Bird Species

Image Classifier

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Metis Deep Learning Module

18 May 2022

Objective

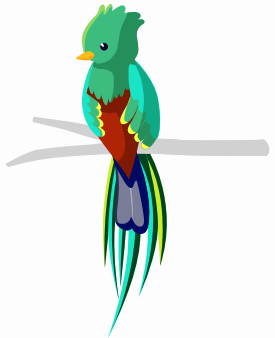
- Automated classification could help scientists study bird behavior using webcams
- Create an image classifier trained on images of bird species

Data Overview

- Data set on 400 species from Kaggle
- 120-240 training, 5 validation, 5 test images (jpg) per species

Methods

- Baseline logistic regression
- Basic convolutional neural network (CNN)
- Transfer Learning (VGG16, ResNet)

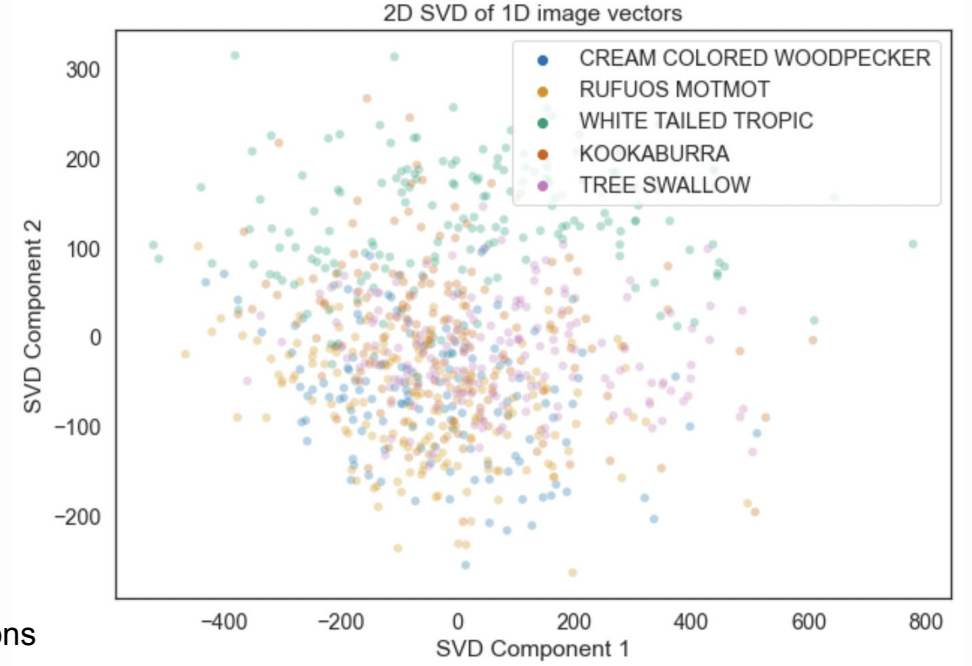


- Memory restrictions limited number of species
- Limited modeling to species with the most training images

Baseline Model

- Logistic regression
- Some data separation although significant overlap
- Accuracy decreases with number of classes

Classes	Accuracy
5	32%
15	15%



*Model limited to 5 classes due to memory restrictions

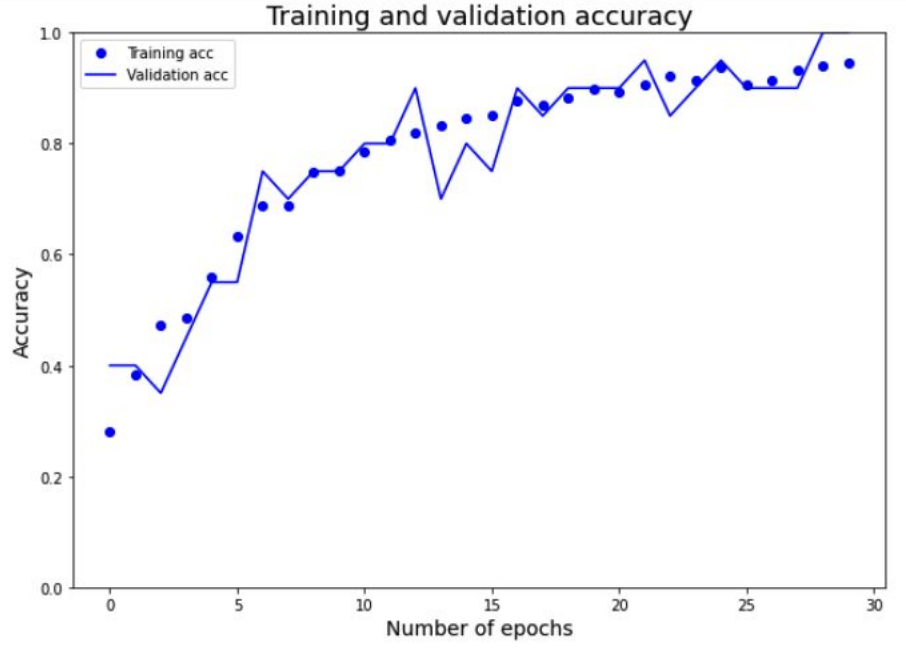
Basic CNN

Neural networks can work where logistic regression fails

- Alternating layers of convolution and pooling to reduce image dimensionality

Best validation accuracy with

- ≤ 45° rotation, horizontal flipping
- Maximize number of training images
- Double batch size to reduce overtraining

