

# Novelty Assessment Report

**Paper:** SelvaBox: A high-resolution dataset for tropical tree crown detection

**PDF URL:** <https://openreview.net/pdf?id=GH7z1RURL6>

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## Abstract

Detecting individual tree crowns in tropical forests is essential to study these complex and crucial ecosystems impacted by human interventions and climate change. However, tropical crowns vary widely in size, structure, and pattern and are largely overlapping and intertwined, requiring advanced remote sensing methods applied to high-resolution imagery. Despite growing interest in tropical tree crown detection, annotated datasets remain scarce, hindering robust model development. We introduce SelvaBox, the largest open-access dataset for tropical tree crown detection in high-resolution drone imagery. It spans three countries and contains more than \$83\,000\$ manually labeled crowns -- an order of magnitude larger than all previous tropical forest datasets combined. Extensive benchmarks on SelvaBox reveal two key findings: 1) higher-resolution inputs consistently boost detection accuracy; and 2) models trained exclusively on SelvaBox achieve competitive zero-shot detection performance on unseen tropical tree crown datasets, matching or exceeding competing methods. Furthermore, jointly training on SelvaBox and three other datasets at resolutions from 3 to 10 cm per pixel within a unified multi-resolution pipeline yields a detector ranking first or second across all evaluated datasets. Our dataset, code, and pre-trained weights are made public.

### Disclaimer

This report is **AI-GENERATED** using Large Language Models and WisPaper (a scholar search engine). It analyzes academic papers' tasks and contributions against retrieved prior work. While this system identifies **POTENTIAL** overlaps and novel directions, **ITS COVERAGE IS NOT EXHAUSTIVE AND JUDGMENTS ARE APPROXIMATE**. These results are intended to assist human reviewers and **SHOULD NOT** be relied upon as a definitive verdict on novelty.

Note that some papers exist in multiple, slightly different versions (e.g., with different titles or URLs). The system may retrieve several versions of the same underlying work. The current automated pipeline does not reliably align or distinguish these cases, so human reviewers will need to disambiguate them manually.

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## Core Task Landscape

This paper addresses: **Tropical Tree Crown Detection in High-Resolution Drone Imagery**

A total of **50 papers** were analyzed and organized into a taxonomy with **30 categories**.

### Taxonomy Overview

The research landscape has been organized into the following main categories:

- **Deep Learning-Based Detection Methods**
- **LiDAR-Based Detection and Segmentation**
- **Photogrammetric Structure-from-Motion Approaches**
- **Species-Specific Detection and Classification**
- **Ecological and Phenological Monitoring Applications**
- **Biophysical Parameter Estimation and Scaling**
- **Forest Composition and Diversity Analysis**
- **Operational Workflows and Field Integration**

### Complete Taxonomy Tree

- Tropical Tree Crown Detection in High-Resolution Drone Imagery Survey Taxonomy
- Deep Learning-Based Detection Methods
  - Specialized Detection Network Architectures
  - One-Stage Detection Networks (2 papers)
    - [10] TCDNet: Tree crown detection from UAV optical images using uncertainty-aware one-stage network (Weichao Wu, 2022) [View paper](#)
    - [18] A deep learning-based framework for object recognition in ecological environments with dense focal loss and occlusion (Muhammad Munir Afsar, 2024) [View paper](#)
  - Instance Segmentation Networks (3 papers)
    - [3] Individual tree-crown detection and species classification in very high-resolution remote sensing imagery using a deep learning ensemble model (Mihai-Sorin Stupariu, 2020) [View paper](#)
    - [14] Drone aerial image identification of tropical forest tree species using the mask R-CNN (Robiah Hamzah, 2022) [View paper](#)
    - [28] Accurate tropical forest individual tree crown delineation from aerial RGB imagery using Mask R-CNN (JGC Ball, 2022) [View paper](#)
  - Multimodal Fusion Networks (2 papers)
    - [4] MTCDNet: Multimodal Feature Fusion-Based Tree Crown Detection Network Using UAV-Acquired Optical Imagery and LiDAR Data (Heng Zhang, 2025) [View paper](#)
    - [47] ShadowSense: Unsupervised Domain Adaptation and Feature Fusion for Shadow-Agnostic Tree Crown Detection from RGB-Thermal Drone Imagery (Rudraksh Kapil, 2024) [View paper](#)
  - Hardware-Optimized Implementations (1 papers)
    - [13] A Tree Crown Segmentation Approach for Unmanned Aerial Vehicle Remote Sensing Images on Field Programmable Gate Array (FPGA) Neural Network (J Ma, 2025) [View paper](#)
  - Foundation Model Adaptation and Transfer Learning
  - Parameter-Efficient Fine-Tuning (1 papers)
    - [2] Parameter-Efficient Fine-Tuning for Individual Tree Crown Detection and Species Classification Using UAV-Acquired Imagery (Jiuyu Zhang, 2025) [View paper](#)

