

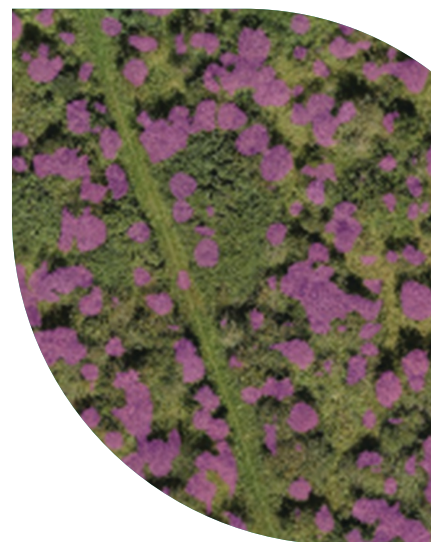
Toolbox to map shrub cover and biomass from drone imagery

DESCRIPTION

This technology is an open-source software package that enables mapping of individual shrub crowns from drone imagery using deep learning, combined with an allometric model that estimates individual shrub biomass from crown diameter and height. Both models are currently at the development stage, with the toolbox trained and tested at a rewilding site in the UK managed by the Wildlife Trust (Strawberry Hill Farm, Bedfordshire).

The toolbox consists of several interconnected components. The `attn-unet-shrub-id` package maps individual shrub crowns using 2D drone image mosaics as input, built on a U-NET deep learning model trained on labelled images from drone imagery. The supporting `shrub-prepro` Python package handles pre-processing of geospatial data, including creating binary masks from shapefiles, generating rotated image versions to increase training data volume, and combining RGB imagery with DSM data. A workshop component provides Jupyter notebooks and slides guiding users through preparing training data, training the model, and producing shrub map classifications. Finally, the `BRAMBLE` biomass model is designed to be trained with incomplete data, using a Maximum Entropy allometric model with Bayesian inference, tested using destructive samples of Hawthorn shrubs from the same rewilding site.

The toolbox operates at local, site-based scale and supports both single-date surveys and repeat visits to track change over time.



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BENEFITS OF USING THE TECHNOLOGY

The toolbox offers a novel combination of a U-NET deep learning model trained specifically to identify shrubs and a Bayesian allometric model capable of functioning with incomplete datasets, addressing a common practical limitation in field-based monitoring. By enabling non-invasive, drone-based mapping of shrub cover and biomass, it provides an enhanced evidence base for biodiversity assessments, conservation planning, and environmental reporting. It supports EU and national policy frameworks including biodiversity strategies and habitat reporting, and increases the accessibility of UAV-derived habitat condition metrics to public authorities and research communities. Users can further develop and retrain the models to suit their own local shrub mapping requirements, and partners plan to continue improving the toolbox's usability and allometric model beyond the project.



TARGET USERS

- Biodiversity and ecosystem researchers requiring site-based habitat condition metrics
- Conservation NGOs and land managers monitoring shrub cover and biomass change
- National and regional environmental authorities involved in habitat reporting
- Environmental consultancies and service providers delivering ecosystem assessments
- Private sector actors involved in environmental monitoring

