

MONITORING, REPORTING, AND VERIFICATION (MRV) FOR CARBON OFFSETTING USING DEEP LEARNING TECHNIQUES



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Abstract

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ABSTRACT

Amid the escalating global climate crisis, regulations mandating companies to mitigate carbon emissions through tree planting have become increasingly prevalent. In response, this paper delves into an innovative Automated Monitoring, Reporting, and Verification (MRV) program designed to ensure transparent and accountable carbon offsetting. Our focus lies in evaluating this MRV system, which scrutinizes companies' compliance with carbon offset requirements by monitoring their tree-planting initiatives. Leveraging advanced remote sensing technologies such as satellite imagery, LiDAR, and drones, our methodology revolutionizes vegetation detection, enabling accurate assessment of plant life conditions and precise estimation of carbon sequestration across vast areas. Furthermore, machine learning and computer vision algorithms contribute significantly to automated species detection, thereby facilitating biodiversity conservation efforts through afforestation and reforestation initiatives. In our implementation, we achieved exceptional accuracy in vegetation detection, with precision and recall rates exceeding 98%, and a mean average precision (MAP) score surpassing 95%. Additionally, employing YOLOv8 for image segmentation to generate masks for tree trunks for tree age detection with an accuracy of 98% and YOLOv8 for image classification for species detection with an accuracy of 91% has