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**:  deliverable mark.
2. **Convolutional Neural Networks**:  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-layer perceptron/dense network**: Without restrictions, feel free to design your architecture.

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#### 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.

Create 2 classes from one of these datasets.

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.

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