# PYTHON CHARMERS®

# INTERMEDIATE GEOSPATIAL ANALYSIS IN PYTHON

# Intermediate Geospatial Analysis
## A specialist course using Python

**Audience:** This is a course for GIS analysts, scientists, engineers, surveyors, and other data analysts with prior experience working with spatial data in Python.

**Prerequisites:** Completion of the Python Charmers Python for Geospatial Analysis course and six months Python programming experience.

**Overview:** This course will let you take your spatial analysis further using well-established methods to discover new information by location.

At the end of the course you will understand scientifically and statistically grounded methods of geospatial analysis that you can use to aid in your interpretation of real-world data and to solve real-world problems.

You will learn fundamentals of network analysis through automation of common geospatial tasks, the basics of dealing with network data, and more advanced spatial statistics, including measures of spatial autocorrelation and multi-dimensional interpolation and regression. You will also learn techniques for dealing with very large datasets through parallel processing and visualization.

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

**Exercises:** There will be practical 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.

**Expert instructors:** See bios below.

**Duration:** 2 days

**Price:**
$1,600 (excl GST)

**Dates and locations, July – December 2020:**
7th – 8th September 2020 (live online)
30th November – 1st December 2020 (Melbourne / live online)

PYTHON
CHARMERS

# Topic outline

## Day 1: Automating geospatial processes

Day 1 of the course will revise core concepts, introduce network analysis, and look at common geospatial analysis tasks to automate your workflow and analysis:

- Revision of key concepts and tools; *geopandas* and *xarray*

- Mapping the locations of addresses with geocoding with *geopy*

- Rasterization, vectorization, and skeletonization: converting old map images to vector data with *rasterio* and *scikit-image*

- Finding the most cost effective path with cost-path analysis

- Measuring the flow and capacity of a network: an introduction to network analysis with *NetworkX*

   Case #1: How many people can reach the city on trains in rush-hour?
   Case #2: How many houses are without water if a water-main bursts?

- Automating an analysis process in Python: updating from remote data sources, analysis, automatic map production
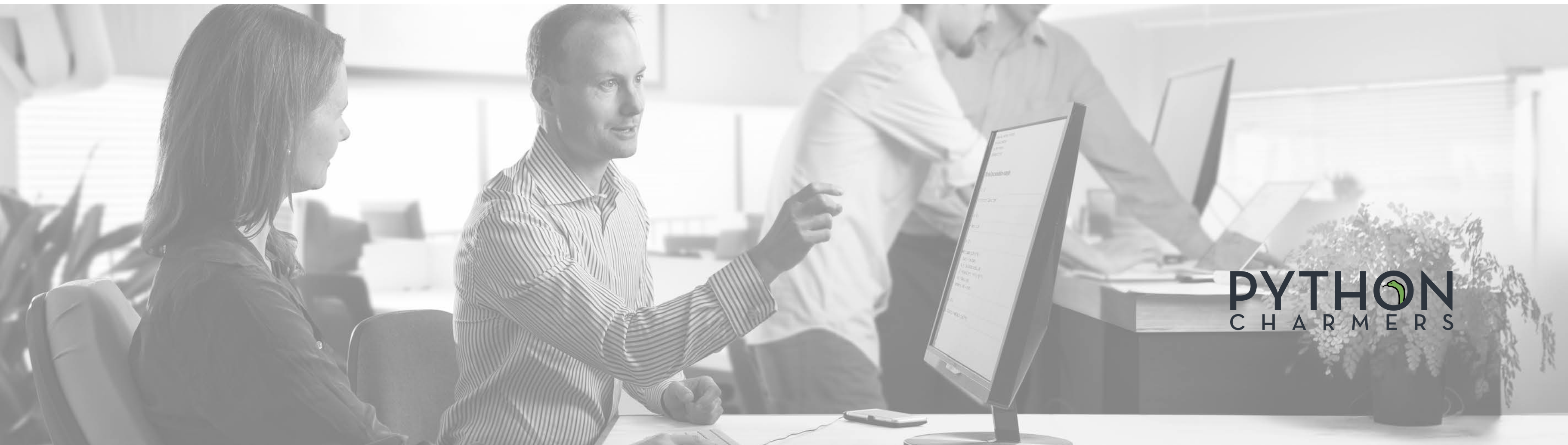
PYTHON
CHARMERS

# Topic outline
## Day 2: Extended analysis of spatial data

Day 2 looks at extending this analysis. You will learn how to perform spatial autoregression tests for spatial dependence, work with point pattern data-sets for optimization and to interpolate surfaces, before finally techniques for managing and visualising large spatial datasets:

- Measuring spatial dependence with *pysal*:
    - How much do property prices depend on school locations?
    - Can you detect spatial dependence in illegal graffiti locations?
    - Measuring air pollution hotspots

- Creating better boundaries from points as concave hulls.
    - Delaunay triangulation, Voronoi tesselation, point pattern analysis with *scipy*, *shapely* and *pysal*

- Spatial data interpolation and regression with *scipy* and *scikit-learn*
    - Case study: How many pedestrians are walking through your city right now?

- Large-scale raster analysis: memory-efficient and parallel techniques:
    - *dask*, *rasterio*, *xarray*. Example: remote-sensing indexing

- Visualization of large-scale datasets with *datashader*

PYTHON
CHARMERS

# Personal help

We are happy to offer on-the-spot problem-solving after each day of the training for you to ask one-on-one questions — whether about the course content and exercises or about specific problems you face in your work and how to solve them. If you would like us to prepare for this in advance, you are welcome to send us background info before the course.

# Other information

**Materials:** We will provide you downloadable and printed course notes (PDF and *Jupyter* notebooks), cheat sheets, solutions to the programming exercises, several written tutorials, and reference documentation.

**Live online delivery:** We have cloud infrastructure (using *JupyterHub*) that allows participants to code online via their web browser. Our trainer(s) can see in real-time how the participants are faring with the exercises and offer help. The cloud coding environment also contain our materials, interactive notebooks and sample datasets.

**Face-to-face delivery:** We provide modern computer-based training facilities (CBD locations) for face-to-face training courses.

**Computer:**
   Virtual: we recommend ≥ 8 GB of RAM, a headset mic and a webcam.
   Face-to-face: an internet-connected computer will be provided for you.

**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.

**Certificate of completion:** We will provide you a certificate if you complete the course and successfully answer the majority of the exercise questions.

# 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 organizations 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.

PYTHON
CHARMERS

**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 450 training courses and bootcamps to over 4,500 delighted people from organizations such as AGL, Atlassian, Barclays, CSIRO, Cisco, Deloitte, Dolby, IMC, pwc, Singtel Optus, Shell, Sportsbet, Telstra, Toyota, Transurban, Verizon, VicRoads, 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.

**Contact:**
Phone:    +61 1300 963 160
Email:    info@pythoncharmers.com
Web:      pythoncharmers.com

PYTHON
C H A R M E R S