PYTHON CHARMERS

PYTHON FOR GEOSPATIAL ANALYSIS

Python for Geospatial Analysis

A specialist course

Audience: This is a course for scientists, engineers, and analysts working with geospatial data sets.

Context: Spatial data is ubiquitous and location analytics are more important than ever. A well drawn map is not only beautiful to look at, but can change how you see the world. In the last 10 years Python has become the go-to language for scientific computing and spatial science.

Overview: By the end of the course, you will have all the knowledge you need to start solving a wide range of analytical problems in Python for scientific and geospatial applications.

Skills: Performing Monte Carlo simulations, constructing statistical models, regression, optimization; analyzing images and time-series; analyzing raster and vector geospatial datasets; and creating beautiful statistical charts and maps.

You will learn to work with and analyze general, scientific, and geospatial datasets in many useful formats, including CSV, Excel, SQL, shape-files, KML, and spatial formats (raster and vector).

You will also learn about the elegance and power of the Python language and the breadth of its amazing ecosystem of powerful packages.

Duration: 5 days

Format: Each topic is a mixture of hands-on exercises, expert instruction, and demos.

Venues: modern, light-filled computer-based training facilities (CBD)

Dates and locations:
Brisbane: 25 February - 1 March 2019
Sydney: 27-31 May 2019
Canberra: 10-14 June 2019
Melbourne: 17-21 June 2019

Expert instructors: See bios below.

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Topic outline

Day 1: Python basics

Day 1 covers how to use Python for basic scripting and automation tasks, including tips and tricks for making this easy:

- Why Python? What's possible?

- The *Jupyter* notebook for rapid prototyping

- Modules and packages

- Python concepts: an introduction through examples

- Essential data types: strings, tuples, lists, dicts

- Worked example: fetching and ranking real-time data from a web API

- Raising and handling exceptions

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Topic outline

Day 2: Handling, analyzing, and presenting data in Python

Python offers amazingly productive tools like Pandas for working with different kinds of data. Day 2 gives a thorough introduction to analyzing and visualizing data easily:

- Reading and writing common tabular data formats:
      CSV, Excel, SQL, JSON, time-series (others on request)

- Indexing and selecting data in Pandas

- Data fusion: joining & merging datasets

- Summarization with "group by" operations; pivot tables

- Interactive visualization and statistical graphics with *Altair*

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Topic outline
Day 3: Essentials of scientific computing with Python

Day 3 teaches you how to use Python for numerical and scientific computing. It covers array and matrix manipulation and an overview of available scientific routines, including an introduction to statistical modelling:

- Introduction to manipulating vectors and matrices with *NumPy*

- Tour of *SciPy* and related packages, with fancy demos:
  - unit conversions
  - interpolation
  - dense & sparse linear algebra
  - image processing
  - signal processing

- Statistics in Python, with scientific applications:
  - modelling
  - confidence intervals and hypothesis testing
  - linear regression
  - Monte Carlo simulation

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Topic outline

Day 4: Scaling up

Day 4 focuses on techniques for creating larger codebases in teams and scaling up from small datasets to large ones that are too big for memory or too slow for one computer to process. It also introduces machine learning for automatically inferring complex models from large datasets:

Morning: best practices

- Sharing code with others:
    - creating scripts, modules and packages
    - using IDEs and revision control with *Git*
    - Python idioms and style

- Speeding up code by 4x to 10,000x:
    - profiling, vectorization, JIT compilation, parallel computing

Afternoon: introduction to machine learning

- classification with *scikit-learn*
- non-linear regression
- clustering
- validation and model selection

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Topic outline

Day 5 will provide a comprehensive tutorial in working with geospatial data using Python. It will cover spatial data access, spatial analysis, and visualizing the results on a map.

- Reading & writing vector data with Geopandas and GDAL
- Reading and writing rasters with Rasterio
- Working with NetCDF data with xarray
- Projections with Geopandas, pyproj and shapely
- Creating beautiful maps with Cartopy and overlaying statistical data
- Introduction to vector and raster image analysis with PySAL and SciPy

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Supplemental materials

We will provide you with printed course notes, cheat sheets, and a USB stick containing kitchen-sink Python installers for multiple platforms, solutions to the programming exercises, several written tutorials, and reference documentation on Python and the third-party packages covered in the course.
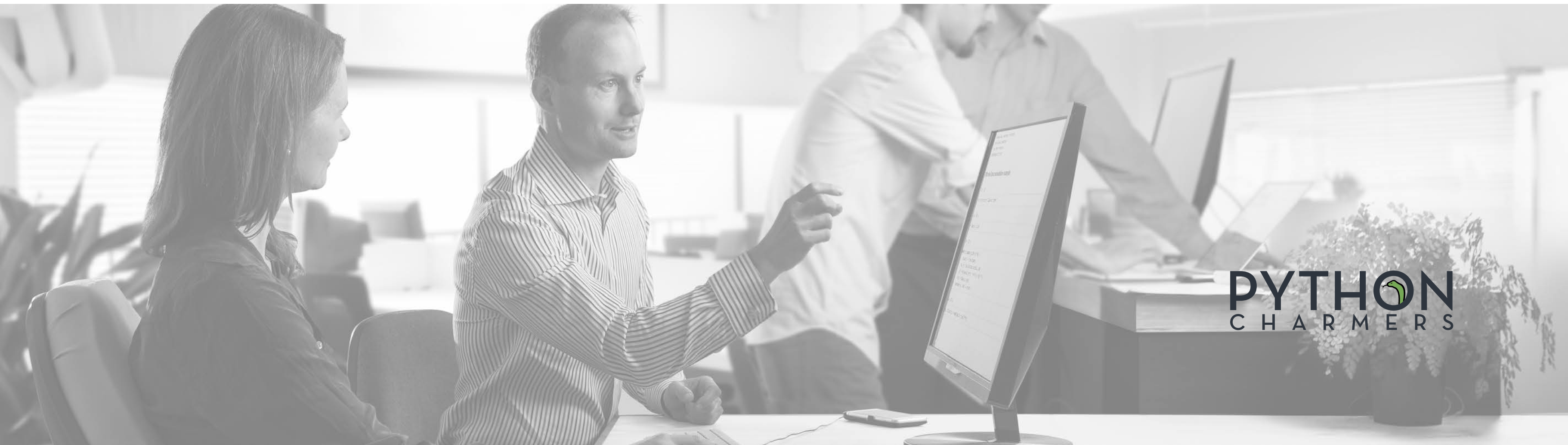
Instructor bio

