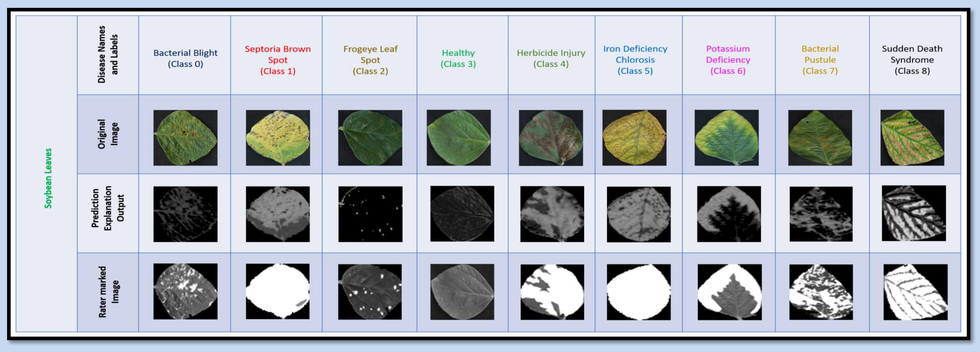
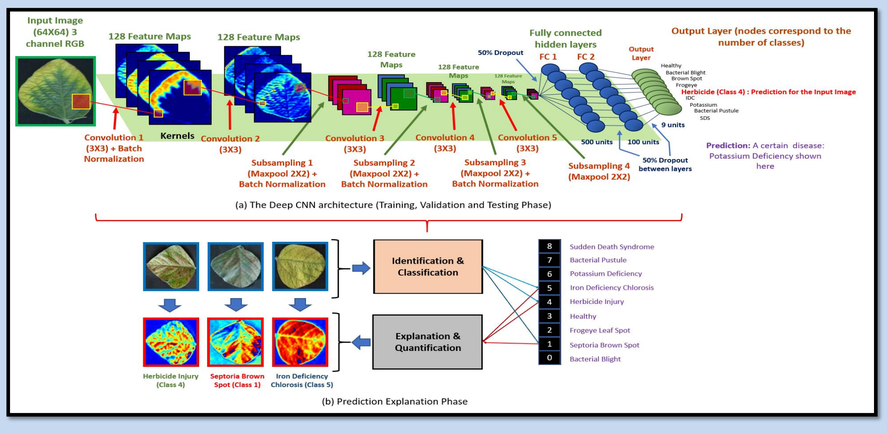


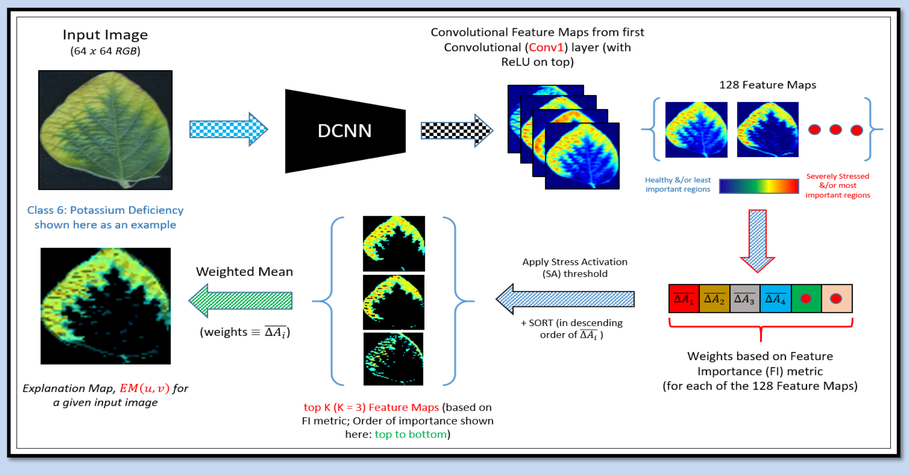
Soybean Stresses that the framework was trained on



Explanation Outputs for different stresses



Framework Flow: A Deep Convolutional Neural Network based model



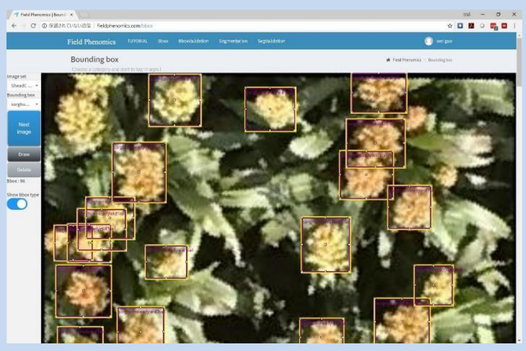
Explanation Framework: Top-K feature extraction

