MSc Project Report

Sri Lankan butterfly species identification using deep learning framework (CapsuleNet)

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Abstract

Sri Lanka in known for its rich wildlife and biodiversity and is home to 245 species of butterflies out of which 26 species of butterflies are endemic to the country. Due to various types of environmental pollution caused by humans and habitat loss due to de-forestation, the butterfly population faces the threat of declining and extinction.

Environmental conservation is most successful when public and school children can contribute and enabling them with real time species identification ability can be useful to raise the awareness about the specific species as well as its habitat and its conservation. Currently species identification knowledge is limited to academics and field enthusiasts, especially when it comes to birds, snakes, plants, butterflies, insects and especially if it falls into the endangered category.

There is a gap where we are lacking a real time butterfly identification application where focus is on species found in Sri Lanka. Also, there is potential improvement of accuracy in existing butterfly research by using CapsuleNet as a deep learning framework. Since CapsuleNet encodes both the spatial and the probability information it is proposed as a future enhancement in

In this research an image recognition model was built using Capsule Neural Network (CapsuleNet) to identify butterfly species found in Sri Lanka. This was achieved by development of a trainable and testable model which is based on CapsuleNet deep learning architecture using PyTorch framework. Training was performed on an image collection of butterfly species found in Sri Lanka. The best performance observed was Train Loss at 0.05 and test accuracy at 0.61.

The model was trained on smaller image sizes due to computer resource constraints, but this makes the feature detection harder during training phase. One area of future improvement is to use larger image sizes of 128 ×128 or higher and evaluate and compare model performance. In this research only the basic forms of image techniques were considered and evaluated. Evaluating the model performance with various advanced image augmentation techniques could be another potential area of future work.