

Python Programming for Life Scientists

205062 (S) + 205063 (Ü)

Briefing (online via Zoom)

15.03.2022 Tue 16:00-17:00

(Zoom Meeting ID: 949 2358 8095; Passwort: 773978; <https://uni-bielefeld.zoom.us/j/94923588095?pwd=OUM3RkExTFFqM1NYZFF4ZmJHRk9ZUT09>)

Course (hybrid: online via Zoom or in G1-106)

21.03.-01.04.2022 Mon - Fri 10:00-17:00

(Zoom Meeting ID: 949 2358 8095; Passwort: 773978; <https://uni-bielefeld.zoom.us/j/94923588095?pwd=OUM3RkExTFFqM1NYZFF4ZmJHRk9ZUT09>)

Project presentations (online via Zoom)

08.04.2022 Fri 10:00-17:00

(Zoom Meeting ID: 949 2358 8095; Passwort: 773978; <https://uni-bielefeld.zoom.us/j/94923588095?pwd=OUM3RkExTFFqM1NYZFF4ZmJHRk9ZUT09>)

Syllabus

Module responsible: Dr. Daniela Holtgräwe, Prof. Dr. Andrea Bräutigam, Prof. Dr. Bernd Weisshaar

Instructors: Hanna Schilbert, Katharina Sielemann, Bianca Frommer, Dr. Daniela Holtgräwe

Questions or remarks?

Please send an E-mail (hschilbe@cebitec.uni-bielefeld.de, ksielemann@cebitec.uni-bielefeld.de, frommer@cebitec.uni-bielefeld.de, dholtgra@cebitec.uni-bielefeld.de).

Motivation

What is Code? How to program? How to use powerful scripts for your own research? These are just example questions, which you could ask yourself and get answers to in “Python programming in genome research”. The analysis of large-scale data sets has become an important challenge due to rapidly evolving technologies. This holds true for almost every research field you could possibly think of. However, the interpretation of large data sets is impossible to do manually and thus computational scripts have the power to analyse Terra bytes of data within a short time range. Moreover, such scripts can help to overcome frequently performed interpretation analysis, such as going manually through the same kind of excel result sheets all over again. Therefore, programming skills have become very valuable – especially when it comes to saving time - not only in research, but also in industry. In the case of genome research, sequencing results and omics data are examples for large data sets, which can be nicely analysed using computational scripts.

Summary of course content

This course teaches the basics of programming using the frequently applied and user-friendly script language Python. Python is often used in life science and statistics and is getting more popular. First, participants will learn the basics of Python syntax by theoretical examples and by applying their new knowledge through the development of their very own scripts. The motto of the course is “learning (programming) by doing”. Exercises are based on real data sets, thus participants are encouraged to deal with realistic challenges in the life sciences. Since the final aim of the course is, that every participant builds up their own little programming project, independent searching and applying of solutions is a major course objective. However, participants are also welcome to bring their own, already existing, project to the course and work on it.

Objectives

- Being able to answer to: “What is Code?”
- Learning the basics of (Python) programming
- Being able to find solutions for error messages by yourself
- Being able to write and understand your own scripts for big data analysis
- Experience whether programming could be a novel part of your own research or not

Topics

- Introduction: Software background (Jupyter notebooks, Python)
- Data types
- The ‘if’ and ‘else’ operators
- Loops

- Functions
- File handling: reading and writing files
- Modules – same time by not reinventing the wheel again
- Choose and prepare your own programming project
- Python project

Requirements

- Nothing is as much important as your own interest in getting to know more about programming
 - Motivation and Interest in experiencing a powerful and easy to handle script language
- NO background knowledge in (bio)informatics is needed
- Personal laptop or computer
- Background in life sciences is recommended but not mandatory – just because exercises will be based on biological problems

Passing the course - For passing the course, four objectives should be fulfilled from each participant:

1. Exercises during class – In order to understand the purpose of certain commands, tasks asked during the course should be processed.
2. Exercises at home – if some of the course exercises could not be finished during the course time, they should be finished at home to not lose connection.
3. Documentation of results via e.g. a simple text file – thus no knowledge gets lost and the principles of FAIR data can be practiced.
4. Python project - Participants should build their own programming project, applying what they have learned during the course. The project needs to be finished before the deadline and will be presented in the course.

Recommended Literature, tutorials, and documentation

- documentation for Python 3.9: <https://docs.python.org/release/3.9.1/>
- stackoverflow: <https://stackoverflow.com/questions/tagged/python> collection of (answered) questions regarding Python coding and error messages

Additional Information

Depending on the participants, the course will be in German/English.

Questions? If something is not clear, please feel free to contact the instructors (Hanna Schilbert, Katharina Sielemann, Bianca Frommer, Dr. Daniela Holtgräwe): hschilbe@cebitec.uni-bielefeld.de, ksielemann@cebitec.uni-bielefeld.de, frommer@cebitec.uni-bielefeld.de, dholtgra@cebitec.uni-bielefeld.de