Deep Learning Programming Exercise № 1

DM873 / DS809, Fall 2022 21/09/2022

To do these exercises, you will use Python 3 and the following packages:

- TensorFlow. The used backend used for Keras.
- Keras. Good front-end package for easier integration of neural networks.
- Matplotlib. This package allows you to graph your data and data transformations.

These can all be installed using pip, the python package manager. You are not strictly forced to use these packages, but it is highly recommended. Feel free to use other packages you think are necessary.

Installations

Run the following commands on terminal if not installed;

Listing 1: Installations of required Python packages

```
1 pip install tensorflow
2 pip install matplotlib
```

Problem

Make a simple neural network using Keras. The goal of this exercise is to look at the MNIST dataset, and tell what numbers are written. Create a model with 3 fully connected hidden layers, and a 10 unit output layer.

Listing 2: Load MNIST dataset.

```
import numpy as np
from keras.datasets import mnist
from keras.utils import to_categorical
import matplotlib.pyplot as plt
# Loads the data
(train_data, train_labels), (test_data, test_labels) = mnist.load_data()
# Plots a single digit from the data
plt.imshow(train_data[1])
plt.show()
# Reshapes the data to work in a FFN
train_data = train_data.reshape((60000, 28*28))
test_data = test_data.reshape((10000, 28*28))
num_classes = len(np.unique(train_labels))
train_labels = to_categorical(train_labels, num_classes)
test_labels = to_categorical(test_labels, num_classes)
```

What to do?

- Consider what activation function you want to use for the output layer.
- Report your accuracy, is this satisfactory? Why / why not?
- Plot the learning history from the history element.