CS4830 Big Data Lab Assignment 6

Shashank H S BE18B006

1. The CIFAR 10 dataset consists of 60000 32x32 colour images in 10 classes, with 6000 images per class. There are 50000 training images and 10000 test images. It was downloaded from this link. The files corresponding to the batches were unpickled and then, the training and test images were stored in c10_data/train/ and c10_data/test/.

The MobileNetV2 model, which was pretrained on the ImageNet dataset, was used to perform classification on the CIFAR 10 dataset. The predictions are as shown below:

label	mobilenetv2 prediction
frog	rock_python
bird	pinwheel
truck	bearskin
automobile	mousetrap
truck	oil_filter
truck	thresher
frog	jaguar
truck	moving_van
airplane	waffle_iron
automobile	panpipe
frog	sidewinder
truck	airliner
automobile	maraca
truck	thresher
frog	clog
truck	thresher
truck	moving_van
frog	jersey
truck	thresher
cat	fire_screen
truck	thresher
truck	moving_van
frog	sidewinder
truck	tobacco_shop
frog	custard_apple

only showing top 25 rows

The predicted classes do not match with the true classes since the CIFAR 10 and ImageNet datasets have different class names. However, the CIFAR 10 dataset contains images which are lower resolution versions of some of the classes in ImageNet. Hence, we can use models pretrained on ImageNet to classify CIFAR 10 images. A subset of 2500 predictions were used and the top 5 predictions for each class were observed. These predictions are shown below.

```
 ####### Top 5 predictions for class airplane #######
               counts
moving_van          7
rock_beauty         4
thresher            4
assault_rifle       4
chain_saw           4


 ####### Top 5 predictions for class automobile #######
                counts
moving_van         260
thresher            48
chain_saw           41
amphibian           26
cassette_player     17


 ####### Top 5 predictions for class bird #######
                counts
fox_squirrel         10
three-toed_sloth      8
rock_beauty           5
patas                 3
bearskin              3


 ####### Top 5 predictions for class cat #######
                counts
EntleBucher          9
fox_squirrel         7
Japanese_spaniel     5
bearskin             5
Windsor_tie          4
```

```
 ####### Top 5 predictions for class deer #######
                counts
fox_squirrel         13
sorrel                5
barn_spider           5
cardoon               4
Japanese_spaniel      3


 ####### Top 5 predictions for class dog #######
                counts
Japanese_spaniel     33
Dandie_Dinmont       11
English_foxhound      9
EntleBucher           6
otterhound            6


 ####### Top 5 predictions for class frog #######
              counts
fox_squirrel      47
sidewinder        33
rock_python       29
cardoon           24
rock_beauty       17


 ####### Top 5 predictions for class horse #######
                            counts
sorrel                          83
thresher                        17
hartebeest                      12
black-and-tan_coonhound         10
German_short-haired_pointer      9
```

```
]                               counts
   sorrel                          83
   thresher                        17
   hartebeest                      12
   black-and-tan_coonhound         10
   German_short-haired_pointer      9


    ####### Top 5 predictions for class ship #######
                  counts
   speedboat           8
   moving_van          5
   yawl                4
   Madagascar_cat      2
   amphibian           2


    ####### Top 5 predictions for class truck #######
                 counts
   moving_van       332
   thresher         133
   chain_saw         25
   paddlewheel       19
   tobacco_shop      16
```

In the above predictions, “moving van” is the top prediction for classes “airplane”, “automobile” and “truck”. “Japanese spaniel” is the top prediction for class “dog”. “Sorrel”, which is a type of horse, was the top prediction for “horse”. “Speedboat” was the top prediction for “ship”. The other predictions are not as accurate / sensible.

2. We perform classification using GoogLeNet, DenseNet121 and InceptionV3, and compare their performance with MobileNetV2. We look at the top match for the classes in the table below. (The individual model predictions are in the output of the python notebook attached in the zip folder).

True class	MobileNetV2	GoogLeNet	DenseNet121	InceptionV3
airplane	moving_van	fox_squirrel	airliner	thresher
automobile	moving_van	moving_van	moving_van	moving_van
bird	fox_squirrel	fox_squirrel	fox_squirrel	fox_squirrel
cat	EntleBucher	fox_squirrel	fox_squirrel	EntleBucher
deer	fox_squirrel	fox_squirrel	fox_squirrel	fox_squirrel
dog	Japanese_spaniel	Japanese_spaniel	Japanese_spaniel	Japanese_spaniel
frog	fox_squirrel	fox_squirrel	fox_squirrel	fox_squirrel
horse	sorrel	sorrel	sorrel	sorrel
ship	speedboat	speedboat	speedboat	speedboat
truck	moving_van	moving_van	moving_van	moving_van

DenseNet121 is the best performing model among the ones in the table. It correctly predicted “airliner” for the “airplane” datapoints which none of the other models could predict. The models predict the same class for almost all the classes in the dataset.

MobileNetV3 was also used for classification but it predicted “can opener” and “safety pin” for airplane, which is completely unrelated.