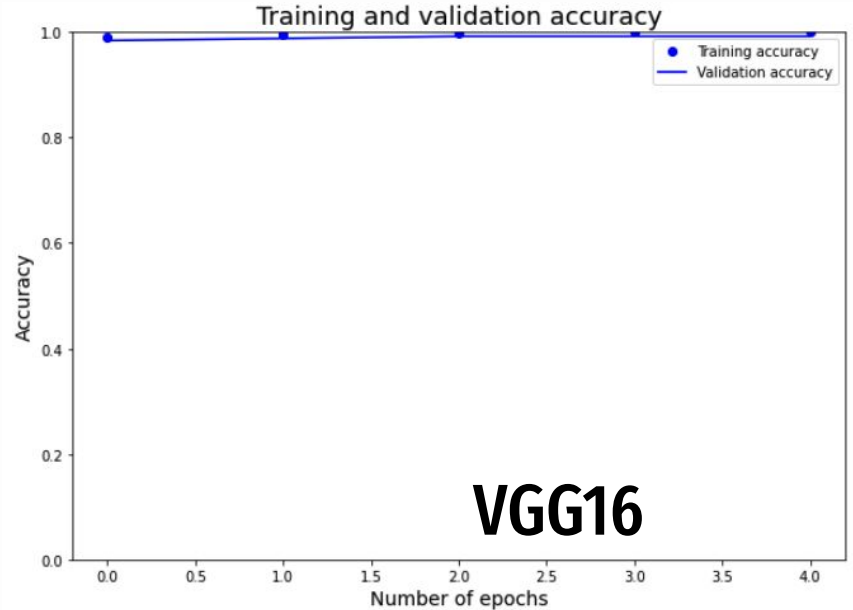


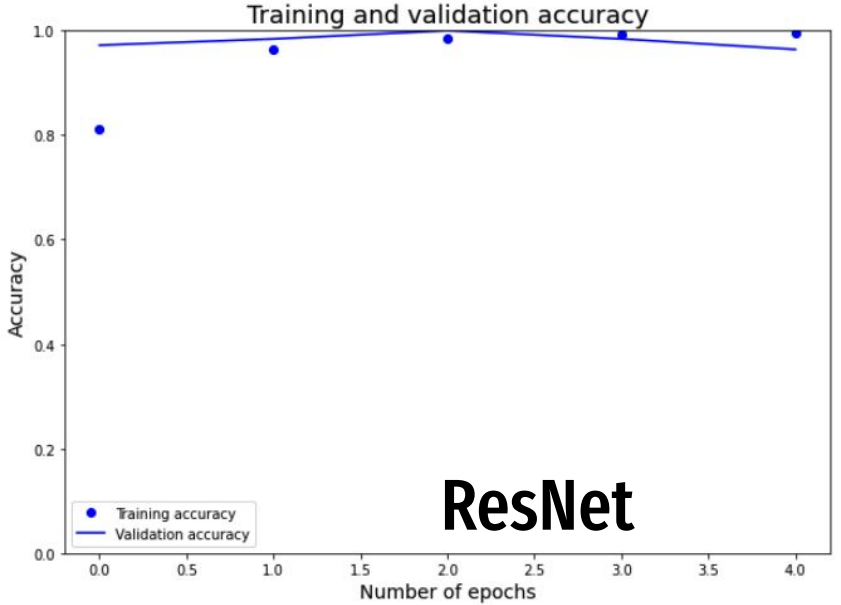
Memory restrictions - limited model to 4 classes

Transfer Learning

Best case scenario with resources to thoroughly train model

- 50 classes
- No image augmentation
- Easily outperforms more basic models with fewer epochs