Plant stress ICQP

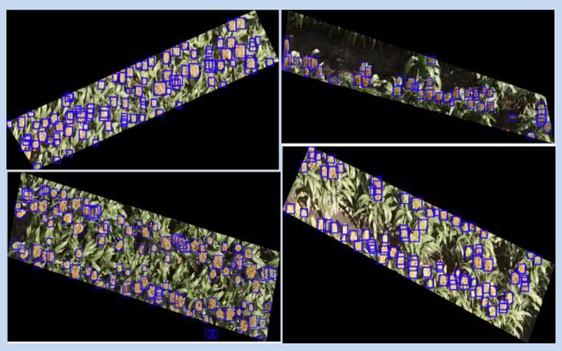
- An explainable Deep Learning based framework for accurately identifying and quantifying stress severity in Soybean Plants
- Deployment of the developed framework through mobile apps as well as on ground robots and unmanned aerial vehicles (UAVs)

Label-efficient deep learning

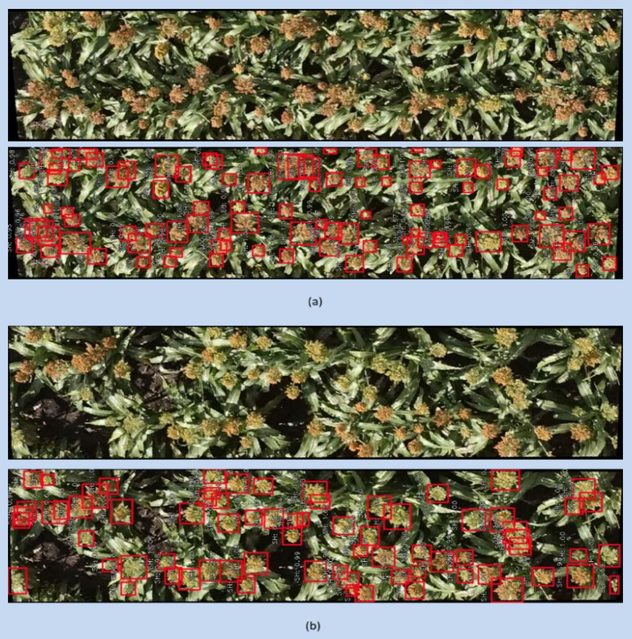
- Creating an automated annotation tool via a Deep Learning-based method for sorghum head detection and counting, across all genotypes
- Deployment of development framework on ground robots and drones for instant estimation of crop yield.



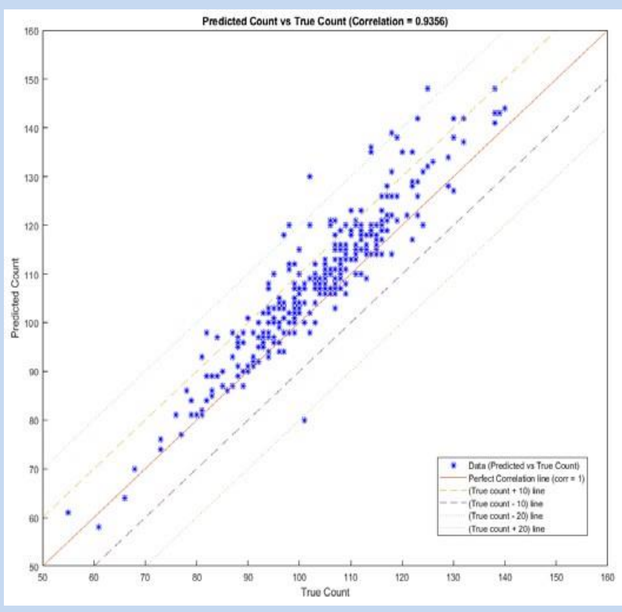
Web-based Annotation Tool



Model Outputs for varying orientations



(a) Detection results for Sorghum Plot for genotype labelled G4, (b) Detection results for Sorghum Plot for genotype labelled G100



Scatter Plot showing True Count (along the x-axis) vs Predicted Count (along the y-axis) for sorghum heads (count correlation = 0.9356)

App deployment and demonstration to US Ag secretary at the 2018 Farm progress Show, based on the disease detection framework

- Interdisciplinary education for students – Sambuddha Ghosal, Koushik Nagasubramanian (from Engineering), David Blystone (from Agronomy)
- App demonstration at 2018 Farm Progress Show – USA's largest outdoor farm event, held in Boone, Iowa

- International Collaboration with The University of Tokyo, Tokyo, Japan
- Organization of First workshop on Machine Learning for Cyber-Agricultural Systems (MLCAS) 2018 as a part of the AFITA/WCCA 2018 conference held in Mumbai, India –
- https://sites.google.com/site/afitamlcas2018/home

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