Advanced Scientific Programming in Python

a Summer School by the G-Node and the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split

Scientists spend more and more time writing, maintaining, and debugging software. While techniques for doing this efficiently have evolved, only few scientists have been trained to use them. As a result, instead of doing their research, they spend far too much time writing deficient code and reinventing the wheel. In this course we will present a selection of advanced programming techniques, incorporating theoretical lectures and practical exercises tailored to the needs of a programming scientist. New skills will be tested in a real programming project: we will team up to develop an entertaining scientific computer game.

We use the Python programming language for the entire course. Python works as a simple programming language for beginners, but more importantly, it also works great in scientific simulations and data analysis. We show how clean language design, ease of extensibility, and the great wealth of open source libraries for scientific computing and data visualization are driving Python to become a standard tool for the programming scientist.

This school is targeted at Master or PhD students and Post-docs from all areas of science. Competence in Python or in another language such as Java, C/C++, MATLAB, or Mathematica is absolutely required. Basic knowledge of Python is assumed. Participants without any prior experience with Python should work through the proposed introductory materials before the course.

Date and Location: September 8—13, 2014. Split, Croatia

Preliminary Program

Day 0 (Mon Sept 8) — **Best Programming Practices**
- Best Practices for Scientific Computing
- Version control with git and how to contribute to Open Source with github
- Object-oriented programming & design patterns

Day 1 (Tue Sept 9) — **Software Carpentry**
- Test-driven development, unit testing & quality assurance
- Debugging, profiling and benchmarking techniques
- Advanced Python I: idioms, useful built-in data structures, generators

Day 2 (Wed Sept 10) — **Scientific Tools for Python**
- Advanced NumPy
- The Quest for Speed (intro): Interfacing to C with Cython
- Programming in teams

Day 3 (Thu Sept 11) — **The Quest for Speed**
- Writing parallel applications in Python
- Python 3: why should I care
- Programming project

Day 4 (Fri Sept 12) — **Efficient Memory Management**
- When parallelization does not help: the starving CPUs problem
- Advanced Python II: decorators and context managers
- Programming project

Day 5 (Sat Sept 13) — **Practical Software Development**
- Programming project
- The Pelita Tournament

Every evening we will have the **tutors' consultation hour**: Tutors will answer your questions and give suggestions for your own projects.

Applications

You can apply on-line at **http://python.g-node.org**
Applications must be submitted before **23:59 UTC, May 1, 2014**. Notifications of acceptance will be sent by **June 1, 2014**.
No fee is charged but participants should take care of travel, living, and accommodation expenses.
Candidates will be selected on the basis of their profile. Places are limited: acceptance rate is usually around 20%.
Prerequisites: You are supposed to know the basics of Python to participate in the lectures. You are encouraged to go through the introductory material available on the website.

Faculty

Francesc Alted, Continuum Analytics Inc., USA
Pietro Berkes, Enthought Inc., UK
Kathryn D. Huff, Department of Nuclear Engineering, University of California - Berkeley, USA
Zbigniew Jędrzejewski-Szmek, Krasnow Institute, George Mason University, USA
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Niko Wilbert, TNG Technology Consulting GmbH, Germany
Tiziano Zito, Institute for Theoretical Biology, Humboldt-Universität zu Berlin, Germany

Organized by Tiziano Zito (head) and Zbigniew Jędrzejewski-Szmek for the German Neuroinformatics Node of the INCF (Germany), Lana Periša for the Numerical and applied mathematics group, FESB, University of Split (Croatia), Ivana Kajić from the Bernstein Center for Computational Neuroscience Berlin (Germany), Ivana Balažević from the Technical University Berlin (Germany), and Filip Petkovski from IN2 Ltd. Skopje (Macedonia).

Website: **http://python.g-node.org**   Contact: **python-info@g-node.org**