DOG BREED CLASSIFICATION

ABSTRACT:

This project uses computer vision and machine learning techniques to predict dog breeds from images. First, we identify dog facial key points for each image using a convolutional neural network. These key points are then used to extract features via SIFT descriptors and color histograms. We then compare a variety of classification algorithms, which use these features to predict the breed of the dog shown in the image. Our best classifier is an SVM with a linear kernel and it predicts the correct dog breed on its first guess 52% of the time; 90% of the time the correct dog breed is in the top 10 predictions.

PROBLEM DESCRIPTION:

This project helps to identify dog breeds from images. This is a fine-grained classification problem: all breeds of Canis lupus familiar will share similar body features and overall structure, so differences between breeds are a difficult problem. Moreover, there is low inter-breed and high interbreed variation; in other words, there are few differences between breeds and large differences within breeds, differences in size, shape, and color. However, dogs are both the most morphologically and genetically diverse species on Earth. It is difficult to identify breeds because diversity is compounded by the stylistic differences of photographs used in the dataset, which features dogs of the same breed in a variation of lightings and positions.

SCOPE:

There are several factors that make the problem of dogs categorization challenging. Firstly, there many different breeds of dogs exist, and all breeds on a high-level look-alike, i.e. there can be only subtle differences in appearance between some breeds. In fact, a dog's breed might be not obvious right away even for people who have expertise in the domain. Therefore, the determination of dog breeds provides an excellent domain for fine-grained visual categorization experiments. Secondly, dog images are very rich in their variety, showing dogs of all shapes, sizes, and colors, under differing illumination, in innumerable poses, and in just about any location. The photos have different resolutions, backgrounds, and scales. In some images, the dogs are partially covered by other objects or wear clothes such as hats, scarves, glasses. Thus, there is a lot of noise on many of the photos that make the problem more challenging. Thirdly, our data set is small in terms of the number of photos per breed.

OBJECTIVES:

This problem is not only challenging but also its solution is applicable to other fine-grained classification problems. For example, the methods used to solve this problem would also help identify breeds of cats and horses as well as species of birds and plants - or even models of cars.

Any set of classes with relatively small variation within it can be solved as a fine-grained classification problem. In the real world, an identifier like this could be used in biodiversity studies, helping scientists save time and resources when conducting studies about the health and abundance of certain species populations. These studies are crucial for assessing the status of ecosystems, and accuracy during these studies is particularly important because of their influence on policy changes. Breed prediction may also help veterinarians treat breed-specific ailments for stray, unidentified dogs that need medical care. Ultimately, we found dogs to be the most interesting class to experiment with due to their immense diversity, loving nature, and abundance in photographs, but we also hope to expand our understanding of the fine-grained classification problem and provide a useful tool for scientists across disciplines.

NOTEBOOK USED - GOOGLE COLAB:

Collaboratory, or "Colab" for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary python code through the browser and is especially well suited to machine learning, data analysis, and education. More technically, Colab is a hosted Jupyter notebook service that requires no setup to use, while providing free access to computing resources including GPUs.

TECHNOLOGY - OPEN CV:

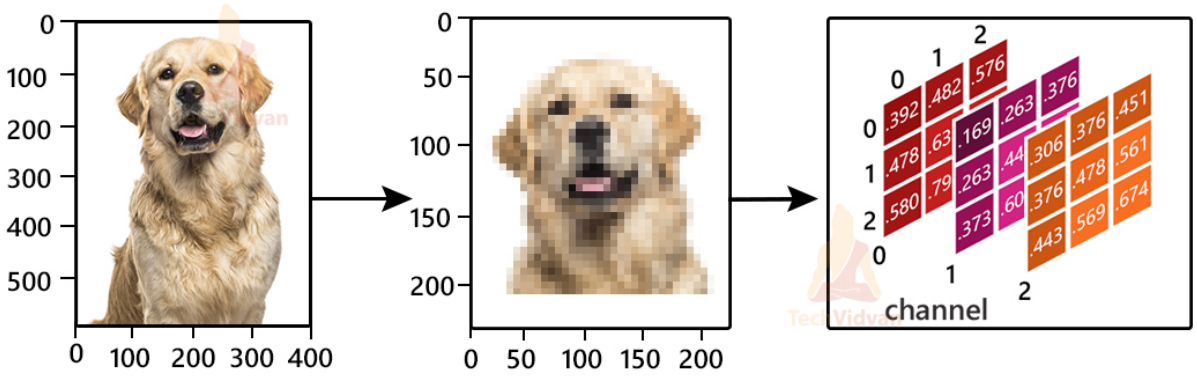
OpenCV is the huge open-source library for computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it is integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify image patterns and their various features we use vector space and perform mathematical operations on these features.

MODEL - CNN(Convolution Neural Network):

Convolutional Neural Networks (CNNs) is the most popular neural network model being used for image classification problem. The big idea behind CNNs is that a local understanding of an

image is good enough. The practical benefit is that having fewer parameters greatly improves the time it takes to learn as well as reduces the amount of data required to train the model. Instead of a fully connected network of weights from each pixel, a CNN has just enough weights to look at a small patch of the image. It's like reading a book by using a magnifying glass; eventually, you read the whole page, but you look at only a small patch of the page at any given time.

CNN is a type of neural network model which allows us to extract higher representations for the image content. Unlike classical image recognition where you define the image features yourself, CNN takes the image's raw pixel data, trains the model, then extracts the features automatically for better classification.



DATASET NAME & LOCATION:

Name: Dog Breed Identification

Location: https://www.kaggle.com/c/dog-breed-identification/data

GITHUB LINK: