

Using AI to detect and identify tree species from satellite images in Hawaii

The application of artificial intelligence (AI) in ecology presents significant opportunities for enhancing biodiversity monitoring and informing conservation efforts, particularly in tropical regions. This project aims to apply the DeepTrees pipelines to a tropical setting at two spatial scales.

First, at a large scale, we aim to identify key species of interest for restoration and conservation on the island of Kauai, Hawaii. Specifically, we will focus on canopy trees that are noxious weeds, foundational native species, and important for food security. We will use both aerial photos or satellite images and ground truth data from forest inventories and from the National Tropical Botanical Garden. Deep learning models will be applied to quantify the number, size, and identity of these strategically significant trees across the entire island. A comprehensive database on tree locations and biomass will be developed and maintained, providing a valuable resource for ongoing research and management.

Second, at a smaller scale, we aim to identify all canopy tree species in a 0.25 km² coastal forest in Hana, Maui. A restoration project is planned for this site that will begin in January 2025, with the goal of removing the invasive African tulip tree, and providing more space for vulnerable native species, such as Pandanas and Metrosideros. Drone sampling in November 2024 will capture high-resolution images for the area, and local scientists will annotate a subset of these images to locate and identify individual canopy trees. The DeepTrees pipelines will be applied to locate and identify all canopy trees in the target area. This information can immediately be used to efficiently plan the restoration work. In future years, new drone images and these same pipelines can capture canopy change in response to habitat restoration.

It is our goal that these collaborative projects will support ecological research and practical conservation measures in Hawaii, and also provide a useful out-of-domain test of the DeepTrees pipelines. We will provide feedback and work to improve the pipelines for ecological applications worldwide.

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