- Segment Anything Model Adaptation (2 papers)
  - [29] Bringing SAM to new heights: Leveraging elevation data for tree crown segmentation from drone imagery (Teng, 2025) [View paper](#)
  - [30] Assessing SAM for Tree Crown Instance Segmentation from Drone Imagery (Teng, 2025) [View paper](#)
- Cross-Domain Transfer Learning (2 papers)
  - [15] PalmProbNet: A Probabilistic Approach to Understanding Palm Distributions in Ecuadorian Tropical Forest via Transfer Learning (Kangning Cui, 2024) [View paper](#)
  - [48] From Orthomosaics to Raw UAV Imagery: Enhancing Palm Detection and Crown-Center Localization (Zhu Rong-kun, 2025) [View paper](#)
- Training Data and Benchmark Datasets ★ (2 papers)
- [0] SelvaBox: A high-resolution dataset for tropical tree crown detection (Anon et al., 2026) [View paper](#)
- [9] ReforesTree: A dataset for estimating tropical forest carbon stock with deep learning and aerial imagery (David Dao, 2022) [View paper](#)
- Active and Incremental Learning Strategies (2 papers)
- [49] UAVs optical image-based Eucalyptus canopy detection using active learning with spatial overlap indicator (D Lian, 2025) [View paper](#)
- [50] Incremental Learning-Driven Segmentation and Clustering Optimization of UAV-LiDAR Rubber Tree Point Clouds (Hengrui Wang, 2025) [View paper](#)
- LiDAR-Based Detection and Segmentation
  - Canopy Height Model-Based Detection (2 papers)
  - [19] Effects of flight and smoothing parameters of number of trees with aerial imagery in a native Brazilian atlantic forest remnant (Carla Talita Pertille, 2024) [View paper](#)
  - [24] A Crown Morphology-Based Approach to Individual Tree Detection in Subtropical Mixed Broadleaf Urban Forests Using UAV LiDAR Data (Wenbing Xu, 2021) [View paper](#)
  - Point Cloud Segmentation Methods (3 papers)
  - [16] A New Strategy for Individual Tree Detection and Segmentation from Leaf-on and Leaf-off UAV-LiDAR Point Clouds Based on Automatic Detection of Seed Points (Yihan Pu, 2023) [View paper](#)
  - [35] RsegNet: An Advanced Methodology for Individual Rubber Tree Segmentation and Structural Parameter Extraction from UAV LiDAR Point Clouds. (Hengrui Wang, 2025) [View paper](#)
  - [42] TM-WSNet: A precise segmentation method for individual rubber trees based on UAV LiDAR point cloud. (Lele Yan, 2025) [View paper](#)
  - High-Density LiDAR for Forest Inventory (1 papers)
  - [31] High-Density UAV-LiDAR in an Integrated Crop-Livestock-Forest System: Sampling Forest Inventory or Forest Inventory Based on Individual Tree Detection (ITD) (Ana Corte, 2022) [View paper](#)
- Photogrammetric Structure-from-Motion Approaches
  - Comparative SfM and LiDAR Assessments (1 papers)
  - [25] Efficiency of individual tree detection approaches based on light-weight and low-cost UAS imagery in Australian Savannas (Grigorij's Goldbergs, 2018) [View paper](#)
  - Canopy Structure and Height Estimation (3 papers)
  - [12] Structural attributes estimation in a natural tropical forest fragment using very high-resolution imagery from unmanned aircraft systems (Johnny Alexander Vega Gutiérrez, 2022) [View paper](#)
  - [39] Individual Tree Detection and Qualitative Inventory of a Eucalyptus sp. Stand Using UAV Photogrammetry Data (A. Almeida, 2021) [View paper](#)
  - [43] Unmanned aerial vehicle (UAV) derived structure-from-motion photogrammetry point clouds for oil palm (*Elaeis guineensis*) canopy segmentation and height estimation (D Fawcett, 2019) [View paper](#)
  - Forest Restoration Monitoring (1 papers)
  - [38] Using lightweight unmanned aerial vehicles to monitor tropical forest recovery (Rakan A. Zahawi, 2015) [View paper](#)
- Species-Specific Detection and Classification
  - Palm Species Detection (3 papers)
  - [6] Mangrove individual tree detection based on the uncrewed aerial vehicle multispectral imagery (Priscila Almeida de Oliveira, 2024) [View paper](#)
  - [8] Individual tree detection and species classification of Amazonian palms using UAV images and deep learning (M. Ferreira, 2020) [View paper](#)
  - [11] Identifying and quantifying the abundance of economically important palms in tropical moist forest using UAV imagery (Ximena Tagle Casapia, 2019) [View paper](#)
  - Early-Successional and Indicator Species (2 papers)
  - [22] Mapping key indicators of forest restoration in the amazon using a low-cost drone and artificial intelligence (Rafael Walter Albuquerque, 2022) [View paper](#)
  - [27] Monitoring early-successional trees for tropical forest restoration using low-cost UAV-based species classification (Williams, 2022) [View paper](#)
  - Plantation and Monoculture Species (1 papers)
  - [41] AGB Estimation in a Tropical Mountain Forest (TMF) by Means of RGB and Multispectral Images Using an Unmanned Aerial Vehicle (UAV) (Váctor González-Jaramillo, 2019) [View paper](#)
- Ecological and Phenological Monitoring Applications
  - Leaf Phenology Tracking (1 papers)
  - [1] Quantifying leaf phenology of individual trees and species in a tropical forest using unmanned aerial vehicle (UAV) images (John Y. Park, 2019) [View paper](#)
  - Flowering Event Detection (2 papers)
  - [5] and accurate monitoring of flowering across multiple tropical tree species over two years with a time series of high-resolution drone imagery and deep learning (CKF Lee, 2023) [View paper](#)
  - [7] Cost-effective and accurate monitoring of flowering across multiple tropical tree species over two years with a time series of high-resolution drone imagery and deep learning (CKF Lee, 2023) [View paper](#)
  - Liana Infestation Assessment (2 papers)
  - [36] A view from above: Unmanned aerial vehicles (UAV s) provide a new tool for assessing liana infestation in tropical forest canopies (Catherine E. Waite, 2019) [View paper](#)

