

# Aprendizagem Automática Avançada

## Project N° 1

### CIFAR-10

2º Semester 2021/2022

#### Work Objectives:

This work consists of binary and multi-class classification of images. The CIFAR-10 database will be used in this work. The report and code implemented must be in a Jupyter Notebook with the name A#####A#####\_T1.ipynb (A##### corresponds to the student numbers). When preparing the work, the following points should be taken into account:

- In the binary classification task, consider the examples of the “ship” class as positive examples and the images of the remaining classes as negative examples.
- In the binary classification task train, test and compare two classifiers of your choice.
- In the multi-class classification task, train and test a classifier of your choice.
- In both classification tasks verify if normalizing the data (data with zero mean and unit variance) is beneficial.
- Use training data to estimate the performance of classifiers and verify that the estimate matches the results obtained with the test data.
- In the multi-class classification task, verify if transforming the data with PCA is beneficial. Also estimate the proper number of principal components.

#### Dados:

CIFAR-10 is an image database consisting of 60000 images of  $32 \times 32$  pixels divided into 10 classes with 6000 images per class. The data is already divided into 50000 images for training and 10000 images for testing. This database can be downloaded through the Python module, TensorFlow/Keras using the following commands:

```
import tensorflow.keras as keras
cifar10=keras.datasets.cifar10
(Xtrain,ytrain),(Xtest,ytest)=cifar10.load_data()
```

**Preparation of the Report:** You should take into account several aspects inherent to a supervised learning project such as the training/test methodologies, the adjustment of hyperparameters of the classifiers, evaluation metrics, etc.

The Jupyter Notebook should be properly commented in order to clearly perceive the various stages of the work developed and the results obtained.