

# PhenomeInsight – An Integrated Web-GIS Platform for Generation, Visualization, and Analysis of Strawberry Phenotypes for Breeding

Xu “Kevin” Wang, Chang Zhao, Aishwarya T. Kaliyamardhanan, Dinesh C. Gogineni, Liyike Ji, Wael Elwakil

## Summary

PhenomeInsight is a web-based GIS application developed to streamline the generation and analysis of field maps using drone images and visualize crop growth status. This tool allows breeders and growers to quickly assess crop conditions and support field management strategies. Currently, PhenomeInsight offers free field map generation, downloading, and visualization exclusively to UF faculty. It also provides various Vegetation Indices (VIs) to help users evaluate crop growth. Additionally, it features hotspot visualization to quickly identify areas needing immediate attention and intervention.

## Background

The use of drone or uncrewed aerial vehicle (UAV) images in agriculture is becoming increasingly common, providing valuable insights into crop health and growth. However, third-party image processing services can be expensive, slow, and often limit access to original data. Additionally, interpreting and utilizing field maps can be complex and time-consuming for non-experts. PhenomeInsight ([devphenomeinsight.rc.ufl.edu/](http://devphenomeinsight.rc.ufl.edu/)) addresses these challenges by offering a user-friendly platform that simplifies the generation and visualization of field maps. It empowers breeders and growers to easily interpret crop growth information without needing advanced technical skills or external assistance.

## Methods

PhenomeInsight is hosted on UF’s Web Application Hosting Service (PubApps) for storing raw data and visualizing field maps. Raw data is transferred to and

organized in a new folder on UF’s HiperGator supercomputer. Then, an image processing pipeline developed using Structure-from-Motion photogrammetry generates the field map automatically. The generated field maps are then synced back to PubApps, and users are notified when the data is ready for visualization. The backend of the visualization panel is built using R Shiny, an open-source toolkit designed for interactive data visualization. Users can generate maps in different VIs and view them on the map panel. Statistical analysis of VI values can highlight hot and cold spots for decision support.

## Results

### Image Upload and User Notification

The application supports uploading various raw data types, including image files, folders containing images, and compressed files (e.g., ZIP). Users must specify the image type – RGB, multispectral, or thermal, before uploading (Fig. 1).

Figure 1. Image uploading panel