- [37] Linking drone and ground-based liana measurements in a Congolese forest (Begam Kasamak, 2022) [View paper](#)
- Biophysical Parameter Estimation and Scaling
  - Aboveground Biomass and Carbon Stock (1 papers)
  - [21] An Empirical Analysis of Above Ground Biomass and Carbon Sequestration Utilizing UAV Photogrammetry and Machine Learning Techniques (Thinnakon Angkahad, 2024) [View paper](#)
  - Canopy Transpiration and Water Use (2 papers)
  - [23] Airborne tree crown detection for predicting spatial heterogeneity of canopy transpiration in a tropical rainforest (Joyson Ahongshangbam, 2020) [View paper](#)
  - [46] Drone-based photogrammetry-derived crown metrics for predicting tree and oil palm water use (Joyson Ahongshangbam, 2019) [View paper](#)
  - Crown Thermal and Microclimate Responses (1 papers)
  - [44] Scale-dependent responses to environmental fluctuations in tropical tree species' crown temperatures (Shannon L. J. Bayliss, 2025) [View paper](#)
- Forest Composition and Diversity Analysis
  - Canopy versus Understory Stratification (1 papers)
  - [32] Integrating high resolution drone imagery and forest inventory to distinguish canopy and understory trees and quantify their contributions to forest structure and diversity (RF Araujo, 2020) [View paper](#)
  - Remote Sensing of Functional Traits and Diversity (1 papers)
  - [26] Remote Sensing of Tropical Forest Plant Composition, Diversity, and Function (Bohlman, 2024) [View paper](#)
- Operational Workflows and Field Integration
  - Automated Ultra-High Resolution Photo Acquisition (2 papers)
  - [33] Seeing the forest and the trees: a workflow for automatic acquisition of ultra-high resolution drone photos of tropical forest canopies to support botanical and ecological studies (Etienne Laliberté, 2025) [View paper](#)
  - [45] Seeing the forest and the trees: a workflow for automatic acquisition of ultra-high resolution drone photos of tropical forest canopies to support botanical and ecological diversity (E Laliberté, 2025) [View paper](#)
  - Emergent Tree and Canopy Layer Detection (1 papers)
  - [20] Locating emergent trees in a tropical rainforest using data from an Unmanned Aerial Vehicle (UAV) (Cici Alexander, 2018) [View paper](#)
  - Forest Degradation and Disturbance Monitoring (2 papers)
  - [17] Detection of forest tree losses in Côte d'Ivoire using drone aerial images (Tiodionwa Ouattara, 2022) [View paper](#)
  - [40] UAV-derived forest degradation assessments for planning and monitoring forest ecosystem restoration: towards a forest degradation index (Lee, 2021) [View paper](#)
  - Unsupervised and Traditional Detection Methods (1 papers)
  - [34] Unsupervised Tree Detection and Counting via Region-Based Circle Fitting. (Smaragda Markaki, 2023) [View paper](#)