Conclusions and Future Work

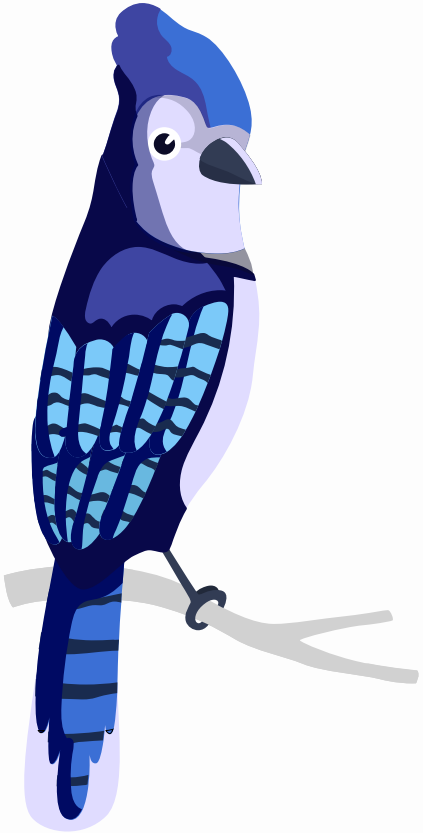
Conclusions

- Logistic regression fails to classify images
- Convolutional neural networks can reach at least 95% validation accuracy with image augmentation and more training data
- Best results by far with transfer learning (VGG16, ResNet)

Future Work

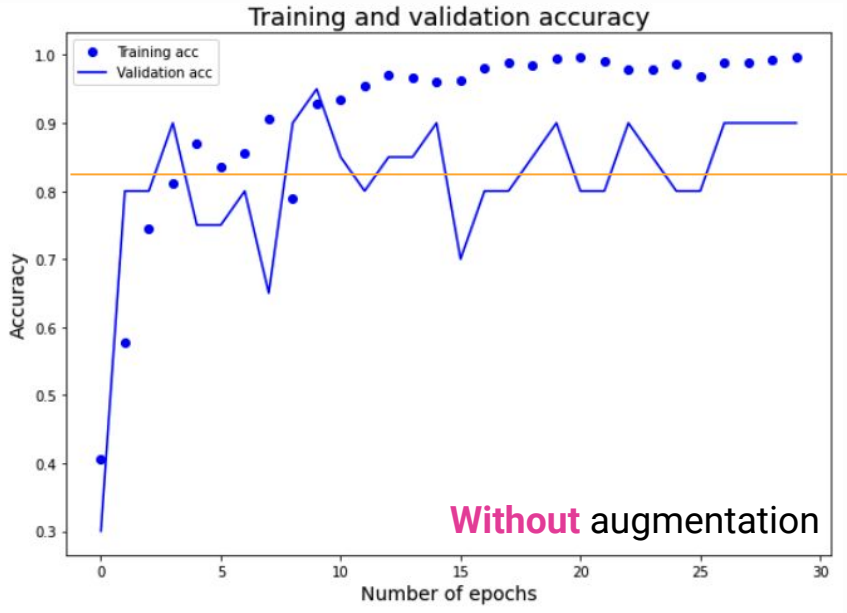
- Analyzing the full 400 species will require more memory and time

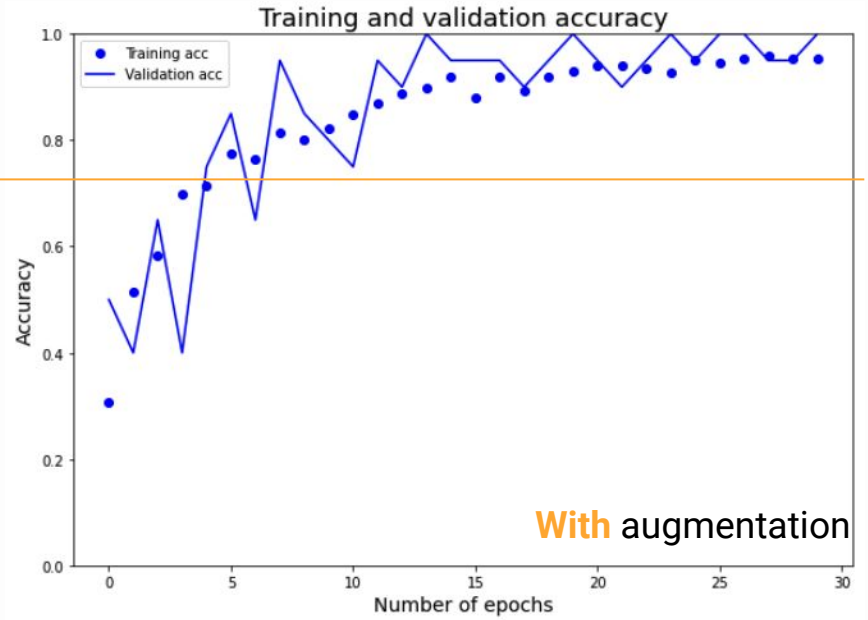
Appendix



Basic CNN

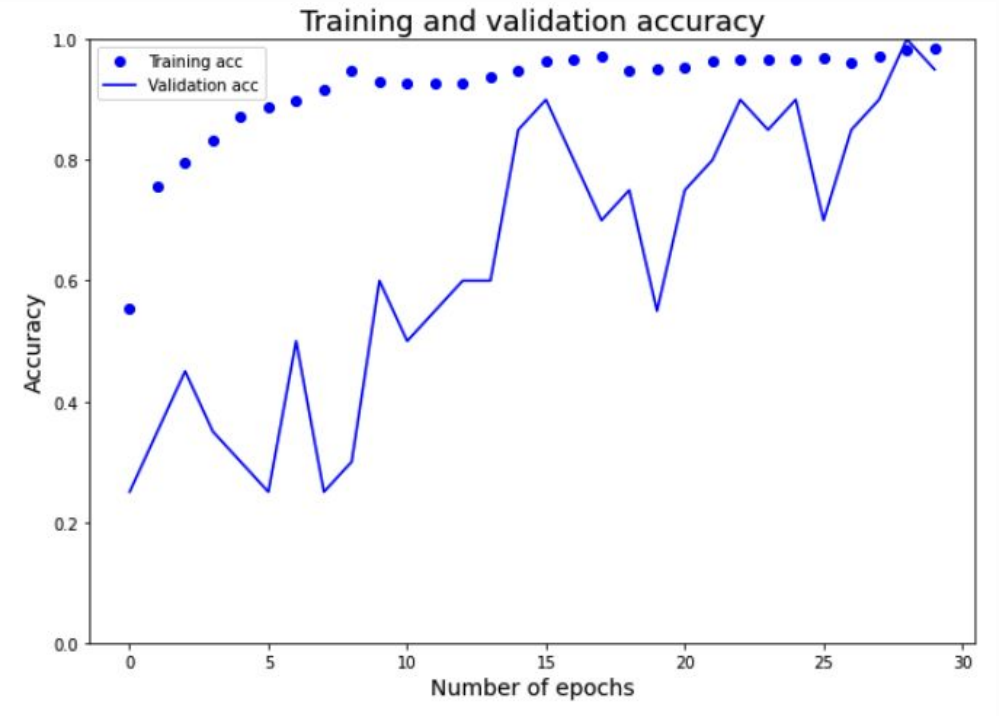
- Memory restrictions - limited model to 4 classes
- Validation accuracy improves with image augmentation
- ≤ 45° rotation, horizontal flipping





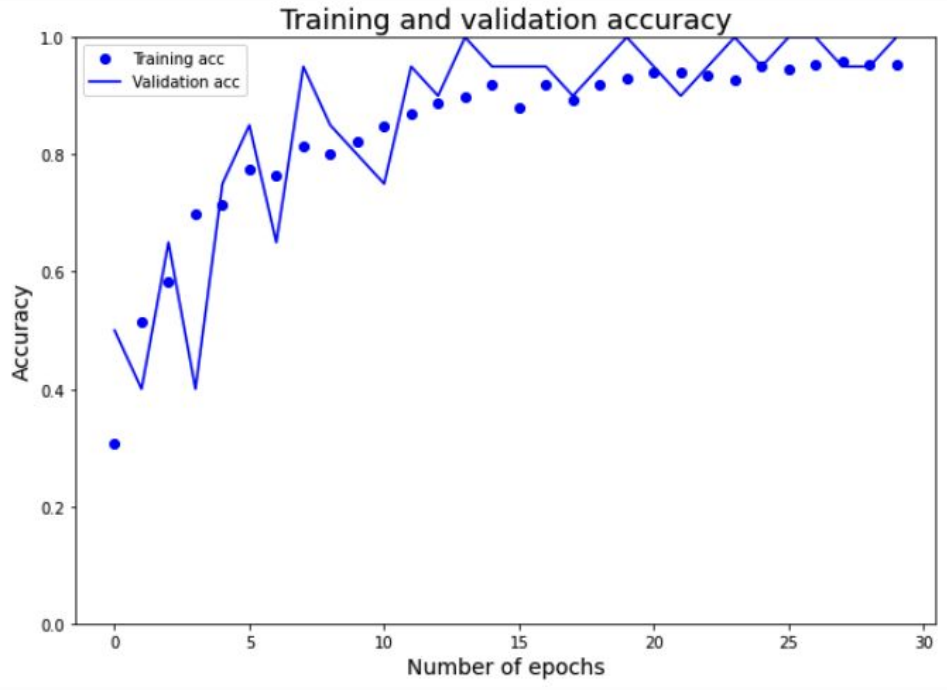
Replace Dropout layer with Batch Normalization

- 4 classes
- Poor performance compared to other models



Decrease Batch Size From 60 to 30

- 4 classes
- Similar performance compared to other models but more overtraining



Thanks