AIML CAPSTONE PROJECT

Submission by

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Overview

Objective of this capstone project is to create a Deep Learning model to predict car make, model and year. This can be used in Automotive Surveillance domain.

Some possible use cases can be:

- Car images can be captured by feeds of security cameras, passed through this model to identify its Make, Model and Year for tracking down in case of any undesirable actions.
- Also, it can be used in pattern generation of likes and dislikes for certain car types/make in particular geography.
- It can also be used to find if any car has used fake license plate by comparing its make, model, year from this model with the ones that are linked to license plate.

Dataset

The Cars dataset contains 16,185 images of 196 classes of cars.
The data is split into 8,144 training images and 8,041 testing images, where each class has been split roughly in a 50-50 split.
Classes are typically at the level of Make, Model, Year, e.g. 2012 Tesla Model S or 2012 BMW M3 coupe.

Observation on the Data

- Each class has varying number of images ranging from 24 to 68 showing a very high imbalance.

- Some cars are very similar but belong to different classes e.g. Aston Martin Vantage Convertible and Aston Martin Virage Convertible. This poses a challenge for model to look out for distinguishing features.

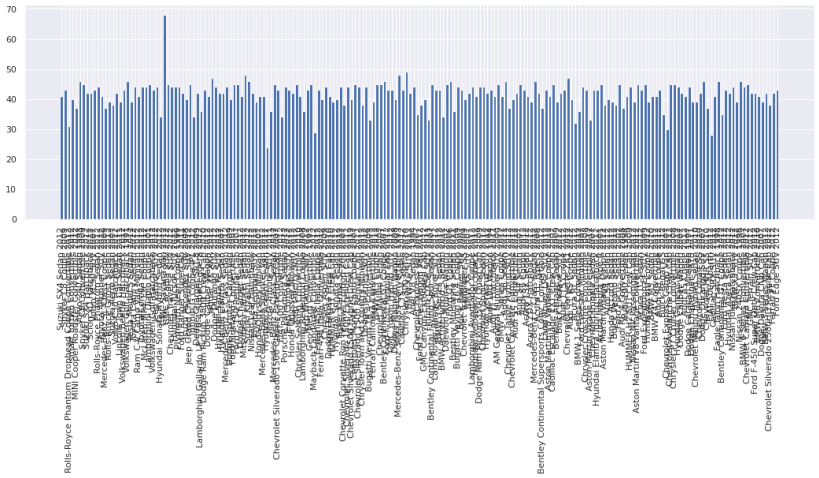
- Images in the dataset are mix of different camera angles. We can see images with front view, side view, Back view. Also, some cover a small area in the image and some are covering almost all of image area. Again, this adds a level of complexity for model to understand different views. This is kind of data augmentation provided in data itself.

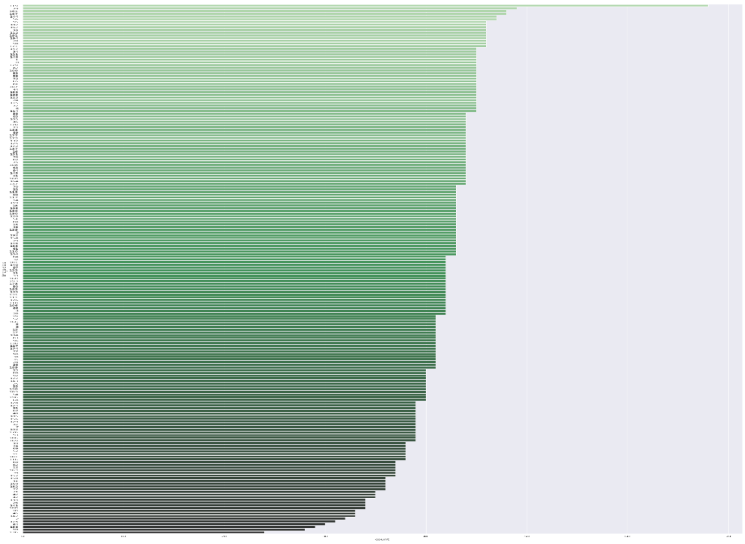
- Images are of varied sizes. For model input, we need to convert them all to be of same size.
- Good part is that we are given Annotations for each image to identify the exact location of car in the given image. Annotations have helped in converting the images to cropped images, hence reducing noise and making it easier for model to skip the object identification step. However, it will not be possible in real-time scenario and we need to take care of this. To make this model useful for real time scenario, we need to add a supporting model that can create bounding boxes for the new images.

- One class had a symbol of '/' in car names excel, which posed problem in traversing through folders, hence, it was replaced by '-'. Interestingly, it had '-' in folder hierarchy of images

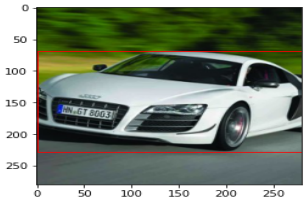
EDA

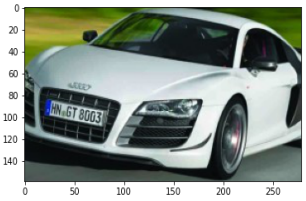
- **During EDA of the car dataset, we could see the class imbalance. Count of cars under different classes varied from 24 to 49, whereas 1 class (119) had 68 number of cars.**



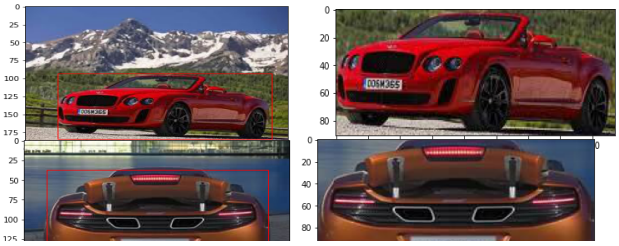


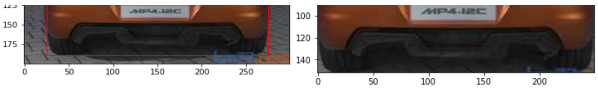
- **Also, we could see that along with images, we were given annotations which represented bounding boxes on car images. This could be used for cropping images by bounding boxes and have most relevant areas of images as input for feature extraction.**





- **By viewing random cars from the given images, we could see that pictures are taken from varying angles e.g. front view, side view and rear view. Image sizes also varied from each other.**

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