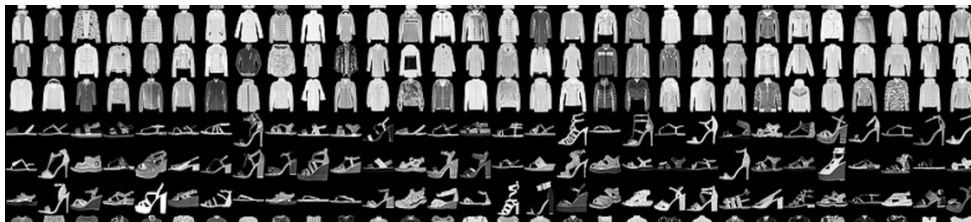# Machine Learning

Practical Sheet 4: Supervised Classification

1. [**MLPs**] Fashion-MNIST is a dataset of Zalando's article images—consisting of a training set of 60,000 examples and a test set of 10,000 examples.

   Data are provided in "csv" format, with one row per image. Each image has 28 pixels in height and 28 pixels in width, for a total of 784 pixels in total. Each pixel has a single pixel-value associated with it, indicating the lightness or darkness of that pixel, with higher numbers meaning darker. This pixel-value is an integer between 0 and 255. The training and test data sets have 785 columns. The first column consists of the class labels (see above), and represents the article of clothing. The rest of the columns contain the pixel-values of the associated image.

   Implement a "mlp_classification.py" Python + Keras script that contains a model (simple feed forward neural network), able to distinguish between the 10 classes in this dataset.

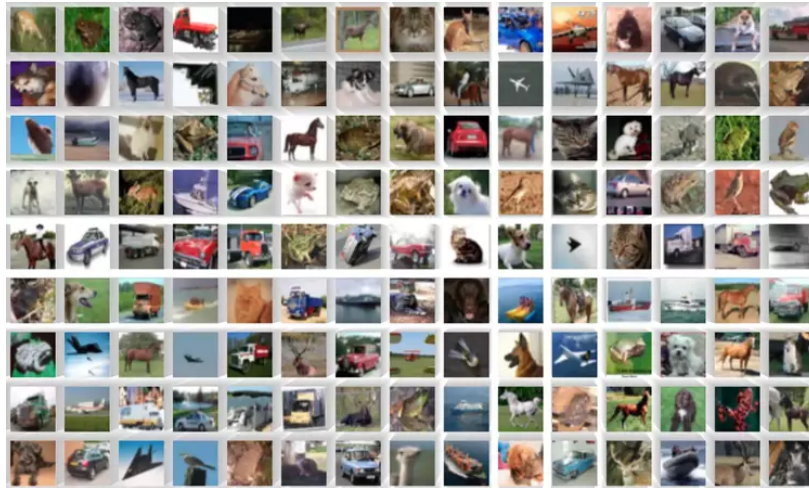   For each instance in the dataset, use the "fashionmnist_feature_extraction.py" functions, available in the course web page, to obtain a set of handcrafted features that will feed the classification module.

   Nest, the function that creates the network receives as parameter the topology of the desired model (e.g., "53" refers to a network with 3 layers:

   - 5 neurons in the input layer
   - 3 neurons in a hidden layer
   - (and 10 neurons in the output layer, which will correspond to the number of classes)

2. [**CNNs**] Consider the "CIFAR-10" dataset, (in "png" format) available at the course web page, stored in "zip" format. The dataset is divided into two main folders:

   - "train": for parameter and hyper-parameter learning purposes;

- "test": for performance evaluation

Inside each folder, there are 10 sub-folders, each one regarding the instances of the 10 classes in this set:

Images are stored in "png" format, and have 32 x 32 resolution.

Implement a "cnn_classification.py" Python + Keras script that contains a model (simple feed forward neural network), able to distinguish between the 10 classes in this dataset.