

Upload Date:	[Moodle Assignments]	March 14th, 2023
Hand-In Deadline:	[Moodle Assignments]	March 21th, 2023, 23:59:59
Correction Session:	[VU class]	March 22th, 2023

NOTE 1: This assignment can be started in the first practical lecture to familiarize yourself with the environment used in the following assignments. Please upload the files as Jupyter Notebooks, following the naming convention in Moodle before the next session and tick your solved exercises.

0.Jupyter Notebook. In the Anaconda Prompt, activate your environment, then run:

```
> jupyter notebook
```

- Create a new Jupyter Notebook in your working directory. Select your Python 3.8 Environment as your Kernel.
- Check whether you can import some of the basic packages you installed (for example: `numpy`, `matplotlib`).
- Using `numpy` and `matplotlib.pyplot`, create a plot of $\cos(x)$ for $x \in [0; 2\pi]$ and choose green as a line color.
- Using `matplotlib.pyplot`, create a scatterplot of some random data.

Hint: You can use `dir([LIBRARY])` to get information about the members of a given library, and `?[FUNCTION]` to see the documentation of a given function. You can also call the documentation of a function by moving the cursor over the function and repeatedly pressing **SHIFT+TAB**.

NOTE: Jupyter Notebook sometimes malfunctions when certain Antivirus software is running in the background. If you experience any issues, check this first.

- 1 **Python syntax and plot types. (4P)** In a jupyter notebook generate 4 subplots on a 2x2 grid with the following properties:

- A histogram of 1000 Gaussian random numbers, with x-axis limits between -5 and +5.
- A scatterplot of noisy data that should be arranged around a line of slope 1.
- A barplot of categories "A" to "Z" at every other letter, and the height of each bar should correspond to the position of each letter in the alphabet.
- A normal plot of $\cos(x)$, $\sin(x)$ and $\cos(x) - \sin(x)$ in $[-\pi; +\pi]$.

Do not forget to label the axis.

- 2 **Plotting "real" data. (8P)** Download the file `ex2_grades.dat` from Moodle. You should perform the following tasks:

- Read in the data in the file `ex2_grades.dat` using `numpy`.
- Create a histogram of grades with the following key: $< 60\% = 5, 60.00\% - 69.99\% = 4, 70.00\% - 79.99\% = 3, 80.00\% - 89.99\% = 2, 90.00\% - 100.00\% = 1$.
- Find and print the 5 best students, their scores, and their grades.
- Compute and print the lowest, highest and average scores and add this information to the histogram figure.

3 **Plotting and filtering. (6P)** Download the file `ex3_co2.dat` ¹ from Moodle. You should perform the following tasks:

- Read in the data file.
- Compute the total CO₂ emission of each country/region from 1950 onwards and create a barplot comparing some countries/regions.
- Show the development from 1950 onwards for the top countries/regions.

¹<https://www.kaggle.com/yoannboyere/co2-ghg-emissionsdata>