

## CIFAR 10 – Detector Tutorial

So the purpose of this tutorial is to get you working on code yourself with something to start with. You should build practical experience with python and TensorFlow and show some understanding of the framework used in Neural Networks. Once you have completed this I am going to send you a few papers to review and I think we can get going on the first project after that.

Cifar-10 is a data set of images, each containing one of ten objects in it, it will be your goal to write a detector that takes the image as an input and outputs the correct label. Here is a link to the dataset: <https://www.cs.toronto.edu/~kriz/cifar.html>.

I have put together a framework for a image classification detector. Instead of using an ipython notebook, you will be using a simple .py code file. You can edit this in whatever word processor or IDE you would like. I use notepad ++. What I want you to do is:

- Successfully train the existing detector
- The code has been very lightly commented, please fully comment the code to show understanding
- Modify the model to achieve at least a test accuracy of 60%
- Add in code to save and restore a model
- Add in code to track the progress of the training using Tensorboard
- Write a new python script that:
  - Takes a directory of an existing image of any size
  - formats the image to be read in by a previously trained cifar-10 detector
  - makes a classification of the image
  - outputs the image with the classification written out on the image

I'd like you to answer the following questions:

- 1) What is one hot encoding?
- 2) What is the purpose of the optimizer? This model currently uses Stochastic Gradient Descent, what is that and are there any other options?
- 3) Briefly describe what the following do:
  1. Fully Connected Layer
  2. Convolutional Layer
  3. Activation Function
- 4) What is the loss function and what is it's purpose?
- 5) What did you do to improve the network and what are some ideas to improve it further?

To use the python script you can use a docker image I have created for our use. Use the docker command:

```
docker run -it -v directory/with/python/script:/notebooks krebbet/ml
```

The terminal will now be a portal into the docker container. To run the detector navigate to the directory with the python script *cifar10-detector.py* and execute the command

## **python cifar10-detector.py**

Additionally I have included a python tutorial document, use this as you see fit. It goes through the basic structures in the language and may prove useful to go through. While you are going through this remember you need to build a practical understanding of these tools you need to be able to review papers and implement methods well enough to understand there practical application. A lot of this stuff I imagine is brand new so when ever you need some guidance please contact me.