

Improved Rare Species Identification Using Focal Loss Based Deep Learning Models

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Abstract : The use of deep learning for species identification in camera trap images has revolutionised our ability to study, conserve and monitor species in a highly efficient and unobtrusive manner, with state-of-the-art models achieving accuracies surpassing the accuracy of manual human classification. The high imbalance of camera trap datasets, however, results in poor accuracies for minority (rare or endangered) species due to their relative insignificance to the overall model accuracy. This paper investigates the use of Focal Loss, in comparison to the traditional Cross Entropy Loss function, to improve the identification of minority species in the “255 Bird Species” dataset from Kaggle. The results show that, although Focal Loss slightly decreased the accuracy of the majority species, it was able to increase the F1-score by 0.06 and improve the identification of the bottom two, five and ten (minority) species by 37.5%, 15.7% and 10.8%, respectively, as well as resulting in an improved overall accuracy of 2.96%.

Keywords : convolutional neural networks, data imbalance, deep learning, focal loss, species classification, wildlife conservation

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