Southern Region Small Fruit Consortium Proposal Public Abstract

Title: **Enabling high-throughput yield prediction for efficient blueberry production**

Accurate yield data is critical for blueberry growers to optimize production and marketing strategies. Estimating blueberry yield before harvest, either based on a visual assessment or manual sampling, remains largely inefficient and inaccurate. The overall goal of this study is to enable high-throughput yield prediction through image-based analysis. Specifically, we aim to: (1) develop 2D image-based deep learning models to accurately estimate per-plant yield and maturity for various blueberry cultivars under various production systems and (2) develop a smartphone app to allow convenient yield and maturity monitoring before harvest. In 2022, we collected image and yield data on 60 southern highbush and rabbiteye blueberry plants and 12 container-grown southern highbush plants of 20 genotypes. The majority of the field image data have been manually annotated and preliminary prediction models were trained and tested for berry detection and yield prediction on a portion of the dataset. The current prediction model can accurately detect an average of 91% of the ripe berries captured in an image taken in the field. However, the accuracy of yield prediction in the field is moderate with an R^2 of 0.59. We expect the accuracy for both berry detection and yield prediction to continue to increase as we complete data analysis in 2022 while collecting more data in 2023.