

# Smartphone web-apps for growers to identify, report, and survey strawberry diseases using artificial intelligence

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## Summary

Many common strawberry diseases in Florida are caused by fungal pathogens that are managed most effectively with fungicides when they are detected and identified early. We developed a prototype smartphone web-app using artificial intelligence for in-field expert diagnosis of strawberry diseases from images of symptoms taken with the smartphone camera.

## Methods

### AI model and web-app development

During winter of 2021/22, approximately 80,000 digital images of healthy and disease-affected strawberry plants were collected at the Gulf Coast Research and Education Center (GCREC). The images were grouped into six classes: i) healthy (asymptomatic), ii) Leaf Scorch, iii) Powdery Mildew, iv) Pestalotia, v) Powdery Mildew Immune Response, vii) Unknown (non-strawberry scenes). The authenticity of symptoms in the collected images was ensured by having a strawberry disease expert from Dr. Peres's lab present during the photography sessions. The images were used to train a deep-learning artificial neural-network (EfficientNet-B7 model) with a TensorFlow/Keras framework on a deep-learning server. The trained model was deployed to a smartphone web-app after validation and then tested independently in the field. The app also submitted the images and reported the approximate location and time of the diagnoses to a UF server for archival purposes, to be examined by experts, and to map and survey the disease incidence.

## Results

The web-app performed well in the field and correctly identified the symptoms that it was trained for, with near 100% accuracy (Figure 1). Since only three of many disease symptoms are currently included in this preliminary proof-of-concept model, and because of the considerable similarity in symptom expressions by different pathogens, there is a moderate risk of mis-classification if the app is used on unseen, untrained disease symptoms. Therefore, we have requested a second year of funding to continue the project to increase the number of disease symptom classes, to deploy and support the smartphone app for strawberry growers in the 2022/23 season.



**Figure 1.** Steps used to identify symptoms on strawberry plants with the smartphone web-app.

A video of the smartphone web-app can be viewed at



<https://www.dropbox.com/s/pxnwe0d2vp6y30g/straw-app.mp4?dl=0>. Scan this QR code with your phone camera to view the video.

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