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# Count of Trees in East Africa with Deep Learning

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**Abstract :** Trees play a crucial role in maintaining biodiversity and providing various ecological services. Traditional methods of counting trees are time-consuming, and there is a need for more efficient techniques. However, deep learning makes it feasible to identify the multi-scale elements hidden in aerial imagery. This research focuses on the application of deep learning techniques for tree detection and counting in both forest and non-forest areas through the exploration of the deep learning application for automated tree detection and counting using satellite imagery. The objective is to identify the most effective model for automated tree counting. We used different deep learning models such as YOLOV7, SSD, and UNET, along with Generative Adversarial Networks to generate synthetic samples for training and other augmentation techniques, including Random Resized Crop, AutoAugment, and Linear Contrast Enhancement. These models were trained and fine-tuned using satellite imagery to identify and count trees. The performance of the models was assessed through multiple trials; after training and fine-tuning the models, UNET demonstrated the best performance with a validation loss of 0.1211, validation accuracy of 0.9509, and validation precision of 0.9799. This research showcases the success of deep learning in accurate tree counting through remote sensing, particularly with the UNET model. It represents a significant contribution to the field by offering an efficient and precise alternative to conventional tree-counting methods.

**Keywords :** remote sensing, deep learning, tree counting, image segmentation, object detection, visualization
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