

## Mini-Project Goals, Tasks, and Assignments

### Goals

Each mini-project proposes to examine in depth one of the statistical signal and data processing tools seen in class.

The goals of the mini project are:

- Implement one (or more) of the tools seen in class;
- Explore more advanced / specific tools related to the tools seen in class, via scientific literature and numerical implementation;
- Present the tools to the class with a demo and a performance comparison.

### Tasks

Such goals are achieved via specific tasks:

- Work as a team (everyone must contribute and be aware of every detail of the accomplished work);
- Implement the assigned tool seen in class (Python or Matlab);
- Test it on simulated and real data (real data will be provided);
- Submit a report on the test of the tool on simulated and real data (**Assignment #1**);
- Explore other advanced tools, not presented in class, outperforming the assigned tool (start from the suggested literature, and pursue the research of information on additional papers & books);
- Submit a report on the advanced tools (**Assignment #2**);
- Implement the new tools (Python or Matlab);
- Prepare a demo (on simulated and real data) comparing the tools;
- Prepare about 5 slides to present to your colleagues the tools, their comparison, a demo, and your conclusions.
- Submit the demo (with instructions), the presentation, and a final report (min 6 pages, max 10 page) on the mini-project (**Assignment #3**);

### Assignments

- **Assignment #1: Report on the test of the tool on simulated and real data**

The report presents the assigned tool and its advantages, disadvantages, and limitations, both in a theoretical as well as numerical way with examples using synthetic data (to show specific characteristics) and real one.

- **Assignment #2: Report on the advanced tools**

The report presents the advanced tool explored in the literature, their link to the tools seen in class, their theoretical foundations, as well their theoretical advantages, disadvantages, and limitations.

- **Assignment #3: Concluding submission of the mini-project**

**– Presentation**

It aims at simply and clearly present you mini-project to your colleagues. It is important to present advantages, disadvantages, and limitations of all examined tools, both in a theoretical and in a numerical way. Comparisons and conclusions are also demanded.

**– Demo**

The goal of the demo is to give a practical example of the tools, their advantages, disadvantages, and limitations, and their comparison.

**– Final report** (min 6 pages, max 10 page)

It is the concluding report, integrating the previous submitted reports and the results, comparison, and conclusions that will be presented to the class.

**Evaluation**

Like in every Research or Research & Development project, you have access to what has been already done by your predecessors. You are expect to understand what your predecessor has done and improve it by bringing some "innovation" (better solution, better explanation, better demo).

You will be evaluated on the specified tasks (and assignments), on the quality of problem solutions, on the quality of your implementation, on the quality of the presented demo & results.