Python for the Lab

Python for the Lab is our original workshop. We designed it to help scientists level up their skills in instrument control. The contents of the workshop are based on more than 10 years of hands-on experience working for different companies and research groups.

Workshops are fast paced, for small groups, and hands-on. Students are provided with a small instrument that works like an oscilloscope and a function generator. During the workshop, we cover all the steps required from communication to acquisition of data, to real time display of results.

Python for the Lab is designed for **4 to 8 participants**, it is held **on-premises**, and it takes **3-full days**. A certificate of completion is provided. Participants are required to have *some programming experience* and have been exposed to basic patterns such as for-loops or if-else conditionals.

Course Contents

Day 1

- Morning: We bring everyone up to speed on Python syntax, with special attention to object-oriented programming. We also discuss how to setup a development environment.
- Afternoon: We start exploring the instrument, learn about, serial communication, encoding and decoding of messages. We acquire the first data, and add support for real-world units using Pint.
- Take away: Insights on the importance of *planning* the program's architecture.

Day 2

- Morning: Introduction to the MVC design pattern. We see how importing packages works, and what abstraction means. Quick introduction to multithreading to ensure responsive programs.
- Afternoon: Introduction to PyQt. We build the first elements of a user interface. We also introduce the use of QtDesigner for speeding up styling and element layout. We face the challenges of a poorly designed Model and fix it.
- Take away: Designing a program is iterative, but few best practices can massively help speed up.

Day 3

- Morning: We start polishing details of the measurement. We see how to save data and metadata to ensure reproducibility. We start improving the user interface experience with the addition of threads.
- Afternoon: We add a second Model to understand the power of the MVC pattern. We create a signal monitor reusing the components of the previous user interface. We explore Qt documentation and discuss how to move forward.
- Take away: Proper software architecture helps not only speed up development, but also lowers the barrier to newcomers and helps with maintainability.

About the Instructor

Aquiles Carattino started developing Python programs to control the instruments in the lab where he did his PhD. He automated confocal microscopes, spectrometers, and built the electronics for signal conditioning and temperature control. After graduating, he started Python for the Lab as an attempt to spread the knowledge he had gained.

In 2019 he co-founded **Dispertech**, a company that specializes in nanoparticle characterization through optical techniques. The company leveraged Aquiles' expertise in software and hardware design to build and commercialize a prototype of the instrument in just over 6 months.

Besides Python workshops, Aquiles engages in mentoring sessions for (aspiring) entrepreneurs with a science background, gives talks at events, and supports companies with different consulting solutions.

Some companies and organizations that trusted us.
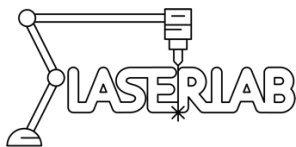
Amsterdam Laser Lab

What Students Say

💬 "It is a very nice and well-organized course. The contents are interesting and useful."

💬 "Gives a clear understanding of the communication between a computer and instruments. At the end of the course, I was very satisfied to write a python module to control a DAQ. And making the user interface was fun."

💬 "Excellent course, self-contained and, in my opinion, a great steppingstone to find your way to do instrumentation with Python. I loved the hands-on approach with a simple REAL device that gives you the insights (and experience) into the typical problems you encounter when doing instrumentation for the lab. It is very valuable that the trainer shares specific tips and tricks that come from a vast experience in this field. A total must for a researcher who wants to design new tools and experiments."