Dog Breed Classification

(Image processing using CNN + GAN)

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Questions asked:

How accurately CNN can predict the dog breed by processing images?

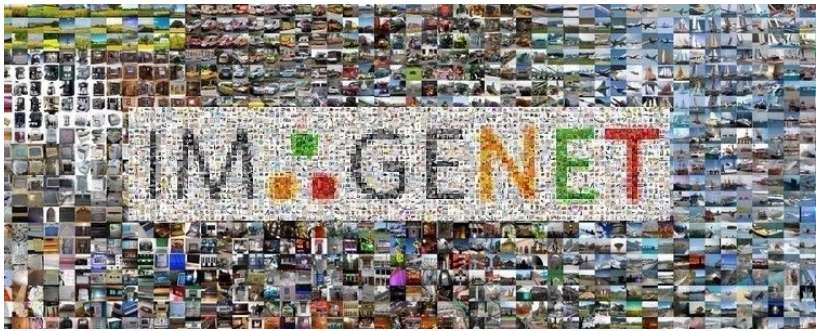
How good is Generative Adversarial Network in generating dog images?

Workflow

amazon web services + TensorFlow + jupyter

Cloud Computing for Deep Learning

Dataset



Data Analysis and Modeling

Keras
A deep learning library

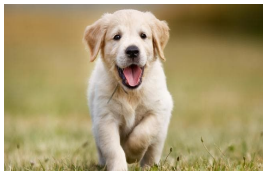
scikit learn

DATA

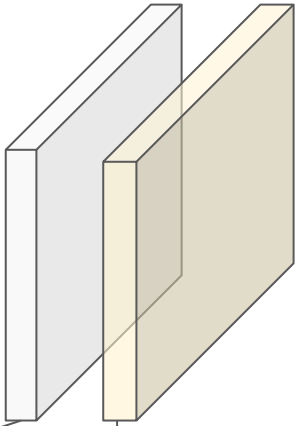
The Stanford Dogs dataset contains images of 120 breeds (multi-class classification) of dogs from around the world. This dataset has been built using images and annotation from ImageNet.

Number of categories: **120**
Number of images: **20,580**
Annotations: **Class labels**

Initial CNN architecture

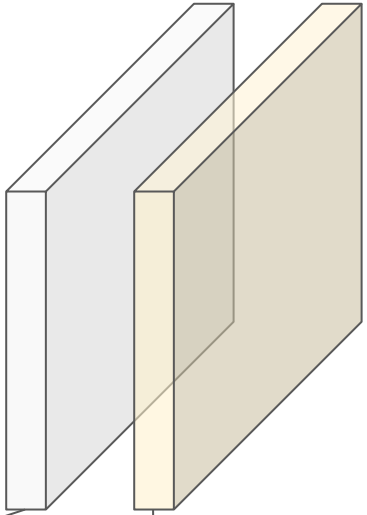


Input Image
(224, 224, 3)



Conv Layer 1 (64, (3, 3),
activation='relu'

Pooling 1
Layer (2x2)

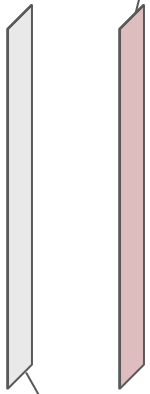


Conv Layer 2
(120, (3, 3),
activation='relu'

Pooling 2
Layer (2x2)

Fully
connected
Layer

Output Layer 1 (120x1),
activation='sigmoid'



Dense Layer 1 (120x1),
activation='relu'