## Narrative

Core task: tropical tree crown detection in high-resolution drone imagery. The field has evolved into a multi-faceted landscape organized around several complementary branches. Deep Learning-Based Detection Methods form a central pillar, encompassing works that develop neural architectures and training strategies for automated crown delineation, such as MTCDNet[4] and TCDNet[10]. LiDAR-Based Detection and Segmentation leverages three-dimensional point clouds to capture canopy structure, while Photogrammetric Structure-from-Motion Approaches reconstruct forest geometry from overlapping RGB imagery. Species-Specific Detection and Classification targets individual taxa or functional groups—illustrated by studies on palms like PalmProbNet[15] and Amazonian Palms Detection[8]—whereas Ecological and Phenological Monitoring Applications track temporal dynamics such as flowering events (Flowering Monitoring Drone[5]) and leaf phenology (Leaf Phenology UAV[1]). Biophysical Parameter Estimation and Scaling translates crown-level detections into forest-wide metrics like biomass, Forest Composition and Diversity Analysis quantifies community structure, and Operational Workflows and Field Integration addresses practical deployment challenges including flight planning and data processing pipelines.

Within the deep learning branch, a particularly active line of work focuses on Training Data and Benchmark Datasets, recognizing that model performance hinges on the availability of high-quality annotated imagery. SelvaBox[0] contributes directly to this effort by providing a curated benchmark dataset designed to support reproducible evaluation and method comparison. This emphasis on standardized training resources contrasts with studies that prioritize architectural innovation (Deep Learning Ensemble[3]) or parameter-efficient adaptations (Parameter Efficient Tree Detection[2]). Meanwhile, ReforesTree[9]—a close neighbor in the taxonomy—also addresses data challenges but targets restoration contexts where labeled examples may be scarce. The interplay between dataset curation, model design, and domain-specific constraints remains a central open question: as tropical forests exhibit extreme structural and spectral heterogeneity, the community continues to explore whether general-purpose benchmarks or task-specific datasets better advance detection accuracy and ecological relevance.

## Related Works in Same Category

The following **1 sibling papers** share the same taxonomy leaf node with the original paper:

### 1. ReforesTree: A dataset for estimating tropical forest carbon stock with deep learning and aerial imagery

**Authors:** David Dao, Gyri Reiersen, Bjørn Ljørtjens, KENZA Amara, Konstantin Klemmer, et al. (9 authors total) | **Year/Venue:** 2022 | **URL:** [View paper](#)

#### Abstract

Forest biomass is a key influence for future climate, and the world urgently needs highly scalable financing schemes, such as carbon offsetting certifications, to protect and restore forests. Current manual forest carbon stock inventory methods of measuring single trees by hand are time, labour, and cost intensive and have been shown to be subjective. They can lead to substantial overestimation of the carbon stock and ultimately distrust in forest financing. The potential for impact and scale of...

