

Programming Assignment 4 – Corgi CNN

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Network architecture

I decided to use 2 sets of convolutional layers, rectifier, and pooling layers. and 2 fully connected layers for my network. As for the number of channels, kernel size, and number of features, I decided these values after doing some tuning. I ran through numerous iterations of output and decided that the values that are now implemented were the best I could find. As for the specific architecture, I followed a guide to implementing a CNN with PyTorch (<https://pyimagesearch.com/2021/07/19/pytorch-training-your-first-convolutional-neural-network-cnn/>) and they used a similar structure. This made it easy for me to understand and work with this model. When training, I used the optimizer Adam and the loss function of cross entropy.

Implementation notes

To start with the hyperparameters, again, I did a lot of testing with these and found that 3 epochs and a batch size of 5 was a good number to run the program quickly and also achieve good accuracies. I also used a very small learning rate of 0.0002 which helped my model not overfit. I had to tune these parameters because the model was very prone to overfitting if any of these values were too small or large, greatly affecting performance.

I decided to convert the class labels to ints to make calculations much simpler. In this script, I did not convert them back to the breeds because I just needed to compare the ints to get the accuracies.

When training, I decided to chop off any batches that didn't have my desired batch size of 5, to make things consistent and so I didn't have to add more logic to deal with a variable batch size. The rest of the training process was very standard, just processing the input and getting the loss, etc. When running through the validation and testing set, I decided to still use the provided dataset script to load the images. I just used a batch size of 1 to run through examples one by one. I found this was a great way to easily get the input in a format that is usable.

Performance

The overall accuracy of my model on the test set for an average run is 75%. These values can range from the 60s to high 70s or even 80s. This is because the model may overfit and may not learn a great amount depending on how the images are shuffled or may learn very well. I have tuned my model to not overfit greatly, so after 3 epochs the training accuracy is only around 80%, but I have found this is a good spot to prevent overfitting.

Running the CNN

To run this program, you can just run `cnn.py` with no arguments. To the terminal it will print epoch by epoch training and validation accuracies, and then a final test accuracy. I have provided the dataset in the zip file so it should know where the training and testing sets are and have no problem loading the images. If there is a problem loading the training and testing images, please set a valid path to testing data on line 74 of `cnn.py` and a valid path to training data on line 119 in `cnn.py`