Neural Networks and Deep Learning

Cracow University of Technology

Lab Assignment 9:

Task 1: Image classification with Convolutional Neural Networks

In this laboratory, Fashion MNIST dataset is used for training the model. This dataset consists of a training set of 60,000 images and a test set of 10,000 images of 10 fashion categories. It was proposed as more challenging replacement for the MNIST.

The classes are:

Label	Description
0	T-shirt/top
1	Trouser
2	Pullover
3	Dress
4	Coat
5	Sandal
6	Shirt
7	Sneaker
8	Bag
9	Ankle boot

You can access the Fashion MNIST dataset using the Keras.

So:

- First load fashion MNIST dataset
- Check the shape of the dataset

- Visualize first 10 train data points
- Reshape the images from (60000, 28, 28) → (60000, 28, 28, 1)
- Normalize from [0,255] to [0,1]
    - Simple function: pixel = pixel / 255
- Build CNN-based classifier with the following architecture:

  Convolutional layers:

    - Convolutional layer: kernel size: 2×2, 64 kernels, "same" padding, ReLU activation
    - Max pooling layer with pool size = 2, and stride = 2
    - Convolutional layer: kernel size: 2×2, 32 kernels, "same" padding, ReLU activation
    - Max pooling layer with pool size = 2, and stride = 2
    - Flatten layer
    - Dense layer with 256 neurons and ReLU activation
    - Last dense layer with softmax activation

- Train Classifier
- And finally apply the classifier on unseen data and print result

Task 2: Implementing a max-pooling layer.

Define a function that takes as parameter a 2 dimensional image, the filter or pool size, stride size, and two different options as max pooling and average pooling and outputs the pooling layer.

Test and show the result on a simple numpy array and also on a real image.