Assignment 4: Neural Networks

Please submit a .zip file named <your name>.zip containing 1) report named report.pdf including your answers to all required questions with images and/or plots showing your results, and 2) the python notebook with the cells run and the relevant source code. If you include other source code for a given exercise, please indicate it in the report.

CIFAR 10 classification:

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. The dataset is divided into five training batches and one test batch, each with 10000 images. Consider 4 training batches as training set (40000 images), 1 training batch (10000 images) as validation.

(a) Download the dataset (https://www.cs.toronto.edu/~kriz/cifar.html).

(b) Use one of the deep learning frameworks (Pytorch, Tensorflow, Keras, others upon approval) and the AlexNet pretrained model, to classify the images in the CIFAR10 dataset. Construct a confusion matrix that relates the CIFAR10 classes with the 10 most frequent classes from ImageNet predicted by the model (**30 points**).

(c) Use one of deep learning frameworks (Pytorch, Tensorflow, Keras) and the AlexNet pretrained model to extract features for all the images in the CIFAR10 dataset. Use the output of the 'fc6' layer. Train a linear classifier (logistic regression or linear svm) and evaluate it, using the train, validation and test partitions suggested for the dataset (**30 points**).

(d) Repeat the previous step, but this time using as features the output of the 'fc7' layer. Compare and discuss (**40 points**).