DOG BREED IMAGE CLASSIFICATION

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Abstract:

The process of identifying what an image represents is called *image classification*. An image classification model is trained to recognize various classes of images. For example, you may train a model to recognize photos representing three different types of animals: rabbits, hamsters, and dogs.

Image classification is the primary domain, in which deep neural networks play the most important role. The image classification accepts the given input images and produces output classification for identifying an accurate prediction.

Image classification is a complex process that relies on numerous components.
Here are some of the classification techniques(strategies) presented.
The main emphasis will be on cutting-edge classification techniques that are used to enhance accuracy in characterization.

There are:

Convolutional Neural network, Support vector machine, Fuzzy logic, Genetic algorithm , etc.

Keywords:- , Dog Images(dataset),CNN, Deep learning, image classification, image recognition, machine learning, Artificial Intelligence

I. Introduction

In computer vision , image classification plays an important role, it has a very important meaning in our research, work and life.
Image classification is a method that involves image preprocessing, segmentation of images, extraction of key features and identification of matches.
We not only get the image information faster than ever with the new figure image classification techniques, we apply it to scientific experiments, like - traffic identification, protection, medical equipment, face recognition and theft detection.

II. Background Information

A.

We will address convolutionary neural networks here, which are a smart way of reducing the number of parameters.

The CNN solution reuses the same parameter several times instead of dealing with a fully connected network.

The major principle behind CNNs is that it is good enough to have a local understanding of a picture.

The functional advantage is that having fewer parameters significantly increases the time it takes to learn and decreases the amount of knowledge needed to train the model.

Instead of a fully connected network of weights from each pixel, A CNN has only enough weights to look at a small patch of the picture instead of a completely linked network of weights from each pixel. It's like reading a book using a magnifying glass; finally, you read the entire page, but at any given moment, you look at just a tiny patch of the page.

Consider an image of 256 x 256.

CNN will efficiently scan it chunk by chunk instead of processing the whole image at once, say, a 5 x 5 window.

Along the picture, the 5 × 5 window slides (usually left to right, and top to bottom), as shown in the figure below. How "quickly" it slides is called its stride length. For example, a stride length of 2 means the 5 × 5 sliding window moves by 2 pixels at a time until it spans the entire image. This 5 x 5 window has an associated 5 x 5 matrix of weights.

B. *Deep Learning* Deep Learning [2] is machine learning technique which is used to model the data that are designed to do a required task. Deep learning in neural networks has widespread purposes in the area of image recognition, classification, decision making, pattern recognition etc. Some other deep Learning practices like

multimodal deep learning is used for feature selection, image recoAppgnition etc.

