Remote Sensing and Machine Learning for Invasive Species Identification

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Collecting environmental data using traditional field methods can be challenging and time consuming due to site size, safety hazards, and access limitations. Improvements in the affordability of drones and recent advances in drone-mounted sensors have made it possible to mitigate some of these challenges while offering additional data collection and analysis capabilities. Sensors such as multispectral or hyperspectral can detect what the human eye cannot and provide meaningful data on environmental conditions at spatial resolutions as high as square inches. By leveraging automation and machine learning, we can unlock these large, high-resolution environmental datasets. In this presentation, we will provide a brief background on methods for collecting, processing, and analyzing digital data, focusing on multispectral sensors and data; discuss a multiyear case study that applies these methods; and provide recommendations on how similar methods can be applied to other ecosystems or scaled to larger sites using satellite data.

The case study focuses on identifying and mapping invasive and native species at a 100-acre mixed upland and wetland restoration site in Florida. A 10-band multispectral sensor was used to collect 100 acres of data in 2021 and 2023. Field sampling was performed to produce training and validation data for different machine learning models. Our final model included 14 species and achieved an overall species-level accuracy above 80%. By comparing our model results from 2021 to 2023, we identified changes over time and provided stakeholders with detailed, quantifiable information that they can use to improve land management decisions in the future.

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