Advanced Scientific Programming in Python

an Autumn School by the G-Node, the Center for Mind/Brain Sciences and the Fondazione Bruno Kessler

Scientists spend more and more time writing, maintaining, and debugging software. While techniques for doing this efficiently have evolved, only few scientists actually 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 with 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'll 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. Clean language design and easy extensibility are driving Python to become a standard tool for scientific computing. Some of the most useful open source libraries for scientific computing and visualization will be presented.

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

Date and Location

October 4th—8th, 2010. Trento, Italy.

Preliminary Program

Day 0 (Mon Oct 4) — **Software Carpentry & Advanced Python**
- Documenting code and using version control
- Object-oriented programming, design patterns, and agile programming
- Exception handling, lambdas, decorators, context managers, metaclasses

Day 1 (Tue Oct 5) — **Software Carpentry**
- Test-driven development, unit testing & Quality Assurance
- Debugging, profiling and benchmarking techniques
- Data serialization: from pickle to databases

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

Day 2 (Wed Oct 6) — **Scientific Tools for Python**
- Advanced NumPy
- The Quest for Speed (intro): Interfacing to C
- Programming project

Day 3 (Thu Oct 7) — **The Quest for Speed**
- Writing parallel applications in Python
- When parallelization does not help: the starving CPUs problem
- Programming project

Day 4 (Fri Oct 8) — **Practical Software Development**
- Efficient programming in teams
- Programming project
- The Pac-Man Tournament

Applications

You can apply on-line at **http://www.g-node.org/python-autumnschool**
Applications must be submitted before **August 31th, 2010**. Notifications of acceptance will be sent by **September 4th, 2010**.
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 in past editions was around 30%.
Prerequisites: You are supposed to know the basics of Python to participate in the lectures!
Look on the website for a list of introductory material.

Faculty

Francesc Alted, author of PyTables, Castelló de la Plana, Spain
Pietro Berkes, Volen Center for Complex Systems, Brandeis University, USA
Valentin Haenel, Berlin Institute of Technology and Bernstein Center for Computational Neuroscience Berlin, Germany
Zbigniew Jędrzejewski-Szmek, Faculty of Physics, University of Warsaw, Poland
Eilif Muller, The Blue Brain Project, Ecole Polytechnique Fédérale de Lausanne, Switzerland
Emanuele Olivetti, NeuroInformatics Laboratory, Fondazione Bruno Kessler and University of Trento, Italy
Rike-Benjamin Schuppner, Bernstein Center for Computational Neuroscience Berlin, Germany
Bartosz Teleńczuk, Institute for Theoretical Biology, Humboldt-Universität zu Berlin, Germany
Bastian Venthur, Berlin Institute of Technology and Bernstein Focus: Neurotechnology, Germany
Stéfan van der Walt, Applied Mathematics, University of Stellenbosch, South Africa
Tiziano Zito, Berlin Institute of Technology and Bernstein Center for Computational Neuroscience Berlin, Germany

Organized by Paolo Avesani for the Center for Mind/Brain Sciences and the Fondazione Bruno Kessler , and by Zbigniew Jędrzejewski-Szmek and Tiziano Zito for the German Neuroinformatics Node of the INCF.

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