

Exercises for Practical #0

In this practical you will start to play with vectors and matrices.

1. Create a numpy array which contains the current date in the form `[DD, MM, YY]`.
2. Create a numpy array of integers from 1 to 100. For the vector you've just created, compute the:
 - (a) Minimum
 - (b) Maximum
 - (c) Average
 - (d) Standard deviation
3. Construct a numpy array of the first ten powers of 2. What is their sum? What is their average? (Hint: `help(np.logspace)`)
4. Multiply the 4th entry of the vector above by 10, and delete entries 5–8. What is the vector's average now?
5. Compute the 2 norm of `A = [1 2 3; 4 5 6; 7 8 9]`;
6. Compute the 2 norm of `[1 2 ... 100; ... ; 901 902 ... 1000]`;
7. What is the second entry in the solution of $(A + I)x = [1; 2; 3]$, where A is the 3×3 matrix from exercise 5?
8. What is the second entry in the solution of $(B + I)x = [1; 2; 3]$, where B is obtained from A by reversing the first row?
9. Construct a random vector of size 26 where each entry is a random character from the English alphabet. How many unique letters did you get? (Hint: Look at `string.ascii_lowercase`, `np.random.choice`, and `np.unique`)
10. On a single figure, plot $\sin(x)$, $\sin(x^2)$, and $\sin(x) + \sin(x^2)$ against x on the interval $[0, 10]$ in different `colors` and `linestyles` (see `help(plt.plot)`). Add a title, legends, and a grid to your figure.
11. Plot a semi-log plot of $\exp(-x^2)$ on the interval $[0, 5]$.
12. (Advanced) Plot the eigenvalues of a random 10×10 matrix. On a subplot, plot the eigenvectors. (Hint: check out `eig`.)