

# Python for the Lab

Python for the Lab is a 3-day workshop aimed at bridging the gap between developing software for analysing data and developing software to control an experiment. The workshop begins with a discussion on how to develop a driver to communicate with a real-world device. Followed by learning how to perform a complete measurement, including how to store meta-data to ensure experiments are repeatable and reproducible. We will end the workshop by building a user interface that enables users to change parameters of the measurement and to visualize data in real-time.

At the end of the workshop, you will have a working program following all the best-practices that we have developed over years of building software for controlling experiments in different settings, from optical setups to ion propulsion systems. The main take-home message of the workshop is that by implementing clear design patterns, groups can achieve a great degree of collaboration both internally and externally, making the re-use of parts of programs not only a possibility but a reality. This ensures the long-term survival of a code, even long after the original developers have moved forward in their careers.

## Intended Audience

The workshop is aimed at young scientists willing to learn how to control devices and automatize tasks in the lab. Prerequisite: working knowledge of a programming language such as Matlab, Python, C, etc. Participants should understand the basics of computer programming, such as for-loops, if-statements, etc. The workshop is designed to be hands-on since the beginning, performing measurements with a real device. The idea is to give attendees the basic tools to start their own projects, not only in terms of selection of libraries, but also in terms of decisions that will ensure that programs are sustainable in the longer term.

## Technology Stack

We will use **Python** as the programming language and will rely on known libraries such as *numpy* to do some basic data manipulation. **PyQt5** will be used to build user interfaces, and **PyQtGraph** to do real-time plots of a signal. We will discuss about specific libraries for interfacing with instruments, such as pyVISA, pySerial, and frameworks such as Lantz, which are normally not covered in any other workshops. We will use **PyCharm** as the Python editor and **QtDesigner** for building user interfaces.

## Requisites & Duration

In order to follow the workshop, you will need to bring a laptop with any operating system you normally use and with which you feel comfortable. The acquisition device, which will be provided by the instructor, is USB2 compatible, therefore it works with any PC. One week prior to the workshop you will receive instructions to install the needed software.

The workshop demands 3 consecutive full days. Time can be adapted according the group dynamics, and some topics such as introduction to version control, distribution of packages, etc. can be included based on attendees' experience and interests. Certificates of completion are given upon completion of the workshop.

## About the Instructor

Aquiles Carattino completed his PhD in experimental Physics in 2017. During this period, he started developing software for his own experiments, and in 2017 founded a company to develop software for research labs. By the end of 2017 he created pythonforthelab.com and started offering workshops aiming at creating a strong community of python developers around common technologies and practices. In early 2019, Aquiles and some partners founded a new company to develop the next generation of nanoparticle tracking devices, which are planned to be released to the market in early 2020.