Bias: Endangering Species and Performance

An Evaluation of SpeciesNet on Leopard Classification

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** Equal Contribution*

Introduction

- Wildlife is in crisis, with over 1 million species at risk of extinction and a 69% decline in global animal populations since 1970 [1].
- Camera traps deployed worldwide generate massive image datasets, offering an opportunity to monitor biodiversity.
- This research evaluates SpeciesNet [2], a deep learning model featuring an animal detector (MegaDetector) and classifier (EfficientNet V2 M), trained on global camera trap data, to assess its ability to identify endangered species.

Research Design and Methods

Data Distribution Analysis
Analyzed SpeciesNet's training data by IUCN threat level

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Evaluation on Unseen Reserve
Tested on select species data from Nkhotakota Wildlife Reserve in Malawi [3]

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Error Analysis: Leopard Misclassifications
Inspected failed leopard detections, focusing on scene characteristics (e.g. night, motion blur)

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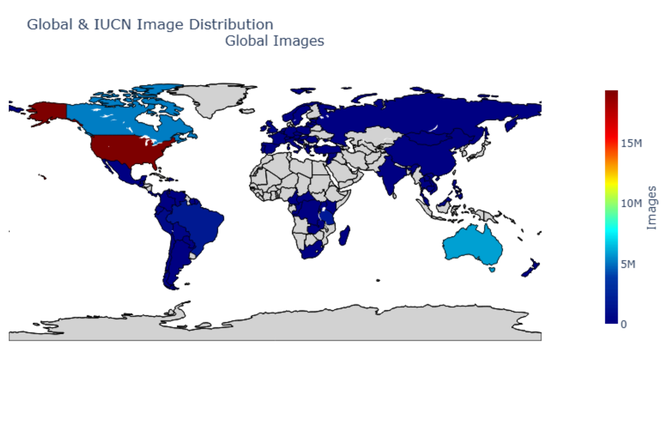
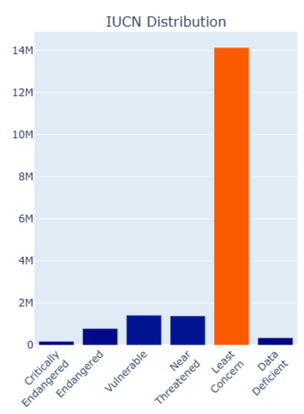
Fine-Tuning for Leopard vs. Serval
Basic fine-tuning of SpeciesNet for binary classification (SVM) between leopard and serval

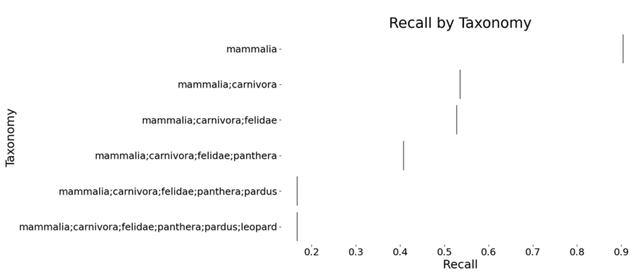
Training Dataset with IUCN categories

- Dataset Trained on ~2k species categories
- Grouped according to IUCN categories

