SDU

Deep Learning Summer Course - Exercise 0

Summer 2023
Monday 7-8-2023

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

- [NumPy](#). This is often a good package to use, in order to create various data transformation / generate data.

- [Pandas](#). With this package you can import your data into a data frame similar to how it's done in R.

- [Matplotlib](#). This package allows you to graph your data and data transformations.

- [PyTorch](#). This package is a versatile deep learning framework that facilitates building and training of neural networks.

- [Seaborn](#). This package is built on top of Matplotlib, providing a high-level interface for creating informative and aesthetically appealing statistical graphics in Python.

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0. Download and install [Python](#)

Python can be coded in any text editor, but an [IDE](#) can help make the development easier. Use what ever works for you!
Using [pip](#) (Which comes with python), install the following packages:

      i.   numpy
      ii.   pandas
      iii.   matplotlib
      iv.   torch
      v.   torchvision
      vi.   seaborn

1. [NumPy](#)
   a. Import NumPy in a python script.

```python
a = np.full((2, 3), 4)
b = np.array([[1, 2, 3], [4, 5, 6]])
c = np.eye(2, 3)
d = a + b + c
```

   b. Think about which values are in the NumPy array 'd', then verify if you were correct.

```python
a = np.array([[1,2,3,4,5],
              [5,4,3,2,1],
              [6,7,8,9,0],
              [0,9,8,7,6]])
```

   c. Sum the rows of 'a'.
   d. Get the transpose of 'a'.

2. [Pandas](#)
   a. Import pandas.

b. Read the file 'auto.csv'.

c. Remove all rows with 'mpg' lower than 16.

d. Get the first 7 rows of the columns' weights' and 'acceleration'.

e. Remove the rows in the 'horsepower' column that has the value '?', and convert the column to an 'int' type instead of a 'string'.

f. Calculate the averages of every column, except for 'name'.

3. Matplotlib

a. Import Matplotlib

```
a = np.array([1,1,2,3,5,8,13,21,34])
b = np.array([1,8,28,56,70,56,28,8,1])
```

b. Make a plot with two lines, using 'a' and 'b'. Name the first axis 'epochs' and the 2nd axis 'accuracy'. Call the line made from 'a' for 'training accuracy' and the line made from 'b' for 'validation accuracy'. Title the plot 'Training and validation accuracy' and show the plot.

4. PyTorch

a. Import Pytorch

b. Create two random matrices using PyTorch's (**torch.rand**) of size (3x3).

c. Multiply the two matrices using PyTorch's matrix multiplication function (**torch.matmul**).