C. Applications of Image classification are employed in varied applications

1.Automated Image Organization – from Cloud services to telecoms

2.Photography and video editing apss and websites

3.Visual Search options for Improved ease of detection of

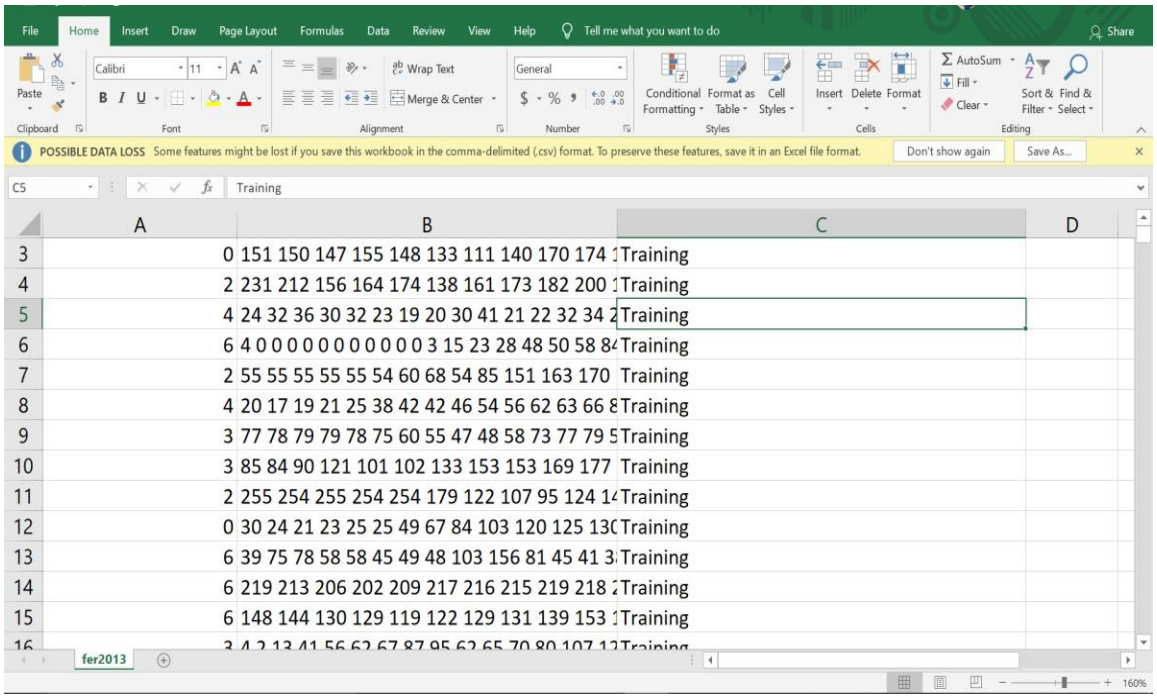
4.Image Classification for websites with bid visual databases

5.Image and Face Recognition on Social Networks etc.

III. Proposed Methodology

This section explains the methodology we used for this Image classification algorithm.

A.Dataset :We have taken the dataset of dogbreeds from standford edu website (http://vision.stanford.edu/adity



a86/ImageNetDogs/) to perform training and testing on the model for image classification.

Our dataset has more than 20,000 images, which has 120 class names i.e dog breeds.

B. Pre processing

We are only going to need the Class and the Image Data. Image data is one big string of numbers exactly 2304 numbers. These are pixel intensity values and each number represents the darkness of that pixel in the image. It can take any value from 0 (White) to 255 (Black). We split the string to get hold of individual numbers and then reshape it into a 48 x 48 array and dividing by 255 normalizes the data.

Once we go through all the images, we expand the dimension of our data array by one to accommodate for the channel value. We one-hot encode the labels then return the NumPy arrays.

C.Importing Libraries

We have imported some libraries such as NumPy, pandas, TensorFlow, keras etc.

NumPy- for mathematical operations.

Mathplotlib,pyplot to picturize

TensorFlow-for using deep learning models.

