

Advanced Topics in Machine Learning

Assignment # 1

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Due date: 14/03/2017

In this assignment you need to upload a zip file to ILIAS which includes: 1) assignment1.lua file and 2) a pdf of your answers to the questions (see next page). The zip file name must be FirstName_LastName.zip. If your implementation requires auxiliary functions, you must implement that function inside the corresponding .lua file. We prefer pdf format (over docx) because it is universally supported on all platforms. Please also indicate your name on top of the first page in your pdf submission. Please do not print or display anything in the code (comment it out before submission).

Maximum grade: 4 Points

The goal is to classify images into two possible classes: **person** and **non-person**. After extracting the uploaded directory you will have the following files:

- **train/pos**: includes 2000 person images for training
- **train/neg**: includes 2000 non-person images for training
- **test/pos**: includes 2000 person images for testing
- **test/neg**: includes 2000 non-person images for testing
- **train.h5** : includes features of the training set extracted from a pre-trained CNN. The first 2000 features contain features of the images in train/pos and the last 2000 features contain features of the images in train/neg. Each feature is a 4096-dimensional vector.
- **test.h5** : includes features of the test set extracted from a pre-trained CNN. The first 2000 features contain features of the images in test/pos and the last 2000 features contain features of the images in test/neg. Each feature is a 4096-dimensional vector.
- **assignment1.lua**: is a .lua script that reads features from train.h5 and test.h5 (you do not need to extract features). It also has the body of the function *logistic_sgd*. Your implementation will go in this file.

First, run the script. If all packages are installed, you should get the following message: *average precision: 50.01* (if you have not installed hdf5 package follow this link for installation: <https://github.com/deepmind/torch-hdf5/blob/master/doc/usage.md>). It also generates *precision_recall.png* which is the precision recall plot of your classifier.

Questions:

- **[1 point]** Write the objective function and update rule of stochastic logistic regression.
- **[2 points]** Implement the *logistic_sgd* function inside assignment1.lua. If your implementation is correct, your average precision should be around 90% and you should also get a plausible precision-recall plot.
- **[1 point]** Change *logistic_sgd* so that the script generates the receiver operating characteristic (ROC) curve in *roc.png*.