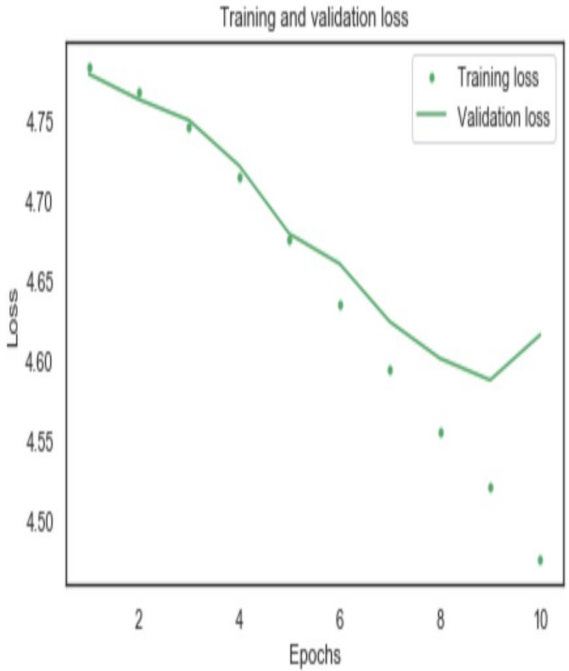
Model Performance

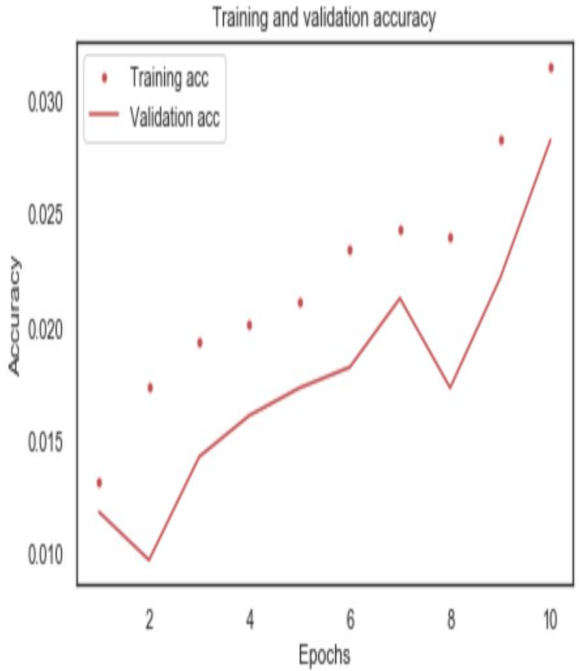
# of Epochs = 10
Batch size = 50

Accuracy = 0.0315
Validation Accuracy = 0.0282

Loss = 4.4749
Validation Loss = 4.6159

Test Accuracy = 0.024
F1 score = 0.019





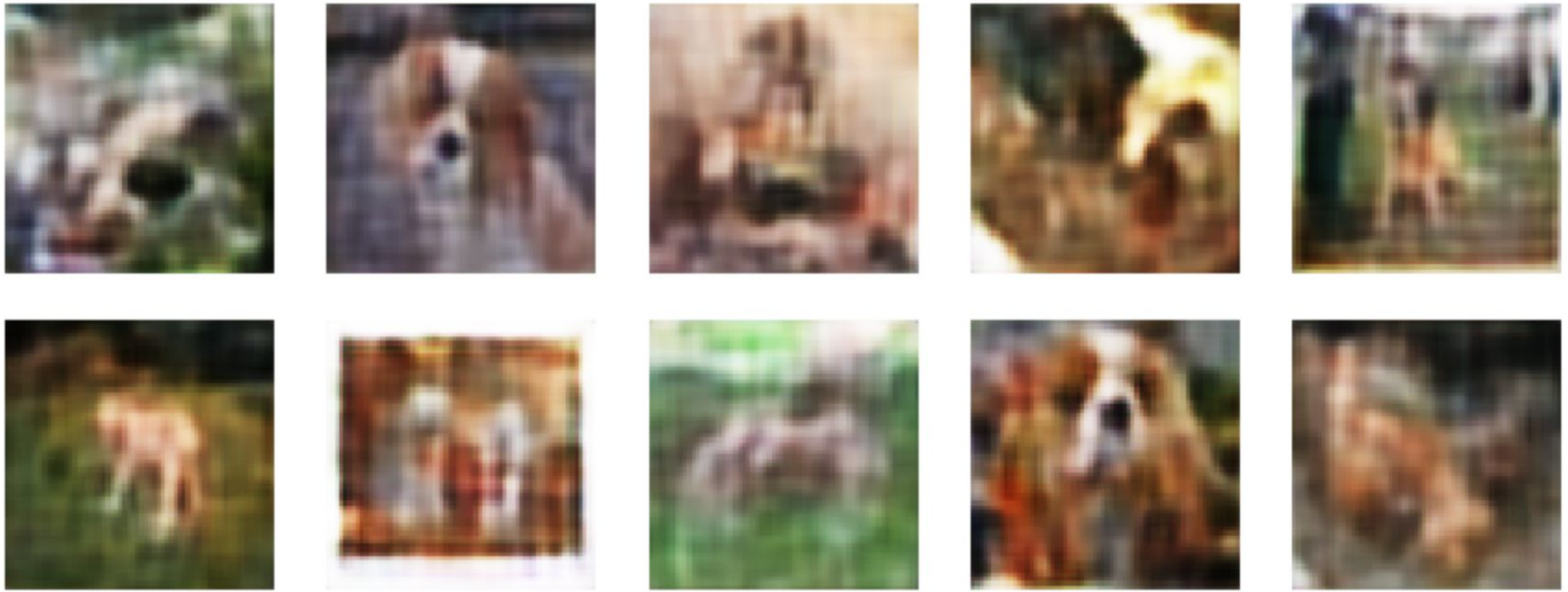
Transfer Learning

Inception_v3	ResNet50
# of Parameters = 23,851,784 Hidden Layers = 159	# of Parameters = 25,636,712 Hidden Layers > 152
# of Epochs = 10 Batch size = 32	# of Epochs = 10 Batch size = 32
Validation Loss = 0.9771 Validation Accuracy = 0.7689	Validation Loss = 1.2283 Validation Accuracy = 0.7139
Test Accuracy = 0.76 F1 score = 0.30	Test Accuracy = 0.73 F1 score = 0.08

Generative Adversarial Network

Living portraits

GAN generated images (64x64)



GAN generated images (224224)








Conclusions

- Pick something that proven to work for similar problem and use it
- Begin from small network and gradually increase its complexity
- Computational capacity becomes crucial
- How large is your dataset

Future work:

- Experiment with different types of GAN
- Use bounding box for Dog images for better classification