Big Data Lab - Lab 8

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1)

The CIFAR10 dataset was downloaded from here. The pickle files corresponding to all batches were unpickled and the training and test images were stored to the path having the structure *datasetname/train/classname/* and *datasetname/test/classname/* resp..

Mobilnet v2 model, which was pretrained on ImageNet, was used to predict on CIFAR10 dataset. The predictions are 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
```

As CIFAR10 dataset has different label names than that of ImageNet, the predicted labels don't exactly match with the true labels. Since CIFAR10 dataset consists of low-resolution version of some of the common classes in ImageNet dataset, we can still try to make out if a model trained on ImageNet dataset does good or bad on CIFAR10 dataset by comparing the predicted and true labels. We can collect a subset of 2500 predictions and see the top 5 predictions for each true label.

####### Top 5 predictions for class airplane #######

	counts
moving_van	7
assault_rifle	4
chain_saw	4
rock_beauty	4
thresher	4

####### Top 5 predictions for class automobile #######

	counts
moving_van	244
thresher	47
chain_saw	41
amphibian	25
cassette_player	15

####### Top 5 predictions for class bird #######

	counts
fox_squirrel	10
three-toed_sloth	8
rock_beauty	5
bearskin	3
patas	3

####### Top 5 predictions for class cat #######

	counts
EntleBucher	10
fox_squirrel	7
bearskin	5
Japanese_spaniel	5
rock_beauty	4

####### Top 5 predictions for class deer #######

	counts
fox_squirrel	13
barn_spider	5
sorrel	5
cardoon	4
German_short-haired_pointer	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	51
sidewinder	35
rock_python	30
cardoon	24
rock_beauty	17

####### Top 5 predictions for class horse #######

	counts
sorrel	86
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
milk_can	2

####### Top 5 predictions for class truck #######

	counts
moving_van	332
thresher	133
chain_saw	25
paddlewheel	19
tobacco_shop	16

As we can see from the above results, truck, automobile and airplane has moving van as the top prediction. Ship has speedboat as top prediction. Dog has its top predictor as Japanese Spaniel. Horse was predicted as sorrel which was also one breed of horse. On the other hand, cat was being matched with a breed of dog. The predictions for other classes do not really make sense.

2)

For comparison, we do predictions using ResNet50, DenseNet121 and VGG19. Instead of fetching the top 5 predictions like we did in q1, we look only at the top match. Refer the table below:

True class\model	Mobilenet v2	ResNet50	DenseNet121	VGG19
Airplane	moving_van	letter_opener	moving_van	chain_saw
automobile	moving_van	moving_van	moving_van	moving_van
Bird	fox_squirrel	Limpkin	fox_squirrel	fox_squirrel
Cat	EntleBucher	fox_squirrel	fox_squirrel	fox_squirrel
Deer	fox_squirrel	fox_squirrel	fox_squirrel	fox_squirrel
Dog	Japanese_spaniel	Japanese_spaniel	Japanese_spaniel	Japanese_spaniel
Frog	fox_squirrel	tailed_frog	fox_squirrel	fox_squirrel
Horse	sorrel	sorrel	sorrel	sorrel
Ship	speedboat	speedboat	speedboat	speedboat
Truck	moving_van	moving_van	moving_van	moving_van

From the table above, ResNet50 seems to be the better performing model for the following reasons:

- Bird and Frog classes were correctly predicted in ResNet50 whereas other models could not predict it. Note that Limpkin belongs to bird.
- Airplane was predicted as `letter_opener` in ResNet50 owing to similar structure of both the objects.
- With respect to other classes, the predictions were more or less the same with ResNet50 and other models.

As bird and frog classes turned out to be proxy for a tiebreaker, ResNet50 is the better performing model.