**SCIENTIFIC COMPUTING**

**Prof. Sebastián Roldán Vasco**

**MASTER IN AUTOMATION AND INDUSTRIAL CONTROL - 2024-1**

**DEADLINE: 5th April 2024**

**GRADED WORK:**

**• Written report in a Jupyter Notebook[[1]](#footnote-1) with:**

✴Short theoretical background with references

✴Brief description of the methodology

✴Results

✴Discussion and conclusions

**• Data, scripts and functions would be self-contained in the notebook**

**The work must be written entirely in English**

**GOAL:**

This lab aims to apply manipulation algorithms, i.e. filtering, sorting, indexing, denoising, amplification, labeling, segmentation, etc., to your own data, while analyzing the algorithm's complexity.

**ACTIVITY:**

1. (10%) The student must provide a whole or a part of the data that he/she will use for the thesis development. Data must be downloaded automatically from the cloud, e.g. a GitHub repository. Such data must be properly described theoretically, including the problem statement that the student wants to address in the thesis. In other words, the student must describe the database.
2. (20%) Choose a minimum of three algorithms to handle the data which implies the use of loops. Analyze the complexity of such algorithms and report.
3. (30%) Make modifications to the previous algorithms to reduce their complexity and improve performance. Describe the strategy(ies) you use and compute the new complexity. Implementation of code profiling is strongly recommended.
4. (25%) Choose three functions of your code. It could be the same as in the previous items. Describe such functions theoretically, e.g. show the formulae and explain them. Change the functional programming and rewrite the code using Objects-Oriented Programming. Compare the performance of both implementations.
5. (15%) Use a visualization library (for example Matplotlib) to illustrate your data previous and posterior to the application of algorithms. Explain the graphics you provide.

1. If you decide to work in Matlab against the course’s recommendation, you can use the live script option in MLX format. [↑](#footnote-ref-1)