Deep Learning seminar
First deliverable:
Dense & Convolution networks

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1 Introduction

This document summarizes all the requirements for the first deliverable of the section: Deep Learning. This summary is divided into two sections, one for each block:

1. **Dense Networks**: $\frac{1}{3}$ deliverable mark.

2. **Convolutional Neural Networks**: $\frac{2}{3}$ deliverable mark.

Although both sections have different purposes, there are transversal requirements:

1. **Dataset**: 2 different datasets will be used, one for each section. Analyze the data is **mandatory** since understand and know the data we're using is **primordial** to work with any artificial intelligence model.

2. **Network architecture**: This datasets are commonly used for *benchmark* purposes by the research community. This means, there are different architectures and configurations converging to *good-result* solutions. Nevertheless, feel free (we encourage you) to play with all the parameters available (remember having a look to tensorflow.keras webpage) to compare and understand better the results from your models and why are they working (or not).

2 Dense Networks deliverable

For this section we'll be using the **wine dataset**. This dataset contains about 180 samples with over 10 different features to classify samples in 3 different classes.

2.1 Objective

The objectives for this section are defined below:

2.1.1 Analyze and prepare the data

Analyze the dataset as seen in the previous subjects of the MUDS and prepare the data (if needed) explaining your analysis and your decisions.

2.1.2 Building model

As per construction, this problem is very similar to the examples we've seen during the session. For this objective, two different models are required:

1. **Single neuron**

2. **Multi-laer perceptron/dense network**: Without restrictions, feel free to design your architecture.

2.1.3 Evaluate results

Explain your results and compare the different models. Which one is better, why is this result coherent (or not) and what could be done to improve the models.

3 Convolutional Neural Networks deliverable

For this section, feel free to use any of the below datasets:

1. **CIFAR10**: Reuse the dataset used on the last notebook seen in session 2.

2. **Vegetables dataset**: Kaggle dataset. Contains several types of vegetables.

3. **Chess dataset**: Kaggle dataset again, images in this case are all the chess figures.

4. **Flowers**: Following *vegetables* and *chess* but this time, we're classifying flowers.

All but CIFAR10 are uploaded in the folder Day-2. Although this datasets are recommended, feel free to use any dataset but will be necessary to give a brief explanation about it.

3.1 Objective

Here the objective is different: Since all datasets are **multiclass**, this time a **binary classification** is required.

3.1.1 Class selection

: Completely up to you. Explore the dataset and select two classes to build your **binary classifier**. Keep in mind that might be *easier* for the model to classify those classes that are **clearly differentiable** by humans. Anyway, explain which classes are selected and why.

3.1.2 Building model

: Completely up to you, taking into account that the *complexity* of the images to build a deeper model (or not), try to use this information in your favour.
Although is not mandatory, testing out several models (architectures, hyperparameters etc) is a good method to deeply understand your model behavior.

3.1.3 Evaluation

: Evaluate your results. Is a good result? is not? If so, why? Is there something you could do to improve the performance?

4 Doubts, questions

Do not hesitate to contact me with your doubts at: sergi.bernet@salle.url.edu.
The deadline for this deliverable is the 22/03/2022. Note you have **2 weekends**, don't wait until the end, there are more deliverables and handle all of them at the same is a lot of work to deal with.