



# MACHINE LEARNING IN DEPTH

COURSE GUIDE (V1): JULY – DECEMBER 2023

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# Machine Learning in Depth

A specialist course in Python

**Audience:** This is a course for data scientists, data analysts, engineers, researchers, software developers, and quants.

**Overview:** This course introduces machine learning using *scikit-learn* and deep learning using *PyTorch*.

By the end of the course, you will understand the concepts of classical ML algorithms as well as neural networks, convolutional neural networks, and transformers, and you will have experience applying these in practice to develop and refine models for classification and regression across various domains.

**Prerequisites:** Prior experience with Python. High-school math knowledge is recommended. A quantitative background and familiarity with basic probability and linear algebra would also be beneficial but are not required.

You may skip day 1 if you have recently completed either of Python Charmers' courses *Python for Predictive Data Analytics* or *Python for Scientists and Engineers*.

**Context:** Trawling through large volumes of data and making accurate inferences and predictions are now skillsets in fierce demand. Python offers some of the best tools for this in any language.

**Format:** Live instructor-led online training with interactive exercises. Each topic combines guided hands-on exercises and expert instruction.

**Duration:** 3 days

**Price:**

Regular course (3 days): AUD \$2,550 (excl GST)

Partial course (2 days): AUD \$1,700 (excl GST)

**Dates (July – December 2023):**

17 – 19 July 2023

20 – 22 September 2023



# Topic outline

## Day 1: Machine learning

Day 1 gives you a practical and comprehensive introduction to machine learning for powerfully inferring complex models from data, with examples from a range of industries, including time-series and spatial datasets:

- Crash course in *NumPy*
- Concepts in machine learning (ML)
- Overview of the ML package ecosystem in Python
- Regression and classification with *scikit-learn*, with applications: time-series, diagnosis, image recognition, satellite imagery, ...
- Validation and model selection; diagnostic tools; *yellowbrick*
- Feature engineering and selection; *eli5*; text analysis
- Outlier and anomaly detection with *pyOD*

# Topic outline

## Day 2: Deep learning

Day 2 introduces the approach to machine learning known as “deep learning”, using neural networks trained with the *PyTorch* library on GPUs:

- *PyTorch* nuts and bolts; using GPUs
- Concepts in deep learning (DL):  
network architectures, activation functions, loss functions, SGD
- Similarities and differences of *PyTorch* vs *scikit-learn*; the *skorch* API
- Residual and convolutional networks for time-series and image data
- Regularization: weight decay, dropout, pooling, batch normalization

# Topic outline

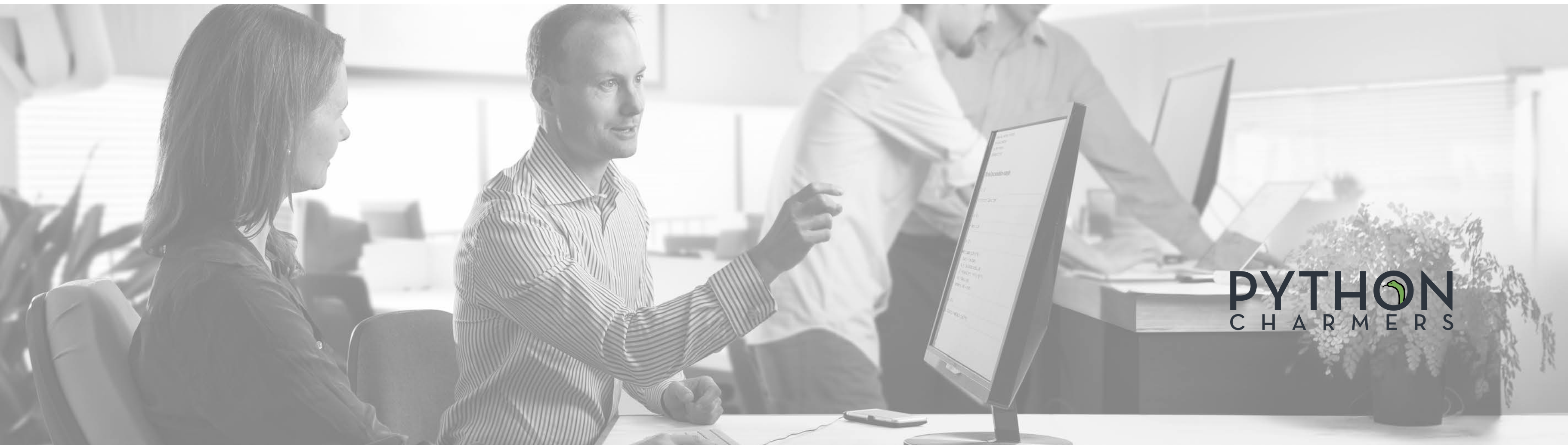
## Day 3: Current and future directions; best practices

Day 3 describes some of the most promising recent architectural innovations in deep learning models. It then walks you through the theory and practice of refining existing models trained by others and gives you advice on how to refine and deploy models in production:

- Time-series modelling with recurrent networks; LSTM; transformers
- Fine-tuning pre-trained *PyTorch* models with *HuggingFace*
- Real-world advice on improving ML models; diagnostics
- Deploying machine learning models in production
- Overview of the DL package ecosystem in Python; trends, innovations: *Lightning; AutoPyTorch; Jax; Elegy*

## 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.



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## Other information

**Format:** Courses are conducted online via video meeting using Python Charmers' cloud notebook server for sharing code with the trainer(s).

**Computer:**

- **Hardware:** we recommend  $\geq 8$  GB of RAM and a webcam. Preferably also multiple screens and a quiet room (or headset mic).
- **Software:** a modern browser: Chrome, Firefox, or Safari (not IE or Edge); and Zoom.
- **Coding:** we have a cloud-based coding server that supports running code and sharing code with the trainer(s).

**Timing:** Most courses will run from 9:00 to roughly 17:00 (AEDT) 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.

**Materials:** You will have access to all the course materials via the cloud server. We will also send you a bound copy of the course notes, cheat sheets, and a USB stick containing the materials, exercise solutions, and further resources.

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# Instructor bio



**Dr Edward Schofield**

Ed has consulted to or trained over 3000 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 runs leads the Python user group in Melbourne and regularly presents at conferences in data analytics and Python in Australia and internationally.

Ed holds a PhD in machine learning from Imperial College London, with a focus on generative models for sequence prediction. 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.





# Instructor bio



**Dr Robert Layton**

Robert is the author of the book “Data Mining in Python”, published by Packt. 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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### **About Python Charmers®**

Python Charmers is a leading global provider of training in data science and software development, based in Australia and Singapore. Since 2010, Python Charmers has given over 550 training courses to over 5,500 delighted people from organizations such as AGL, Atlassian, Barclays, Cisco, CSIRO, Deloitte, Dolby, GDF Engie, IMC, Oracle, pwc, Rio Tinto, Shell, Singtel Optus, Sportsbet, Telstra, Toyota, Verizon, Westpac, and Woolworths. Python Charmers specializes in teaching data science and programming to scientists, engineers, data analysts, quants, and computer scientists.

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

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

<https://pythoncharmners.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:**

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Web: [pythoncharmners.com](https://pythoncharmners.com)

The logo for Python Charmers, featuring the word "PYTHON" in a large, bold, sans-serif font, with a small green Python snake icon integrated into the letter "O". Below "PYTHON" is the word "CHARMERS" in a smaller, all-caps, sans-serif font.

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