Contribution ID: **34** Type: **Poster**

Global-Local Information Fusion for Vision-Based Species Classification Models

Tuesday 4 November 2025 14:05 (5 minutes)

Training computer vision models for animal biodiversity monitoring tasks demands a vast amount of labelled data for the target ecosystem. While raw, unlabelled data can be readily acquired on a large scale through camera trap systems deployed across the globe, labelling it all with species information requires significant expert effort, leading to a bottleneck in the pipeline. Since the labels need to be specific to the local downstream use-case, simply running a large pre-existing species classifier on the unseen images is often insufficient, due to (i) distinct ecosystem environments being hard to generalise across and (ii) certain classes inevitably not being present in the given model's knowledge base, as a result of its limited training set and the fact that each ecosystem has a unique species distribution (which is also typically long-tailed in nature). We therefore propose a model-agnostic and ecosystem-agnostic approach to tackle such labelling dilemmas by lifting information from a "global" model, before "mapping"the information to the label environment of the local model. The probabilistic pseudo-label outputs can then be used for training without any additional manual labour. Our experiments on a public, expert-labelled regional dataset demonstrate a boost of over 10% in overall local-model accuracy for data regimes with a low proportion of ground-truth labels, with no loss in average per-class accuracy. We conclude that transferring information between models, without label-convention consistency or for out-of-distribution classes, can optimise the development of species classification tools for animals and ecosystems that are under-represented in "global"models.

Confirm eligibility

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Session Classification: Poster Session

Track Classification: Poster