#### Relationship Analysis

Both papers belong to the Training Data and Benchmark Datasets category, focusing on creating annotated datasets for tropical tree crown detection in high-resolution drone imagery. They overlap in addressing the scarcity of tropical forest datasets with manual annotations and RGB drone imagery for individual tree detection. However, the original paper (SelvaBox) presents a substantially larger dataset with 83,000+ manually labeled crowns across three countries at 1.2-5.1 cm/px resolution, while the candidate paper (ReforesTree) provides 4,600+ tree annotations matched with ground-truth field measurements (DBH, species, biomass) at 2 cm/px resolution across six agro-forestry sites in Ecuador, emphasizing carbon stock estimation for offsetting certification rather than pure detection benchmarking.

## Contributions Analysis

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**Overall novelty summary.** The paper introduces SelvaBox, a large-scale annotated dataset containing over 83,000 manually labeled tropical tree crowns across three countries, positioned within the Training Data and Benchmark Datasets leaf of the taxonomy. This leaf contains only two papers, indicating a relatively sparse research direction focused on curating standardized resources for model development. The dataset contribution addresses a recognized bottleneck in tropical forest remote sensing, where annotated imagery remains scarce despite growing interest in automated crown detection methods.

The taxonomy reveals that SelvaBox sits within the broader Deep Learning-Based Detection Methods branch, which encompasses specialized architectures (one-stage detectors, instance segmentation networks), foundation model adaptations (SAM-based approaches, parameter-efficient fine-tuning), and active learning strategies. Neighboring branches include LiDAR-Based Detection and Photogrammetric Structure-from-Motion Approaches, which leverage three-dimensional data rather than RGB imagery alone. The dataset's multi-country scope and high-resolution focus distinguish it from species-specific detection efforts (e.g., palm identification) and ecological monitoring applications that track temporal dynamics rather than static crown delineation.

Among the 30 candidates examined, none clearly refute the three core contributions: the SelvaBox dataset itself (10 candidates examined, 0 refutable), the benchmark evaluation framework (10 examined, 0 refutable), and the multi-resolution training pipeline (10 examined, 0 refutable). The sibling paper ReforesTree addresses restoration contexts with potentially different annotation strategies, but the limited search scope prevents definitive claims about overlap. The statistics suggest that within the examined literature, no prior work provides a tropical crown dataset of comparable scale or geographic diversity, though the analysis does not cover exhaustive domain-specific repositories or unpublished institutional datasets.

Based on the top-30 semantic matches and taxonomy structure, the work appears to occupy a relatively underserved niche in tropical forest benchmarking. The sparse population of the Training Data leaf and absence of refuting candidates among examined papers suggest novelty in dataset scale and multi-country coverage. However, the limited search scope means the analysis cannot rule out overlapping efforts in specialized forestry journals, regional datasets, or concurrent preprints not captured by the semantic search strategy.

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This paper presents **3 main contributions**, each analyzed against relevant prior work:

### Contribution 1: SelvaBox dataset for tropical tree crown detection

**Description:** The authors present SelvaBox, a large-scale dataset comprising over 83,000 manually annotated tree crown bounding boxes from high-resolution drone imagery across Brazil, Ecuador, and Panama. This dataset is an order of magnitude larger than all previous tropical forest datasets combined and addresses the critical scarcity of annotated tropical forest data.

This contribution was assessed against **10 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

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#### 1. Automated tree-crown and height detection in a young forest plantation using mask region-based convolutional neural network (Mask R-CNN)

URL: [View paper](#)

##### Brief Assessment

Young Plantation Mask[53] focuses on tree-crown and height detection in a young forest plantation using Mask R-CNN, not on creating large-scale tropical forest datasets from drone imagery.

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#### 2. Accurate delineation of individual tree crowns in tropical forests from aerial RGB imagery using Mask R-CNN

URL: [View paper](#)

##### Brief Assessment

Tropical Mask RCNN[55] presents a dataset of 3,797 manually delineated tree crowns from Malaysian Borneo and French Guiana, which is substantially smaller than SelvaBox's 83,000+ annotations. The candidate focuses on Mask R-CNN methodology for tree crown delineation rather than challenging the novelty of a large-scale tropical dataset.

