

Capstone Proposal

Machine Learning Engineer
Nanodegree

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Distinguish images of dogs from cats

Domain Background

Image recognition have received a large amount of attention over the last few decades. We can see it through hundreds of books published on the subject and the growing of new big train in Machine Learning: Deep Learning. By using a hierarchy of numerous artificial neurons, deep learning can automatically classify images with a high degree of accuracy. Thus, neural networks can recognize different species of cats, or models of cars or airplanes from images.

This project, was proposed by [Kaggle](#) inside the competition [Dogs vs Cats](#) created on September 2013. In this competition, the aim was to write an algorithm to classify whether images contain either a dog or a cat. Philippe Golle of Palo Alto Research Center ([1](#)) wrote literature suggests machine classifiers can score above 80% accuracy on this task. Philippe Golle describe a classifier which is 82:7% accurate in telling apart the images of cats and dogs used in Asirra. This classifier is a combination of support-vector machine classifiers trained on color and texture features extracted from images. Our goal is to improve the accuracy of this solution by using a deep learning algorithm: Convolutional Neural Network(CNN). The motivation is to solve the dogs vs cats problem, upload the predictions to Kaggle to get the score of our prediction model and get highest score.

Problem Statement

The goal is to classify whether a given image contain either a dog or a cat, the tasks involved are the following:

1. Download Dogs and Cats data.

First, we need to download the 2 datasets (train.zip and test.zip) from the [competition page](#):

- train.zip contains labeled cats and dog's images that we will use to train the model.
 - test.zip contains unlabeled cats and dog's images that we will use to classify to either dog or cat using the trained model.
2. Train the Convolution Neural Network on the training data
 3. Make prediction on the testing data

Datasets and Inputs

The dataset is comprised of 25,000 images of dogs and cats. Our goal is to build a machine learning algorithm capable of detecting the correct animal (cat or dog) in new unseen images. The application uses a classifier trained using the [Kaggle dataset](#).



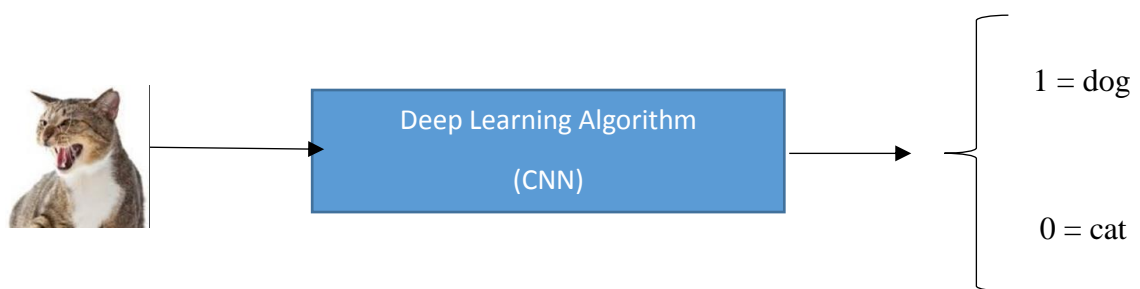
Cats and Dogs images from Kaggle Dataset

First, we need to download the 2 datasets (train.zip and test.zip) from the [competition page](#):

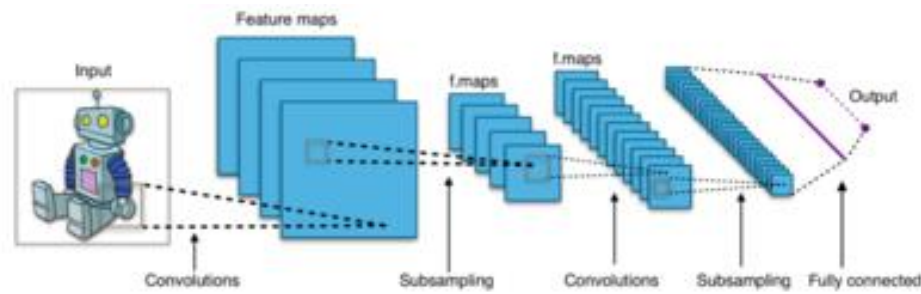
- train.zip contains labeled cats and dog's images that we will use to train the model.
- test.zip contains unlabeled cats and dog's images that we will use to classify to either dog or cat using the trained model.

Solution Statement

We run our algorithm on the train.zip files and predict the labels for test1.zip (1 = dog, 0 = cat). We built a cat/dog classifier using a deep learning algorithm called Convolutional Neural Network(CNN).



We use the Convolutional Neural Network(CNN) algorithm to solve this project. CNN is a type of feed-forward (2) artificial neural network. These models are designed to emulate the behavior of a visual cortex. CNNs perform very well on image recognition tasks. CNNs have special layers called convolutional layers and pooling layers that allow the network to encode certain images properties.



CNN by Yann LeCun(1998)

Benchmark Model

For the Benchmark, we will use two approaches: firstly, we upload our predictions to Kaggle to get the score of our prediction model. Secondly, accuracy between true positive and true negative by computing the following formula:

$$accuracy = \frac{true\ positives + true\ negatives}{dataset\ size}$$

Evaluation Metrics

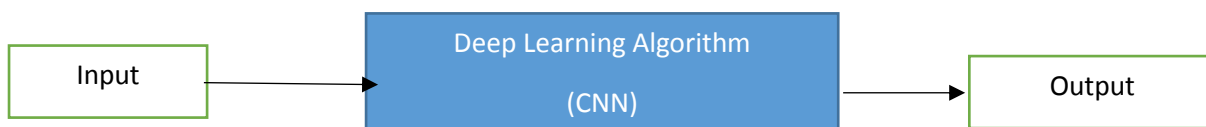
We use accuracy metric for binary classifier with formula:

$$accuracy = \frac{true\ positives + true\ negatives}{dataset\ size}$$

- True positives in this case is when the input is dog image and the CNN predict 1= dog as output; or the input animal is cat and our algorithm predict 0=cat.
- True negatives in this case is when the input is dog image and the CNN predict 0= cat as output; or the input animal is cat and our algorithm predict 1=dog.

Project Design

This application is design command terminal, build on [caffe](#). Caffe is an open-source library developed by Berkeley Vision and Learning Center. We will implement a cat/dog classifier using a convolutional neural network. We will use a dataset from Kaggle's Dogs vs. Cats competition. To implement the convolutional neural network, we will use a deep learning library called caffe and some Python code.



First, we need to download 2 datasets from the competition page: train.zip and test1.zip. We will upload our predictions to Kaggle to get the score of our prediction model.

Reference:

- https://en.wikipedia.org/wiki/Convolutional_neural_network
- <http://adilmoujahid.com/posts/2016/06/introductiondeeplearningpythoncaffe/>