Henry Walshaw

Henry has almost 15 years of experience in Python application development and has trained hundreds of people in how to use Python from organisations including AGL, the Bureau of Meteorology, ESRI, the NSW Department of Finance, National Australia Bank, and Telstra.

Henry's core technical expertise relates to the development and analysis of large scale spatial datasets (primarily using Python), and communicating this understanding to both subject matter experts and the general public.

Before joining Python Charmers, Henry worked in both government and industry — at Geoscience Australia, the Victorian Department of Sustainability and Environment, and the Environmental Protection Agency (EPA); as a consultant with Sinclair Knight Merz (SKM), a manager at we-do-IT, and as CTO of a startup. He holds a Bachelors in Computational Science.

Instructor bio

Dr Edward Schofield

Ed has consulted to or trained over 2000 people from dozens of organisations in Python, including Atlassian, Barclays, Cisco, CSIRO, Dolby, Harvard University, IMC, Singtel Optus, Oracle, Shell, Telstra, Toyota, Verizon, and Westpac. He is well-known in the Python community as a former release manager of *SciPy* and the author of the widely used *future* package. He regularly presents at conferences in data analytics and Python in Australia and internationally.

Ed holds a PhD in machine learning from Imperial College London. He also holds BA and MA (Hons) degrees in mathematics and computer science from Trinity College, University of Cambridge. He has 20+ years of experience in programming, teaching, and public speaking.

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Instructor bio

Dr Robert Layton

Robert is the author of the book "Data Mining in Python", published by O'Reilly. He provides analysis, consultancy, research and development work to businesses, primarily using Python. Robert has worked with government, financial and security sectors, in both a consultancy and academic role. He is also a Research Fellow at the Internet Commerce Security Laboratory, investigating cybercrime analytics and data-mining algorithms for attribution and profiling.

Robert is a contributor to the Python-based *scikit-learn* open source project for machine learning and writes regularly on data mining for a number of outlets. He is also the author of the website "LearningTensorflow.com". He has presented regularly at a number of international conferences in Python, data analysis, and its applications.

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Instructor bio

Janis Lesinskis

Janis is a software developer who has been using Python since 2005. He has worked on several high-end Python projects across a variety of software industry sub-sectors, including: mathematical optimization engines for logistics, a game theory solver, a variety of backend web apps with *Django* and *Flask*, and as a scalability consultant improving Python performance.

Janis loves open source and is the author of several open source Python projects on GitHub. He is involved in education in several ways: in an in-house capacity as a Python consultant, as a regular blogger, as a volunteer for events like Django Girls and Python community workshops, and as a frequent presenter about Python at local meetup events.

Janis is a co-founder of the Custom Programming Solutions consulting group and joined Python Charmers as a trainer in 2018.

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Other information

Computer: An computer and internet connection will be provided for you during the course.

Exercises: There will be practical programming exercises throughout the course. These will be challenging and fun, and the solutions will be discussed after each exercise and provided as source code. During the exercises, the trainer(s) will offer individual help and suggestions.

Timing: The course will run from 9:00 to roughly 17:00 each day, with breaks of 50 minutes for lunch and 20 minutes each for morning and afternoon tea.

Personal help: Your trainer(s) will be available after each day for you to ask any one-on-one questions you like — whether about the course content and exercises or about specific problems you face in your work and how to use Python to solve them. We encourage you to have your own data sets ready to discuss if you wish.

About **Python Charmers**

Python Charmers is the leading provider of Python training in the Asia-Pacific region, based in Australia and Singapore. Since 2010, Python Charmers has given over 250 training courses and bootcamps to over 3000 delighted people from organizations such as AGL, Atlassian, Barclays, CSIRO, Cisco, Deloitte, Dolby, IMC, pwc, Singtel Optus, Shell, Sportsbet, Telstra, Toyota, Verizon, Westpac, and Woolworths. Python Charmers specializes in teaching programming and data science to scientists, engineers, data analysts, quants, and computer scientists in the Python language.

Python Charmers' trainers boast years of Python experience and deep roots in the open source community, as both speakers at events and contributors to well-known open source projects, including *NumPy*, *SciPy*, *Scikit-Learn*, *Pandas*, and *Python-Future*.

Testimonials: Testimonials from past participants of similar bootcamps and training courses are available at

https://pythoncharmers.com/testimonials/

Questions: We are happy to customise this program further on request. Please let us know if you would like to discuss this or have any other questions.

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