Capstone Proposal

Machine Learning Project

About

Dog-Breed Classifier

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A project proposal encompasses seven key points:

1. Domain background

Historically human have interested in a social image description, they described the images they would like to **research** and built academic studying connected with the **computer vision** field, So they built platforms that included a system that learns associations between the used words to **describe images** and the visual features found in it, that can get them better at predicting descriptions on its own.

That **advance** studies made a great benefit for humanity by **reducing** cost for expensive tasks for many industries such as security use **face recognition** for investigating crimes and for using **medical imaging** when exploring viruses developments.

In this **project**, I interested in how convolutional neural networks work to recognize it using the **Dog Breed Classifier**.

2. Problem statement

In **Dog Breed Classifier Project**, we can **define** the problem by using a **specific** question :

How can we use convolutional neural networks to recognize the **Dog Breed Classifier?**

So, we define our problem: make the user-supplied images as input, then classify them.

I took many steps to **solve** project problem such as:

- Make an **algorithm** that has the ability to **identify** and **estimate** the canine's breed then **test** it by given an image of a **dog** and another image of a **human** and see **how the code** will identify the resembling **dog breed for each.**

3. Datasets And inputs

The project **dataset and input** provided by Udacity, and they contain images of dogs breed and humans, in **separate folders**, one contains 13233 images of **humans**, and the other with 8351 images of **dogs**.

The **dog's folder** divided into **folders** of **validation**, **test**, and **train** data, each folder contains images for 133 breeds of dogs, separated into folders using breed name, and **each** breed having a huge number of images.

There are 835 images in the validation set and, 6680 dog images in the training set, And 836 images in the test set, So we can say that the **data will prove useful** for our problem **because** it contains plenty of pre-sorted images for both dogs and humans.

4. Solution statement

The **project solution** is taking an input image and classifying the dog breed in the picture. And, if the picture is for a human, we should **predict the closest** matching dog breed to that human. So, we should **first classify** our input image is it for a dog or a human, because that will help produce an **appropriate output** in our app.

Now, we can classify the human image with a **fairly reliable,** we use the **Haar Cascades** approach, which comes with **OpenCV**, and to classify dog image we directly use one of the **pre-trained models** from the **ImageNet competition** approach because the ImageNet dataset has a number of **labeled** dog images.
Finally, to predict the exact dog breed, we use one of the models from the ImageNet competition. This time, we will only use pre-trained **weights** from the convolutional layer that will retrain fully connected layers for our use case for **133 dog-breed output classes.**

5. Benchmark Model

Our benchmark model has many properties:

● The **Convolutional Neural Network** we should make from scratch and it should get more **than 10%**. accuracy, this is a difficult task for differentiating between dog breeds and for humans.
● About **the pre-trained model,** we should have accuracy for **more than 60%** so it successfully used in a dog breed **classifier app**

6. Evaluation Metrics

The **project problem** is classifying the correct breed for the dog, so the **accuracy percentage** should use the appropriate metric to **assess** how our model is **performing** with bound between **0 and 100**. The accuracy percentage **represent as :**

Accuracy % = (The number of correctly predicted images / The total number of images) x 100

7. Project Design

This section summarizes a theoretical workflow for approaching a solution given the problem, **Here I display the steps I will implement :**

1. **Importing Datasets** as provided by Udacity

2. **Detecting Humans:** by using **OpenCV's** implementation of **Haar feature-based** cascade classifiers.

3. **Detecting Dogs:** by using **pre-trained models (VGG-16**) from the Image**Net competition.**

4. **Classifying dog breed:** by preprocessing our image data **(rotating, resizing, cropping)**and training the model.

5. **Finally**, we will integrate to build a working demo of our project.

Learning Resources

Courses

Computer Vision

Machine Learning Project

Introduction to Computer Vision, Aaron Bobick (Georgia Tech and Udacity)

Object Recognition and Scene Understanding, Antonio Torralba (MIT)

Books

Computer Vision: Models, Learning, and Inference, Simon Prince