Image Classification: Who’s That Doggie in the Window?

# Matt B. Jackson DSC 680 - Summer 2020 https://mbjackson.github.io/

# References

Brownlee, J. (2019, May 15). *Transfer Learning in Keras with Computer Vision Models* . Retrieved from Machine Learning Mastery: https://machinelearningmastery.com/how-to-use-transfer-learning-when-developing-convolutional-neural-network-models/

Chollet, F. (2016, June 5). *Building powerful image classification models using very little data*. Retrieved from Keras: https://blog.keras.io/building-powerful-image-classification-models-using-very-little-data.html

Glader, S. (2018, June 5). *It's that easy! Image classification with keras in roughly 100 lines of code.* Retrieved from Shirin's playgRound: https://www.shirin-glander.de/2018/06/keras\_fruits/

Khosla, A., Jayadevaprakash, N., Yao, B., & Fei-Fei, L. (n.d.). *Stanford Dogs Dataset*. Retrieved from Stanford University: http://vision.stanford.edu/aditya86/ImageNetDogs/

Le, J. (2019, March 15). *How to easily build a Dog breed Image classification model*. Retrieved from Medium: https://medium.com/nanonets/how-to-easily-build-a-dog-breed-image-classification-model-2fd214419cde

LIPING, L. (2020, February 13). *Dog Breed Classification using CNN and transfer learning*. Retrieved from Git Connected: https://levelup.gitconnected.com/dog-breed-classification-using-cnn-and-transfer-learning-cc93a4497e90

Nelson, D. (n.d.). *Image Recognition in Python with TensorFlow and Keras*. Retrieved from Stack Abuse: https://stackabuse.com/image-recognition-in-python-with-tensorflow-and-keras/

Nuhoglu, D. D. (2019, February 9). *Dog Breed Classification using CNNs*. Retrieved from Towards Data Science: https://towardsdatascience.com/dog-breed-classification-using-cnns-f042fbe0f333

Rogers, T. (2019, November). *Transfer Learning for Image Classification using Keras in Python*. Retrieved from Morioh: https://morioh.com/p/0aba01521df1

TensorFlow. (n.d.). *Transfer learning with a pretrained ConvNet*. Retrieved from TensorFlow: https://www.tensorflow.org/tutorials/images/transfer\_learning

# Data Source

1. “Stanford Dogs Dataset” – Stanford University (Khosla, Jayadevaprakash, Yao, & Fei-Fei, n.d.)
   1. Dataset consists of 20,580 images with 120 different classes
   2. http://vision.stanford.edu/aditya86/ImageNetDogs/

# Research Questions

1. How can an Image Classification model be built from scratch?
2. Is it better to use a pre-trained classifier (like ImageNet and MobileNet) as opposed to a custom-built classifier?

# Methods

In this project the dataset will be processed in Python3 using the Keras framework. Keras is a framework that is used in Python for deep learning applications that uses TensorFlow as its backend. Once the images are processed a CNN will be constructed in Keras to see how well it is at classifying dog breed. Then some popular pre-trained classifiers will be put to the test to see which ones perform the best.

# Potential Issues

The biggest issue here is what computer power will be needed to process the images. The total size of all of the training and test images is around 750MB. Having not worked with images too much, I am unsure if my computer will be enough to process the images and train the model is a reasonable time-frame. Beside images, another gray area is how do you structure a CNN? There is so many different ways it can be done, which one is going to be the best for this application?

# Concluding Remarks

There have been lots of advancements when it comes to computer vision. As technology improves, computer vision applications are able to identify lots of different objects. For this project an image classifier will be created to help distinguish different dog breeds. The dataset being used has 120 different breeds that need to be identified. A convolution neural network (CNN) will be created to identify these images. Also, different pre-trained models such as ImageNet and MobileNet will be used to determine if transfer learning is more effective than a custom model.