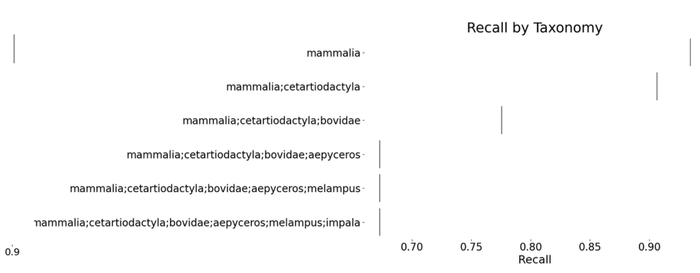




Recall Comparison on Leopard & Impala



Leopard class Performance

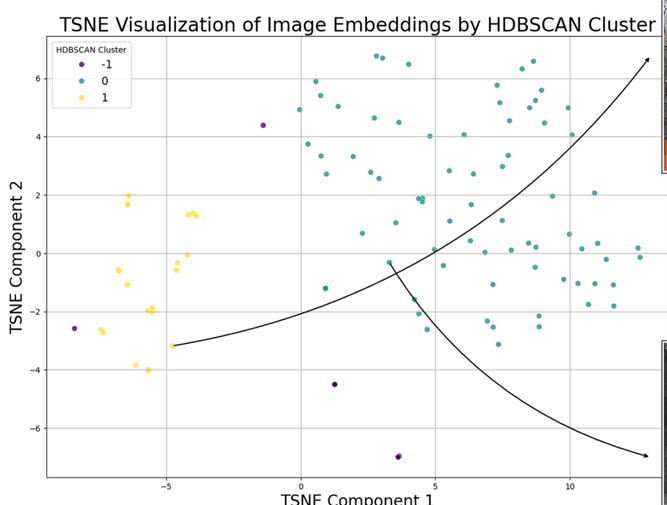


Impala Class Performance

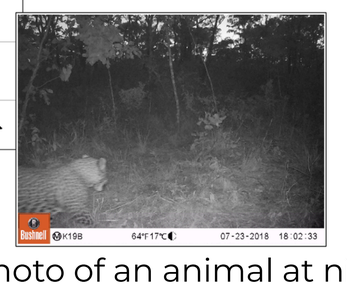
As expected model fails on endangered leopard

Leopard Error Understanding with WildCLIP

A bunch of failed images



an animal partially hidden by leaves



a photo of an animal at night

Leopard vs Seval Fine Tuning Classification

Feature Extraction
Frozen EfficientNetV2-M and AttentionPoolin

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Scale & Tune
StandardScaler
GridSearchSVM

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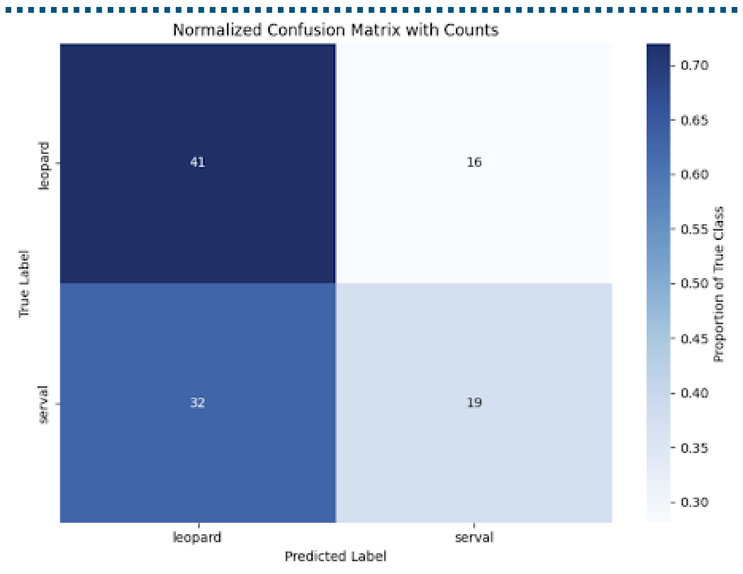
Final Evaluation
Predict on Validation Set



Classifier achieves 72% recall for leopards but only 37% for servals, with 63% of true servals being misclassified.

Misclassified Serval Examples

Discussion and Future Work

- Model failed on evaluating endangered species compared to least concern species
- Fine tuning improved the model performance
- Future work: a more rigourous analysis to establish more possible biases, look into fine tuning both the detector and classifier of SpeciesNet

Acknowledgements

We thank the entire ACVSS organising team for their guidance and support during the mentoring sessions, which helped us formulate the research project.

Citations

[1] WWF (2024) Living Planet Report 2024 – A System in Peril. WWF, Gland, Switzerland
[2] Gadot, T., *et al*. (2024). *IET Computer Vision*, 18(8), 1193-1208. https://doi.org/10.1049/cvi2.12318
[3] Appel, CL., et al. (2025) *Ecological Applications*.