

Assignment for Image Classification .

Computer Vision Course.

In this practical exercise you will solve two image classification problems using deep models.

The goals of this assignment are:

- Develop proficiency in using Keras for training neural nets (NNs).
- Put in practice general Machine Learning knowledge to optimize the parameters and architecture of a dense feed-forward neural net (ffNN), in the context of a computer vision problem.
- Use NNs specially conceived for analysing images. Design and optimize the parameters of a Convolutional Neural Net (cNN).
- Improve the performance of a NN by regularizing and processing the data through the nets.

A) Dense feed forward model

Design and train a ffNN that solves the Traffic Signal and Cifar-10 classification problems. As a starting point in this project you can use the models provided in the materials for the course. You have to improve the results provided in the initial net configuration files. To this end you must decide on:

- Number of layers and number of units in each layer.
- Optimization algorithm and parameters to train the network
- Check the evolution of these parameters during the optimization and decide when to stop training.
- Regularize and pre-process the data through the net. Use any combination of regularization or data processing procedures to improve the performance of your dense ffNN.

At this point you are not allowed to use convolutional layers.

B) Convolutional model

Here we experiment with cNNs, a special type of NN conceived for analysing images. Now you are allowed to use also convolutional layers to design a new model that beats previous classification results.

C) Report

Write a report describing

- the problems and data sets (briefly);
- final network architectures and final performance (accuracy and loss) obtained with all four models (ffNN, cNN for both data sets) on the train and test data sets;
- plots of the evolution of costs and classification performance on both data sets for each architecture;
- the process that you have followed to reach your final solution;
- discuss and compare your results on both data sets.

In your report you may also comment on other experiments that you have made during this project related to other aspects of Deep Learning discussed in class. It would also be very valuable your feedback on the use of *Google Cloud* and *Google Colab* services.

Your report should be submitted by **Monday, January 11th, 2021, 23:55**. In your submission include the Jupyter Notebook source file and the pdf version with the results.