

Activity 18 - Convolutional Neural Networks

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Convolutional Neural Network

I followed the Python code presented in [1] and used the dogs and cats dataset provided by *Kaggle* in [2]. I set half of the labeled images and the other half as my validation dataset.

The code in [1] first demonstrated **a single-layer CNN and a two-layer CNN**. The author decided to create bigger CNN layer by increasing the **number of filters from 48 to 128**. They also **increased the number of epochs** to see if the CNN can do better.

I decided to test all of the author's attempts on **random samples from the test set** provided by [2]. I compared them and tried to find which parameters work best. I set my cut-off probability to be at 50%. Below 50% probability is classified as a dog, while above is classified as a cat.

I also tested some of the CNN models I ran on pictures of cats and dogs outside of the dataset from Kaggle. I used images from my phone gallery.

Single-layer CNN: *24 filters and 5 epochs*

probability of being a cat



0.99937475



0.99342084



0.35800612



0.94503343



0.99610126

Single-layer CNN: *48 filters and 5 epochs*

probability of being a cat



0.7191901



0.9959629



0.85033



0.010818601



0.5935516

Two-layer CNN: 48 filters and 15 epochs

probability of being a cat



0.8725897



0.875263



0.041879475



0.067981094



0.62925935

Two-layer CNN: 128 filters and 5 epochs

probability of being a cat



0.99512553



0.36881924



0.28458828



0.4084851



0.9869002

Two-layer CNN: *152 filters and 10 epochs*

probability of being a cat



0.26046485



0.3131905



0.015831828



0.041553468



0.6436567

Two-layer CNN: 128 filters and 15 epochs

probability of being a cat



0.93850005



0.16682759



0.1491769



0.18066075



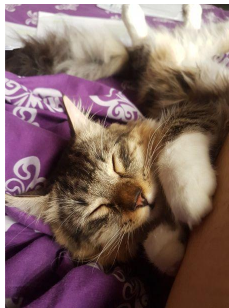
0.9569353

From phone gallery: Single-layer CNN (*48 filters and 5 epochs*)

probability of being a cat



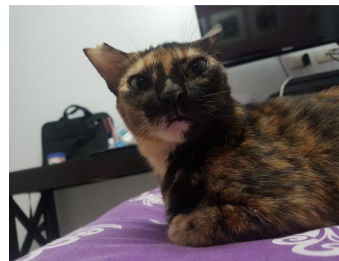
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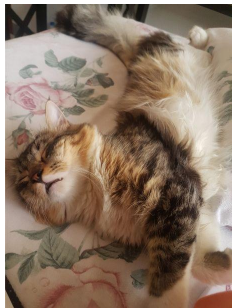
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0.96985835



0.013181746



0.008053392



0.9868699



0.35279673



0.6097278



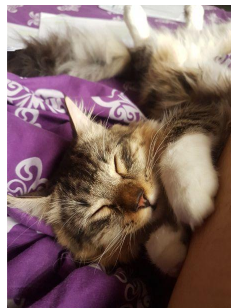
0.06845796

From phone gallery: Two-layer CNN (*128 filters and 15 epochs*)

probability of being a cat



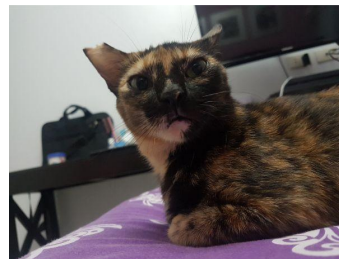
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0.94714093



0.5708572



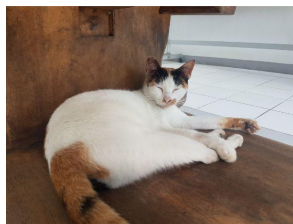
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0.13106179



0.17659661



0.98920476



0.7581545



0.99442416



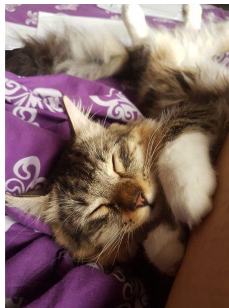
0.48806345

From phone gallery: Two-layer CNN (*152 filters and 10 epochs*)

probability of being a cat



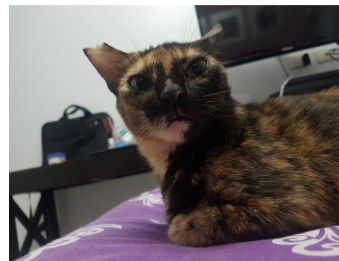
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0.9823366



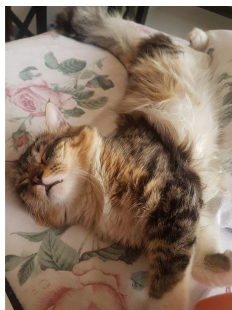
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0.59594166



0.6288559



0.1974861



0.9956317



0.44508478



0.9796209



0.11401796

Evaluation of Results

Based on the results, increasing the the number of filters and CNN layers gives a better result. Increasing the number of epochs changes the probabilities, but the final classification is generally the same.

The best parameters for the two-layer CNN is 128 filters for 15 epochs. On the other hand, the best parameters for the single-layer CNN is 48 filters for 5 epochs.

References

1. <https://www.kdnuggets.com/2019/07/convolutional-neural-networks-python-tutorial-tensorflow-keras.html>
2. <https://www.kaggle.com/c/dogs-vs-cats/data>