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#### 3. UC-HSI: UAV Based Crop Hyperspectral Imaging Datasets and Machine Learning Benchmark Results

URL: [View paper](#)

##### Brief Assessment

UC HSI[52] focuses on UAV-based hyperspectral imaging for crop classification (ten crop varieties), not tropical tree crown detection from RGB drone imagery. The datasets address entirely different agricultural vs. forest monitoring domains with different sensing modalities.

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#### 4. Deep learning based oil palm tree detection and counting for high-resolution remote sensing images

URL: [View paper](#)

##### Brief Assessment

Oil Palm Detection[57] focuses on oil palm tree detection in Malaysian plantations using CNN-based methods, not on creating a large-scale tropical forest dataset for general tree crown detection from drone imagery.

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#### 5. Att-Mask R-CNN: an individual tree crown instance segmentation method based on fused attention mechanism

URL: [View paper](#)

##### Brief Assessment

Att Mask RCNN[51] focuses on a Chinese forest dataset with six tree species for canopy detection and area measurement, not tropical forest monitoring from drone imagery across multiple countries.

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#### 6. Accurate tropical forest individual tree crown delineation from aerial RGB imagery using Mask R-CNN

URL: [View paper](#)

##### Brief Assessment

Tropical Crown Delineation[28] focuses on Mask R-CNN methodology for tree crown delineation in tropical forests, not on dataset creation. The candidate does not present a competing dataset or challenge the novelty of SelvaBox as a large-scale annotated tropical forest dataset.

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#### 7. Individual Tree Crown Detection and Classification of Live and Dead Trees Using a Mask Region-Based Convolutional Neural Network (Mask R-CNN)

URL: [View paper](#)

### **Brief Assessment**

Live Dead Trees[56] focuses on detecting and classifying live versus dead *Casuarina equisetifolia* trees in a specific Chinese coastal region using multispectral UAV imagery, not on creating a large-scale tropical forest dataset spanning multiple countries for general tree crown detection.

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### **8. Individual tree detection and species classification of Amazonian palms using UAV images and deep learning**

URL: [View paper](#)

#### **Brief Assessment**

Amazonian Palms Detection[8] focuses specifically on palm tree species classification in Amazonian forests using UAV imagery, not on creating a large-scale multi-country tropical tree crown detection dataset with 83,000+ annotations spanning diverse tropical forest types.

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### **9. Accurate and accurate monitoring of flowering across multiple tropical tree species over two years with a time series of high-resolution drone imagery and deep learning**

URL: [View paper](#)

#### **Brief Assessment**

Flowering Monitoring Drone[5] focuses on flowering detection across multiple tropical tree species using time-series drone imagery, not on general tree crown detection datasets or bounding box annotations for forest monitoring.

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### **10. A comparative assessment of the performance of individual tree crowns delineation algorithms from ALS data in tropical forests**

URL: [View paper](#)

#### **Brief Assessment**

Tropical Crown Algorithms[54] focuses on comparing ALS (airborne laser scanning) segmentation algorithms for tropical tree crowns, not on creating annotated drone imagery datasets for machine learning-based detection.

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## **Contribution 2: Comprehensive benchmark and evaluation framework**

**Description:** The authors provide extensive benchmarks comparing CNN-based and transformer-based detection methods across multiple resolutions and input sizes. They introduce a raster-level evaluation metric (RF175) that addresses limitations of tile-level metrics and enables proper assessment of model performance on entire rasters rather than individual tiles.

This contribution was assessed against **10 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

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### **1. Building Detection and Outlining in Multi-Modal Remote Sensor Data: A Stratified Approach**

URL: [View paper](#)

#### **Brief Assessment**

Building Detection Stratified[63] focuses on building outline extraction from aerial imagery using semantic segmentation and vectorization, not on benchmarking object detection methods across multiple resolutions with raster-level evaluation metrics for tree crown detection.

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### **2. Improving the energy efficiency of real-time DNN object detection via compression, transfer learning, and scale prediction**

URL: [View paper](#)

#### **Brief Assessment**

Energy Efficient DNN[65] focuses on energy efficiency improvements for YOLOv5 on overhead imagery, not on benchmarking CNN vs. transformer methods or developing raster-level evaluation metrics for tree crown detection.

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### **3. Deep Learning for Archaeological Object Detection on LiDAR: New Evaluation Measures and Insights**

URL: [View paper](#)

#### **Brief Assessment**

Archaeological LiDAR Detection[62] focuses on archaeological object detection with novel centroid-based and pixel-based evaluation measures for buried sites, not general tree crown detection benchmarks with raster-level metrics like RF175.

