Python Programming Assignments

Requirements

These assignments have been tested and developed using the following libraries:

- python==3.6.4
- numpy==1.13.3
- scipy==1.0.0
- matplotlib==2.1.2
- jupyter==1.0.0
- jupyter-client==5.0.1

We recommend using at least these versions of the required libraries or later. Python 2 is not supported.

Python Installation

We highly recommend using anaconda for installing python. Click here to go to Anaconda's download page. Make sure to download Python 3.8 version. If you are on a windows machine:

- Open the executable after download is complete and follow instructions.
- Once installation is complete, open Anaconda prompt from the start menu. This will open a terminal with python enabled.

If you are on a linux machine:

- Open a terminal and navigate to the directory where Anaconda was downloaded.
- Change the permission to the downloaded file so that it can be executed. So, if the downloaded file name is *Anaconda3-2021.05-Linux-x86_64.sh*, then use the following command:

```
chmod a+x Anaconda3-2021.05-Linux-x86_64.sh
```

- Now, run the installation script using:

```
./ Anaconda3-2021.05-Linux-x86_64.sh
```

and follow installation instructions in the terminal.

Create environment

Once you have installed python, create a new python environment will all the requirements using the following command:

```
conda env create -f environment.yml
```

After the new environment is setup, activate it using (windows):

```
activate machine_learning
```

or if you are on a linux machine:

```
source activate machine_learning
```

Now we have our python environment all set up, we can start working on the assignments. To do so, navigate to the directory where the assignments were installed, and launch the jupyter notebook from the terminal using the command:

```
jupyter notebook
```

This should automatically open a tab in the default browser. To start with assignment 1, open the notebook ./Exercise1/exercise1.ipynb.

Python Tutorials

If you are new to python and to `jupyter` notebooks, no worries! There is a plethora of tutorials and documentation to get you started. Here are a few links which might be of help:

- [Laboratory 00]: Class's introduction in Python
- [Python Programming]: A tutorial with videos about the basics of python.
- [Numpy and matplotlib tutorial]: We will be using numpy extensively for matrix and vector operations. This is great tutorial to get you started with using numpy and matplotlib for plotting.
- [Jupyter notebook](): Getting started with the jupyter notebook.

Caveats and tips

- In many of the exercises, the regularization parameter λ is denoted as the variable name `lambda_`, notice the underscore at the end of the name. This is because `lambda` is a reserved python keyword, and should never be used as a variable name.
- In `numpy`, the function `dot` is used to perform matrix multiplication. The operation '*' only does element-by-element multiplication (unlike MATLAB). If you are using python version 3.5+, the operator '@' is the new matrix multiplication, and it is equivalent to the `dot` function.