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# Python Course - Practical Class 2:

## Scientific Libraries and Data Manipulation

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### Exercise #1 - Querying Databases

Consider the star Helvetios:

- How many  $mag_V < 6$  stars can you find within 1 degree of the star?
- How many of these stars are of the  $G$  spectral type?
- are there any ESPRESSO@VLT observations of Helvetios in 2019?

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### Exercise #2 - Data fitting

Consider the data from file `class2_prat_data.txt`. Using the Numpy/Scipy libraries: → load the data from the file and assign the first column to an array  $X$  and the second to an array  $Y$ . → fit a linear function to the data. → fit a quadratic function to the data. → fit a sinusoidal function to the data. → which function fits better the data? (you can plot the data and the fits, see below)

TIP: to make scatter plot of a  $(X,Y)$  data set, you can use:

```
import matplotlib.pyplot as plt
plt.plot(X,Y,'k',color= color, marker = marker)
```

where 'color' represents the color of the marker symbol and marker the symbol to be used ('o' for a circle; '.' for a point)

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### Exercise # 3 - Array/Matrix operations

→ Create an array  $A$  with  $4 \times 4$  elements, and shuffle its values. → Create an array  $B$  with  $2 \times 4$  elements, with all values set to one. → Create an array  $C$  with  $4 \times 2$  elements, with arbitrary values and transpose it. → Concatenate array  $B$  with the transposed of  $C$  into array  $D$ . → Compute the cross-product of array  $D$  with array  $A$  and store it into array  $E$ . → Calculate the median, mean and standard deviation values of array  $E$