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### **4. Leveraging SAM 2 and LiDAR for Automated Individual Tree Crown Delineation: A Comparative Evaluation of Prompting Methods**

URL: [View paper](#)

#### **Brief Assessment**

SAM LiDAR Prompting[59] focuses on evaluating SAM 2 for tree crown delineation using LiDAR-derived prompts, not on benchmarking CNN vs. transformer detection methods or developing raster-level evaluation metrics for aerial imagery.

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### **5. Comparison of object detection and patch-based classification deep learning models on mid-to late-season weed detection in UAV imagery**

URL: [View paper](#)

#### **Brief Assessment**

Weed Detection UAV[60] focuses on comparing object detection models (Faster RCNN, SSD) versus patch-based CNNs for weed detection in agricultural UAV imagery, not on benchmarking methods across multiple resolutions with raster-level evaluation metrics for tropical tree crown detection.

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### **6. Tracking Moose using Aerial Object Detection**

URL: [View paper](#)

#### **Brief Assessment**

Tracking Moose Aerial[66] focuses on aerial wildlife detection using patching augmentation and compares three object detectors (YOLOv11, Faster R-CNN, CO-DETR) on moose imagery. It does not address raster-level evaluation metrics for tree crown detection or the specific challenges of tropical forest monitoring that the original paper tackles.

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## 7. [Detection of Pedestrian and Bicycle Lanes from High-Resolution Aerial Images by Integrating Image Processing and Artificial Intelligence \(AI\) Techniques](#)

URL: [View paper](#)

### Brief Assessment

Pedestrian Bicycle Detection[58] focuses on detecting pedestrian and bicycle lanes from aerial images using image processing and AI techniques, not on benchmarking object detection methods with raster-level evaluation metrics for tree crown or general object detection tasks.

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## 8. [of Individual Tree Segmentation Methods in Mediterranean Forest Based on Point Clouds from Unmanned Aerial Vehicle Imagery and Low-Density Airborne](#)

URL: [View paper](#)

### Brief Assessment

Mediterranean Tree Segmentation[61] focuses on tree segmentation methods in Mediterranean forests using point clouds from UAV and airborne LiDAR, not on benchmarking CNN vs. transformer detection methods on aerial imagery with raster-level evaluation metrics.

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## 9. [TAF-YOLO: A Small-Object Detection Network for UAV Aerial Imagery via Visible and Infrared Adaptive Fusion](#)

URL: [View paper](#)

### Brief Assessment

TAF YOLO[64] focuses on multimodal (visible+infrared) small object detection for UAVs, not on benchmarking detection methods or developing raster-level evaluation metrics for aerial imagery.

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## 10. [Evaluating the Potential of Digital Aerial Photogrammetry \(DAP\) versus Airborne Laser Scanning \(ALS\) for Individual Tree Detection and Segmentation in Subtropical](#)

URL: [View paper](#)

### Brief Assessment

DAP versus ALS[67] focuses on comparing Digital Aerial Photogrammetry versus Airborne Laser Scanning for tree detection in subtropical forests, not on benchmarking CNN vs. transformer methods or developing raster-level evaluation metrics for aerial imagery.

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### Contribution 3: Multi-resolution training pipeline and state-of-the-art models

**Description:** The authors develop a multi-resolution training approach that enables models to generalize across different spatial resolutions and ground sampling distances. Their trained models achieve state-of-the-art performance on both tropical and non-tropical datasets, with competitive zero-shot detection on unseen datasets, and they release pre-trained weights and two open-source Python libraries for preprocessing and benchmarking.

This contribution was assessed against **10 related papers** from the literature. Papers with potential prior art are analyzed in detail with textual evidence; others receive brief assessments.

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## 1. [Urban Tree Canopy Mapping and Analysis Using Iterative Annotation Method and Deep Learning: A Case Study in Beijing](#)

URL: [View paper](#)

### Brief Assessment

Urban Tree Annotation[72] focuses on urban tree canopy semantic segmentation using an iterative annotation method, not multi-resolution training for object detection across varying spatial resolutions and ground sampling distances.