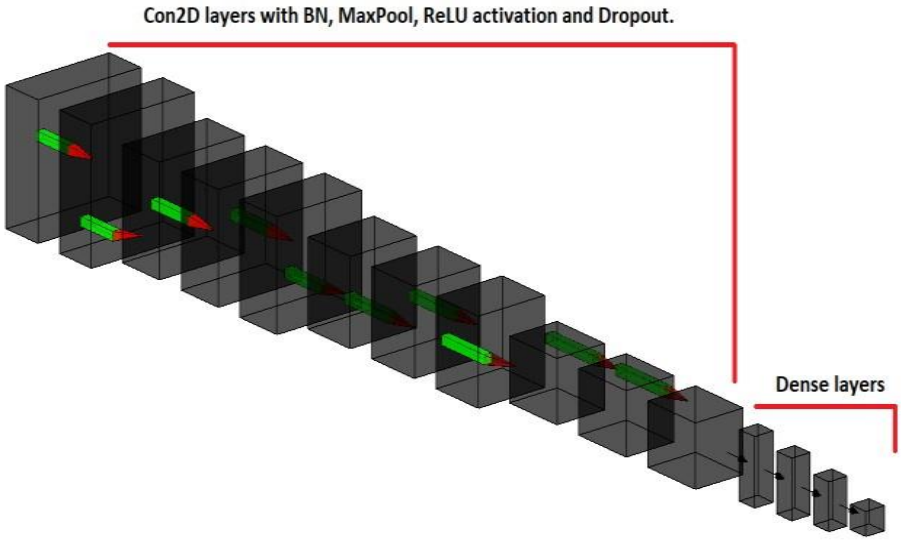
Keras-To build neural networks. And etc

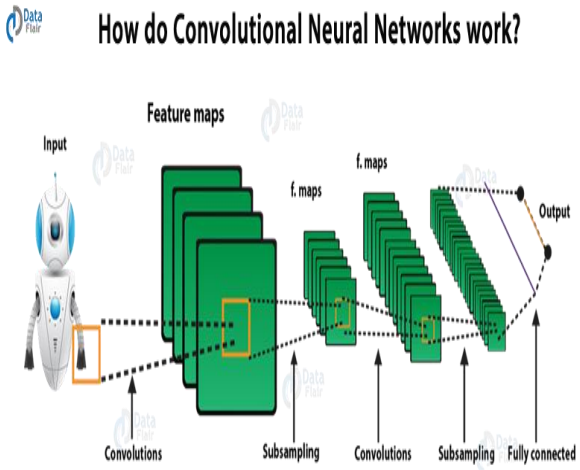
D. Convolutional Neural Networks

In deep learning CNN's are a class of deep neural networks which are mostly used for image modelling and image classifying etc. They are regularized versions of multi-layer perceptrons.CNN's use very less pre-processing compared to other image or visual classification algorithms.

E. Building Model

We have built a model of Convolutional Neural Network which has convolutional layers fitted with filters that extract features out of given images.





*While training the image classification model is fed withimages and their related labels during preparation.

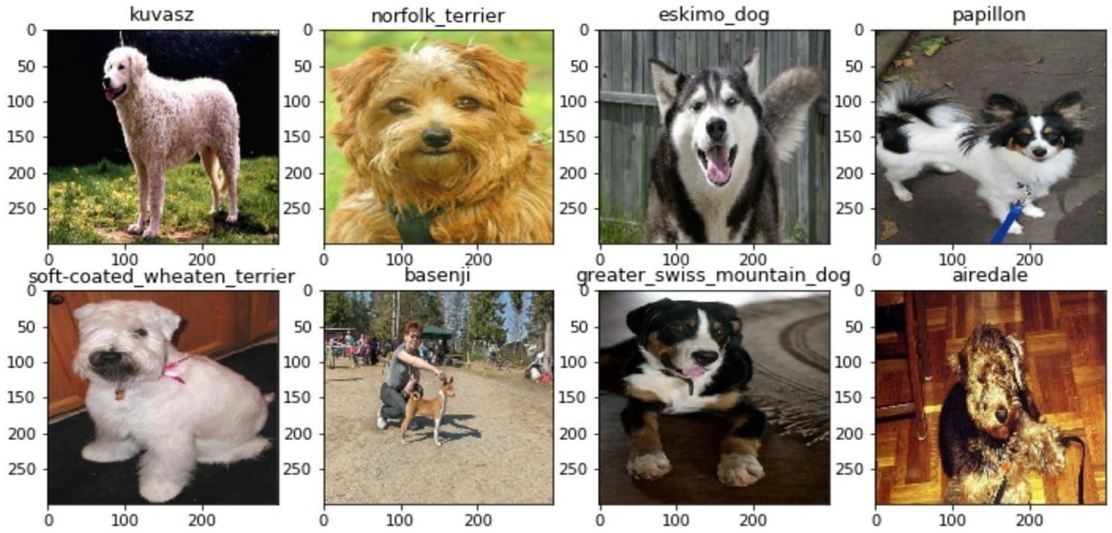
*Each label is the name of a distinct term that the model will learn to identify.

