

In this homework, you are invited to solve an image classification problem at your choice, following the requirements provided below.

Requirements on the problem:

The problem must be an image classification problem. Additional problems (such as segmentation, bounding boxes, etc.) are allowed as long as there is a base image classification problem.

Requirements on the dataset:

You can choose any dataset or subset of a data set with the following features:

- At least 10 classes
- At least 150 images per class
- Excluded educational datasets (e.g., the ones seen in the ML exercises: \*-MNIST, CIFAR, ...)

Requirements on methodology and results:

Solve the problem using 2 different approaches. By approaches, we mean architectures, optimizers, regularizations, pre-processing, etc., not just different values of the hyperparameters.

Using existing models is allowed (some modification of such models is suggested).

Using pre-trained models + fine tuning is allowed provided that: 1) the dataset you use for the homework is not a subset or too similar to the one used for pre-training, 2) there is a significant difference of performance between pre-trained model before fine tuning and after fine tuning.

Report analysis of fundamental metrics, such as accuracy, f1, precision, recall, AUC and others (if appropriate for the chosen problem). Screenshots of the output of some model is not sufficient. You must elaborate the results providing better visualizations and specific comments.

Conduct an analysis of at least one hyperparameter in relation to the chosen metrics.

In practice, you have to define two different approaches, train them with different hyperparameters, compare them (performance vs hyperparameter), and discuss the results.

The output of the assignment should be:

- 1) A report (PDF file of about 10 pages, with your name and matricola code) describing the implemented solution: which dataset has been chosen, how data have been preprocessed, which model/method/algorithm has been used, hyperparameter tuning, description of the evaluation method used, comparative results using appropriate metrics, and discussion about the results. Conclusions should discuss the comparative results. Computational training time can also be interesting to report and comment.
- 2) A ZIP file with the code you used in the project (not including the dataset)

Submit the files through this assignment (other submission methods, such as e-mail, will not be accepted). Make sure to turn the assignment in, otherwise it will not reach the teachers.

**NOTE: do not put the PDF report into the ZIP file!!!**

This assignment must be individual (i.e., one submission for each student) and original (i.e., not equal or too similar to other works either from other students in this class or from other sources). Evaluation will be based on the appropriateness and correctness of the described solution, regardless of the numeric results (as long as they are reasonable).

Deadline: 8/1/2023 11:59 PM CET