UNIVERSIDADE DA CORUÑA USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA Universidade Vigo

Deep Learning (Master's degree in AI)

Practice 1 - CNNs (2022-2023)

INSTRUCTIONS:

- **Deadline:** March 09, 16:00.
- **Objectives**
  - In this practice we will develop several convolutional network models to make predictions about the age an gender of an individual whose face appears in an image.
- **Dataset**
  - We will use a training dataset containing more than 100,000 face images, which is available through the following link (850MB): `https://udcgal.sharepoint.com/:u:/r/sites/MIA-VirtualRoom1/Documentos%20compartidos/DL%20-%20Deep%20Learning/Datasets/faces_dataset_train.zip?csf=1&web=1&e=tiaRic`
  - We will use a test dataset of 1000 images available through the following link (6,8MB): `https://udcgal.sharepoint.com/:u:/r/sites/MIA-VirtualRoom1/Documentos%20compartidos/DL%20-%20Deep%20Learning/Datasets/faces_dataset_test.zip?csf=1&web=1&e=bC3COP`
  - To convert the dataset into a format easier to process by a convolutional network we have developed two data loading notebooks (one for predicting gender and another for predicting age) that are available at your virtual campus. You can make the changes you consider appropriate in them.
- **Tasks to be carried out**
  1. **Develop a convolutional network to predict the gender of an individual whose face appears in an image**.
     - Use the training dataset to train the network and the test dataset as the validation set.
     - Try to develop the best possible model, avoiding underfitting and overfitting and regularizing the network if necessary.
     - The use of pre-trained networks, or networks already created in external libraries, is not allowed for this task. It will be the students' job to design and implement their networks.

2. **Develop a convolutional network to predict the age of an individual whose face appears in an image**.
    - This task must use the trained network obtained in the first task.
    - Students should choose the most appropriate strategy for using such a pretrained model: feature extraction or fine-tuning.

- **Submission**
    - The exercises will be developed using Jupyter Notebooks.
    - Create a notebook for each task above mentioned and put them together in a ZIP file for submission.
    - **Each notebook should include**:
        - The practice can be carried out alone or in pairs, so the first cell of the notebook must be the full names of the authors.
        - The code for each of the models developed should be included and it should be a complete ML process: data loading and manipulation, network creation, training and results.
        - The notebook will be saved with the results of its execution included.
        - The code shall be accompanied by cells with an explanatory report containing a description of the process followed, detailing the problems encountered and justifying the decisions taken. It should also include a section on results and discussion of them.
    - **Submission process**
        - The exercises will be submitted using the virtual campus of each university:
            - Universidade da Coruña: `https://campusvirtual.udc.gal/`
            - Universidade de Vigo: `https://moovi.uvigo.gal/`
            - Universidade de Santiago de Compostela: `https://cv.usc.es/`
        - Each member of the practice group must submit the notebook in their corresponding Moodle task.
        - There is a strict deadline for each assignment. Past due submissions will be rejected.

- **Evaluation criteria**
    - Quality of the predictions made. Take as a reference:
        - An accuracy close to 0.9 in predicting gender in the validation set.
        - A Mean Absolute Error (MAE) of less than 10 years in age prediction in the validation set.
    - Quality of the design.
        - The network design follows the recommendations on how to create convolutional networks.
        - The regularization measures proposed are appropriate.
    - Quality of explanations:
        - The process is adequately detailed and the decisions made are justified.
        - The results are commented and interpreted correctly.