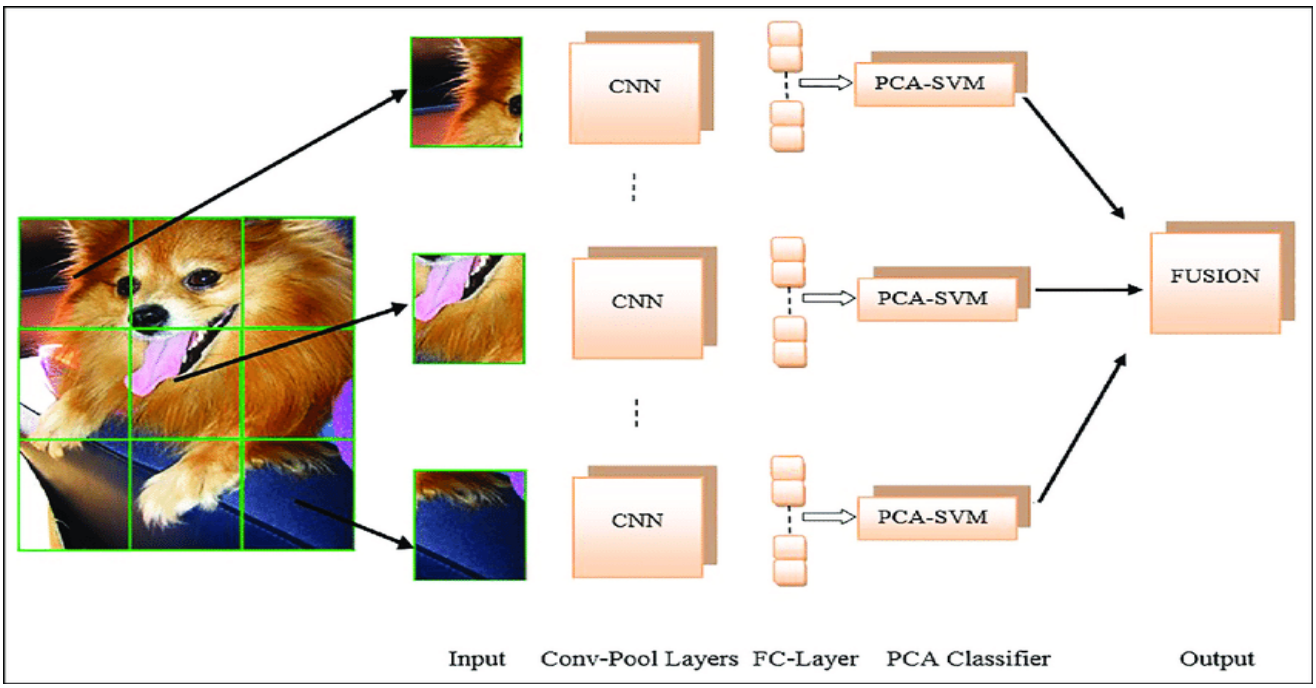
*An image classification model can learn to predict whether new images belong to any of the classes in which it has been trained, provided appropriate training data (often hundreds or thousands of images with label).

ModelCheckpoint: Saves the best version of our model along

with the weights, so that in case any crash occurs, our model can be recovered. We have used Keras to deploy our neural network and if you look at the architecture then you will notice that we have used Dropout layers frequently.

***Dropout layers** inhibit overfitting by randomly dropping out units from the neural network. We will use 20 percent of the training data as validation data.Finally after building model using cnn and layers, When you subsequently provide an new image to the model,it will output the probability of the image belonging to a particular breed means it will tell to which breed the dog image is suited more accurately





IV. Experimental Setup

All the labels that are under training will be trained and size of each image is (28,28,1). While training our number of epochs are 100 if you need you can keep more or less. The batch size is 40 and learning rate is 0.01. You can see after epoch 1 the accuracy is 20.3% and loss is 2.10 and after epoch 100 the loss is 0.21 and accuracy is 84% so that we have completed training.

V. Result and Analysis

In the training the accuracy is 84% approx. But in the testing the accuracy is 61% it means the

model is overfitting but it is still good accuracy compared to other models such as SVM and others.

Maybe it needs more data than this to give some better accuracy.

VI. Conclusion

Many researchers have done many models on Image recognition using many machine learning, deep learning techniques. It is great to have a model like this but much more reliable and much more accurate in future by using more advanced techniques.

So my model will basically classify the image to its appropriate dog-breed most accurately.

REFERENCES

1. http://vision.stanford.edu/aditya86/ImageNetDogs/

2. https://www.tensorflow.org/tutorials/images/classification