SDU

Deep Learning Summer Course - Exercise 1

Summer 2022
Tuesday 9-8-2022

To do these exercises, you will use Python with 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.

- Seaborn. This extends MatplotLib with new plots.

You are not strictly forced to use these packages, but it is highly recommended. Feel free to use other packages you think are necessary.
We will go through your results of this exercise on Wednesday 10-8-2022, so you are expected to have completed them.
Question or comments: Tobias Greisager Rehfeldt

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.

Load the dataset by:

```python
from tensorflow.keras.datasets import mnist
from tensorflow.keras.utils import to_categorical
import seaborn as sns
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
sns.heatmap(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 = 10
train_labels = to_categorical(train_labels, num_classes)
test_labels = to_categorical(test_labels, num_classes)
```

a. Consider what activation function you want to use for the output layer.

b. Report your accuracy, is this satisfactory? Why / why not?

c. Plot the learning history from the history element.