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R-CNN Based Deep Learning Approach for Counting Animals in the Forest: A Survey

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ABSTRACT

This review paper delves into the pivotal realm of animal classification using images obtained through diverse techniques in forest environments. A robust framework is introduced, employing Transfer Learning (TL) within a Convolutional Neural Network (CNN) and leveraging the power of the Region-based Convolutional Neural Network (R-CNN) model for the construction of an automated animal identification system. This innovative framework is adeptly applied to analyze and identify focal species within captured images, contributing to the advancement of wildlife monitoring technologies.

The dataset under scrutiny comprises 6,203 camera trap images featuring 11 distinct species, including Wild pig, Barking deer, Chital, Elephant, Gaur, Hare, Jackal, Jungle cat, Porcupine, Sambhar, and Sloth bear. The inclusion of this diverse set of species ensures the robustness and applicability of the proposed methodology across a broad spectrum of wildlife scenarios.

The integration of Transfer Learning withinthe Region-based Convolutional Neural Network (R-CNN) emerges as a crucial element, showcasing outstanding performance in species classification. Notably, the proposed model achieves a remarkable accuracy rate of 96% on the test dataset after a mere 18 epochs, employing a batch size of 32. This breakthrough holds the potential to expedite research outcomes, foster the evolution of more efficient and dependable animal monitoring systems, and consequently, alleviate the time and effort invested by researchers.In line with ethical considerations, the authors maintain anonymity in their contribution, focusing on the significant strides made in the classification andanalysis of camera trap images within the observed site. This paper positions itself as a noteworthy and impactful contribution to the broader field of wildlife research and technology.

Key words: R-CNN, Deep Learning, Neural Network, Transfer Learning, Recognition

1. INTRODUCTION

In the dynamic field of wildlife conservation and ecological research, there is an escalating demand for sophisticated methodologies to monitor and comprehend animal populations within the intricate ecosystems of forests. This review paper explores cutting-edge technology, placing a focal point on an avant-garde and deliberately anonymous deep learning approach—specifically, the Region-based Convolutional Neural Network (R-CNN) [3]. Positioned as a transformative force, this approach has the potential to revolutionize the landscape of animal counting, providing a nuanced and efficient solution to the multifaceted challenges presented by the dynamic and diverse nature of forest environments.

Forests, with their intricate and ever- changing ecosystems, host an extraordinary diversity of species intricately woven into the fabric of their environment. Monitoring and understanding these populations present formidable challenges that necessitate sophisticated and adaptive methodologies. Traditional approaches to animal counting, reliant on manual observation and enumeration, are often laborious, time-intensive, and susceptible to errors. Herein lies the promise of the R- CNN—a model renowned for its precision in localizing and classifying objects withinimages. Its adaptability to diverse habitats and species [4], coupled with its capacity for nuanced analysis, positions it as a transformative tool for wildlife population assessment in ecosystems where biodiversity is not only extensive but also intricately interwoven.

This paper embarks on a thorough exploration of the application of R-CNN in the domain of animal counting within forest environments. Through a discerning lens, we delve into the model's strengths and capabilities, scrutinize potential limitations, and chart pathways for future enhancements. The deliberate choice to maintain anonymity in authorship underscores the dedication to