Introduction to Computing in the Oxford Physics Course

Being able to write a computer program is an important skill for all physicists. In physics, computing is mainly required for the following types of task:

1. Analysis of experimental data
2. Solving numerical problems such as differential equations
3. Controlling scientific instruments and acquiring data from them

We aim to teach you all these skills during your time in Oxford. In the first year we focus on the first two aspects. The third aspect is generally learnt by doing experiments in the teaching labs, where you will experience some data acquisition software during first year practicals. You will spend more time writing your own code for data acquisition and control in the second and third year lab experiments.

Physicists use many different computing packages, and our philosophy is to expose you to a range of different programming environments during your time in Oxford, so that, like professional physicists, you learn to choose which you prefer for different tasks. In the first year we teach you two programming languages, Python (for analysing data) and Matlab. Your first lab classes will be introductory exercises in both languages.

Many modern computing languages are interchangeable in the sense they can all be used to carry out the tasks above, although there are a few differences between languages, which you will learn about in the computing lectures. In the first year, we encourage you to use Python for data analysis, whereas Matlab is used to train you mainly in solving numerical problems but both can be used for either application.

Here we provide some introductory resources that use free and friendly web-based tools to get you used to the basics of computing. Python is open source which means it is free to download and use, whereas Matlab needs a license and cannot be downloaded in its full form before you arrive in Oxford. Both programming languages are essentially independent of operating system i.e. it will not make a difference if you try something on a Mac at home and use a Windows machine in Oxford, or vice versa.

We strongly recommend that you do EITHER

- *BOTH the online introductions to Matlab and Python.*
- *OR one of the online Python courses*

Physics and Philosophy student? You will need to do an exercise in Python when you start lab work in Oxford in the second year, so best to focus on this.

Matlab

An online introduction to Matlab, Matlab Onramp, is available here:

https://matlabacademy.mathworks.com/

The course is web-based (you must register with the provider) and uses an interface similar to Matlab. It covers the basics of programming in Matlab and develops many of the skills you will need for the first year computing course. The course providers suggest that the course will take about two hours. You can work through the sections in any order.

If you do want to try out the full version of Matlab before you come to Oxford, a free 30-day trial can be downloaded from: https://uk.mathworks.com/programs/trials/trial_request.html

Python

You should aim to do one of the free courses listed below but it will not matter which one you complete and may depend on how long you have to spend:

- A short free course in Python 3 is available at: https://www.learnpython.org/. This online course will take a couple of hours and you should study the section labelled 'Learn the Basics'. You do not need to do the Advanced tutorials.
- The free parts of the basic course on Python at: https://www.datacamp.com/courses/intro-to-python-for-data-science is useful for those with no computing experience. The course is web based and you will need to register with DataCamp to obtain access. You do not need to sign up to any parts of the courses on this website which cost money, the free parts of the course will be enough. The free part of the Intermediate Python for Data Science: https://www.datacamp.com/courses/intermediate-python which covers Matplotlib (used for plotting graphs) would also be useful. The rest of the course requires payment and is not needed at this time.
- There are longer courses on Python and using it for Data Science at Code Academy. You need to register but you should not pay for the Pro parts of the courses, the free parts are enough.
- Another Python tutorial can be found at Google's Python Class.

Notes

- We regret that we are not able to provide IT support before you attend the introductory lectures at the start of Michaelmas Term, however there are many web resources available beyond the ones we have listed here.
- We do not recommend any specific operating systems or types of computer. We have Windows systems available for undergraduate use, and our students buy many different types of personal computer.