Bird Classifier Documentation

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INTRODUCTION

We were very interested in the problem of image classification, and motivated by our own interests decided to create a bird classifier. Our project uses deep learning to create models that accurately identify species of birds from images. We used two datasets to train and subsequently test multiple models, leading to a higher level of accuracy and learning. We used two models, and trained each model on both datasets to discover which would provide the optimal results.

PREVIOUS SOLUTIONS

There are many real-life applications for a bird classifier, including conservation efforts, agriculture pest detection, and wind turbine safety. One solution, aiming to identify bird species due to their integral role in nature, used the VG166 network as their model. They then trained the model further to identify different Bangladeshi bird species with an accuracy of 89% (Islam et al., 2019).

DATASETS

We utilized two datasets, both downloaded through Kaggle. The first, Caltech-UCSD Birds 2011, contains 200 bird species, with a total of 11,788 images. We did not alter this dataset, and trained our models using all 200 categories. The second dataset we useds, Birds 400, originally contained 400 bird species totalling 62,388 images. We chose to alter the size of this dataset for better training results, reducing it to 34 categories and 6,828 images. This greatly improved our accuracy when training our models.

PROPOSED METHOD

To create the optimal model to classify bird species, we used two approaches then compared results. Our first approach was to create a model from scratch, using 2D convolutional, max pooling, flatten and dense layers. We trained this handcrafted model separately on both our datasets. We also trained this model on an even more reduced version of the Birds 400 dataset, featuring only 5 bird species that had the most images. Our second approach was to use a pretrained model, and modify it with further training on our datasets. For this, we used the Inception v3 model, originally weighted for the imagenet dataset, for our base model. We then added a pooling layer and a dense layer to the input, and another dense layer as output. In separate notebooks, we then further trained this model with each of our bird image datasets.

EVALUATION METHOD

We evaluated our models using the keras evaluate method, which runs our models on a specific validation data subset and provides a percentage of how accurate our model was at predicting the species of the bird pictured.

RESULTS

Our handcrafted model trained on the dataset featuring 34 bird species reached an accuracy of 0.6941. When trained on only the top 5 bird species, the handcrafted model had an

accuracy of 0.76. The same model trained on the Caltech Birds dataset (200 categories) only reached an accuracy of 0.008. The pretrained model architecture, when trained further using the 34 birds dataset, had an accuracy of 0.8882. This model trained on the Caltech Birds dataset reached an accuracy of 0.5075.

DISCUSSION

We found that to achieve the highest accuracy recognizing bird species, it worked best to modify a pretrained model using our own data. In addition, using a dataset featuring fewer categories of birds (34 vs. 200) also helped to increase accuracy.

SOURCES

Islam, S., Khan, S. I. A., Abedin, M. M., Habibullah, K. M., & Das, A. K. (2019, July). Bird species classification from an image using VGG-16 network. In *Proceedings of the 2019 7th international conference on computer and communications management* (pp. 38-42)