Assignment 2: Convolutional Networks

Due date: **02.04.2020 - 23:59**
Total: 2 points.

For this homework you will design and train a convolutional network capable of counting the digits in an image. You will get a dataset of 5000 training images and 1000 testing images, each of size 100x100. These images are formed by placing N (1 to 5) digits from the MNIST dataset (28x28 digits) onto a noisy background. The goal is to predict the number of digits in the image.

The dataset is found in the course Google Drive folder in mnist_count_test.pickle and Mnist_count_train.pickle. You can use the code in Convolutions Lab as a starting point for the homework.

You must implement two methods for this task:

Method 1: Without training on the counting dataset.

Just use a model trained to classify images on MNIST dataset. Use this model in a sliding window approach, by splitting the large image into smaller 28x28 patches or convert the model into a fully convolutional network to predict maps representing the probability of digits being present at that location. Without additional training, use these maps to predict the number of digits in the image.

- Compute the accuracy on the testing set.

Method 2: Train a new convolutional network to predict the number of digits.

Design a new convolutional network to directly predict the number of digits. Your task is to investigate the best network architecture for this task and the appropriate loss function (mean square error or cross-entropy).

- Plot the loss and accuracy on the test set after each epoch of training.