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## 2. [A Fine-Scale Segmentation Method for Individual Rubber Trees Based on UAV LiDAR Point Cloud](#)

URL: [View paper](#)

### Brief Assessment

Fine Scale Rubber[76] focuses on LiDAR-based point cloud segmentation for rubber trees using deep learning architectures, not multi-resolution RGB imagery training for tree crown detection across varying spatial resolutions.

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## 3. [The co-effect of image resolution and crown size on deep learning for individual tree detection and delineation](#)

URL: [View paper](#)

### Brief Assessment

Resolution Crown Size[75] focuses on the relationship between image resolution and crown size for detection accuracy in Chinese fir plantations, not on developing multi-resolution training pipelines that generalize across datasets or spatial resolutions.

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## 4. [Implementing Deep Learning algorithms for urban tree detection and geolocation with high-resolution aerial, satellite, and ground-level images](#)

URL: [View paper](#)

### Brief Assessment

Urban Tree Geolocation[74] focuses on urban street tree detection using ground-level and aerial/satellite imagery combinations, not on multi-resolution training approaches for generalizing across different spatial resolutions in natural forest contexts.

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## 5. [General Framework for Georeferencing and Interpretation of Multi-Resolution LiDAR Data for Fine-Scale Forest Inventory](#)

URL: [View paper](#)

### Brief Assessment

Multi Resolution LiDAR[69] focuses on processing multi-resolution LiDAR point clouds for forest inventory (tree location, height, DBH estimation), not on training deep learning models across varying image resolutions for tree crown detection.

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## 6. [High-resolution sensors and deep learning models for tree resource monitoring](#)

URL: [View paper](#)

### Brief Assessment

Deep Learning Tree Monitoring[68] focuses on tree resource monitoring using high-resolution sensors and deep learning models, but does not provide sufficient detail in the available context about multi-resolution training methodologies or zero-shot generalization approaches comparable to the original paper's unified multi-resolution pipeline for tree crown detection.

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## 7. A new individual tree species recognition method based on a convolutional neural network and high-spatial resolution remote sensing imagery

URL: [View paper](#)

### Brief Assessment

CNN Species Recognition[77] focuses on tree species classification using CNNs on high-resolution satellite imagery, not on multi-resolution training for tree crown detection across varying spatial resolutions or ground sampling distances.

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## 8. Learning Framework for Individual Tree Crown Detection and Delineation in Mixed-Wood Forests Using High-Resolution Light Detection and Ranging Data

URL: [View paper](#)

### Brief Assessment

Two Stage Mixed Wood[71] focuses on LiDAR-based tree crown detection in mixed-wood forests using feature pyramid networks for multi-scale processing, not a multi-resolution training approach across varying GSDs for RGB imagery as in the original paper.

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## 9. Olive tree biovolume from UAV multi-resolution image segmentation with mask R-CNN

URL: [View paper](#)

### Brief Assessment

Olive Biovolume Mask[73] focuses on olive tree biovolume estimation using Mask R-CNN at fixed resolutions (3 cm/pixel and 13 cm/pixel), not on developing multi-resolution training approaches that generalize across varying spatial resolutions and ground sampling distances for tree crown detection.

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## 10. Two-Stage Deep Learning Framework for Individual Tree Crown Detection and Delineation in Mixed-Wood Forests Using High-Resolution Light Detection and Ranging Data

URL: [View paper](#)

### Brief Assessment

Two Stage Crown Detection[70] focuses on a two-stage detection framework for individual tree crowns using LiDAR data with multi-scale search strategies, not on multi-resolution training pipelines for generalizing across different spatial resolutions and ground sampling distances in RGB imagery.

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## Appendix: Text Similarity Detection

Textual similarity detection checked 31 papers and found 1 similarity segment(s) across 1 paper(s).

The following **1 paper(s)** were detected to have high textual similarity with the original paper. These may represent different versions of the same work, duplicate submissions, or papers with substantial textual overlap. Readers are advised to verify these relationships independently.

### 1. Accurate delineation of individual tree crowns in tropical forests from aerial RGB imagery using Mask R-CNN

**Detected in:** Contribution: contribution\_1

⚠ **Note:** This paper shows substantial textual similarity with the original paper. It may be a different version, a duplicate submission, or contain significant overlapping content. Please review carefully to determine the nature of the relationship.

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