Development of a Real-Time Bird Species Identification Algorithm Using Deep Learning

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Abstract: Given the recent advancement of AI, the application of machine learning to big data has been regarded as a promising tool in a various research domains. In particular, image analysis using deep learning is expected to contribute to automatic species identification and accumulation of biodiversity data in large spatiotemporal scale obtained, for instance, from camera trap images. In this study, we developed an image analysis model for still images with the aim of establishing a species identification algorithm for waterfowl using convolutional neural networks (CNNs), and reported on a series of efforts to improve the model performance by tuning various parameters such as layer depth as well as data augmentation. In addition, we will report on the application of an object detection algorithm with the goal of developing a real-time bird species identification algorithm using video as input data. For this analysis, we used still images of 15 species taken with a personal digital camera. Data augmentation was then applied to these images to increase the number of images in a data set. We also created a dataset with still images from eBird (https://ebird.org/japan) as an independent, external dataset, and used for comparing the generalization ability between the models trained on each of the datasets.