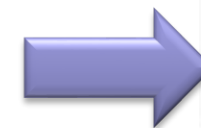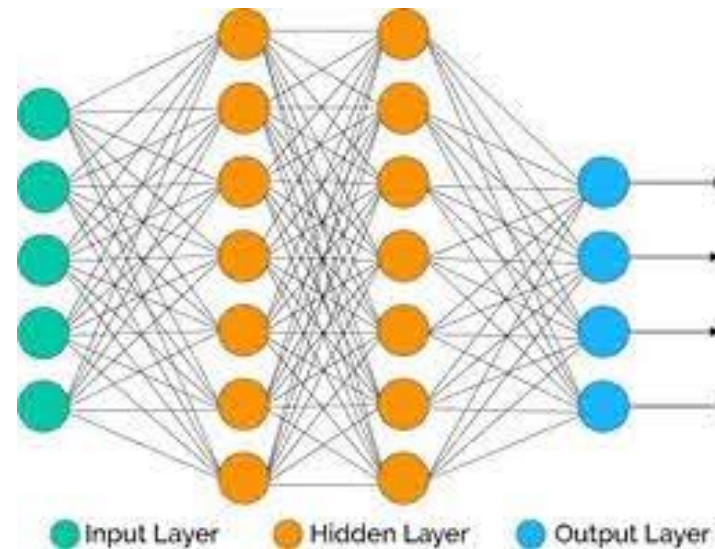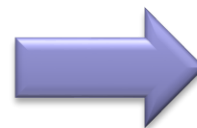# LAB 3: Image Classification with Neural Networks

Machine Learning 2022

(P. Zanuttigh – ICT+Physics of Data)

Image Classification with Neural Networks

Task to be solved:

Classification of clothes images using Neural Networks

The Fashion-MNIST Dataset

- Small images of clothes' items from Zalando web store

- 70'000 samples (7'000 for each class)

- Each sample is a 28x28 grayscale image (784 values)

- Divided into 60'000 for training and 10'000 for testing

- Classified into 10 classes corresponding to 10 different types of clotes

- Recent deep learning schemes can reach an accuracy of 99%

- Expect an accuracy around 80% for a «baseline» NN classification

T_shirt

Trouser

Pullover

Dress

Coat

Sandal

Shirt

Sneaker

Bag

Ankle boot

Classification of Clothes Images

- Dataset of small pictures of clothes: multi-class classification
- Use Neural Networks
- Try different network architectures (e.g., change number of neurons and layers)
  - □ Not always the largest is the best, specially if training data is limited
- See the impact of batch size and learning rate
  - □ From SGD to mini-batches to standard GD
  - □ SGD with single sample batch is very unstable
  - □ Learning rate: controls speed of convergence vs stability trade-off
- Try with smaller or larger amount of training data
- Plot the estimated weights (can be difficult to see what has been learned)

Your Task

- ❑ Complete the jupyter notebook
    - ▪ FIRST THING TO DO: you need to put your name and ID number in the notebook
    - ▪ You can use the ID also as seed for random number generators, try different seeds
    - ▪ The notebook has missing code: need to fill in what is missing
    - ▪ You must write the answer to all the questions in the notebook
    - ▪ But do not change the structure or the input data files, they will not be submitted
- ❑ Check that the notebook run properly from the beginning with the provided data
    - ➢ use the "restart kernel&run all" command
- ❑ Save them as `surname_name_lab3.ipynb`
- ❑ Submit on elearning

Timeline

- Release: 6/12
- Lab 3 : 16/12 h16,30 in rooms Te,Ue
- Delivery deadline: 29/12