HW3 : Bird species classification using transfer learning

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Abstract

The field of image classification has shown an outstanding success thanks to the development of deep learning techniques. In this article, we apply transfer learning from pre-trained models to a classification task.

1 Introduction

The objective of this data challenge is to build a model capable of identifying bird species from images. The dataset we were supplied with contains 1082 images for training, 103 images for validation and 517 unlabeled images. All the images belongs to 20 classes corresponding to 20 species of birds.

2 Processing

2.1 Bird detection

Recognition of bird species in images is a challenging task due to various appearances, backgrounds, and environmental changes. Therefore, I used object detection models, such as YOLO and SSSD, to crop the images and keep only birds. The original images were replaced by the boxes containing birds to remove backgrounds. For each image I used the detection model giving the highest probability.

2.2 Data augmentation & Transformation

One of the big challenges in our classification task is the number of image per class (around 50 images per class). Image data augmentation is a technique that can be used to artificially expand the size of a training dataset by creating modified versions of images in the dataset; These new artificial images are generated using random transformation : rotation, perspective, scale and brightness. I also resize all the images to 256x256 as we used the ResNet architecture as a firstpart of the neural network model.

3 Model

3.1 Transfer Learning

The key purpose of transfer learning is *"Leveraging the knowledge of a neural network learned by training on one task to apply it for another task"*. I build my model using the ResNet 101 architecture [HZRS16]wich is 101 layers deep (As requested, I load just the architecture, not the pretrained weights) on which I add a muli-layer perceptron.

3.2 Model Training

I updated the neural network weights using Stochastic Gradient Descent. I choosed the following hyperparameters :

- learning rate : 0.0001
- momentum : 0.9
- batch batch size : 10
- epochs : 100

4 Results

In order to avoid overfitting, I used the **early stopping** technique; I saved the weights at each epoch and at the end, I choosed the model giving the highest accuracy on the validation set.

Training	Validation	Kaggle
88%	86%	74%

5 Conclusion

Transfer learning works well for our problem, specially with the small size of the dataset. But further improvements could be done using better regularization techniques and epoch time could be reduced by good magnitude using larger batch-size.

References

[HZRS16] Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. Deep residual learning for image recognition. In *Proceedings of the IEEE*

Conference on Computer Vision and Pattern Recognition (CVPR), June 2016.