

5-day Hands-on Workshop on:

Python for Scientific Computing and TensorFlow for Artificial Intelligence

By Dr Stephen Lynch NATIONAL TEACHING FELLOW FIMA SFHEA

Inventor of BINARY OSCILLATOR COMPUTING

Author of PYTHON™, MATLAB®, MAPLE™ AND MATHEMATICA® BOOKS

STEM Ambassador, Public Engagement Champion and Speaker for Schools



Python for Scientific Computing

Dates: Mon 29th May – Thu 1st June

TensorFlow for Artificial Intelligence

Date: Fri 2nd June

Part of the workshop is based on Dr Lynch's latest book, "*Python for Scientific Computing and Artificial Intelligence*", CRC Press, 2023.



A copy of this 340-page reference e-book will be available during the workshop

- This workshop is designed for anyone in the engineering, computing and scientific community who wants to learn how to use Python for Scientific Computing and TensorFlow for Artificial Intelligence (AI) programming.
- No prior knowledge of Python or programming is required to benefit from this workshop.
- The emphasis of the workshop is on practical applications by means of hands-on tutorials using Python and TensorFlow. The emphasis is **not** on the mathematical theory.

Attend this workshop and learn:

- how to program Python using IDLE, SPYDER and JUPYTER/GOOGLE COLAB NOTEBOOKS
- how to model real-world systems in biology, chemistry, computing, data science, economics, engineering, mathematics, physics and statistics
- how the brain works and about ARTIFICIAL INTELLIGENCE
- how to program deep neural networks In GOOGLE COLAB with TENSORFLOW

The workshop participants need no knowledge of any programming language.

The methods used in this workshop have been successfully tested on undergraduates and postgraduates for over 25 years. The workshop is highly interdisciplinary.

This is a practical workshop using Python and TensorFlow.



INTRODUCTION/ OBJECTIVES

The main objective of this workshop is to introduce delegates to Scientific Computing using Python and Artificial Intelligence using TensorFlow.

Participants will be introduced to Python and Scientific Computing before moving on to Artificial Intelligence. The workshop will focus on the Python and TensorFlow programs and **NOT** on the mathematical theory.

WORKSHOP OUTLINE

Day 1: INTRODUCTION TO PYTHON

Topic 1

An Introduction to Python using IDLE

- Using Python as a powerful calculator
- Simple programming techniques including, defining functions, loops and if, then, else statements
- Simple plots using Turtle
- A tutorial introduction to NumPy and Matplotlib with Spyder
- A tutorial introduction to Sympy

Day 2: PYTHON PROGRAMMING

Topic 2

Anaconda, Spyder and SymPy

- Jupyter notebooks and Google Colab
- Simple programming
- Scientific Computing: Biology
- Scientific Computing: Chemistry
- Scientific Computing: Data Science

[Download all files and notebooks here:](https://github.com/proflynch/CRC-Press/)

<https://github.com/proflynch/CRC-Press/>

DAY 3: SCIENTIFIC COMPUTING in PYTHON

Topic 3

Scientific Computing

- Scientific Computing: Economics
- Scientific Computing: Engineering
- Scientific Computing: Fractals and Multifractals
- Scientific Computing: Image Processing
- Scientific Computing: Numerical Methods

DAY 4: SCIENTIFIC COMPUTING in PYTHON

Topic 4

Scientific Computing

- Scientific Computing: Physics
- Scientific Computing: Statistics
- Brain-Inspired Computing
- Neural Networks
- Neurodynamics

DAY 5: AN INTRODUCTION to TENSORFLOW

Topic 5

An Introduction to TensorFlow in Google Colab

- KERAS and TensorFlow
- Recurrent Neural Networks
- Convolutional Neural Networks
- Introduction to TensorBoard
- The Future of AI



WHO WILL BENEFIT FROM THIS WORKSHOP

This workshop is aimed at a large professional audience: from academics and technicians, advanced undergraduate and graduate students to applied mathematicians, engineers, and researchers in a broad range of disciplines such as biology, chemistry, computing, data science, economics, nonlinear optics, neural networks, population dynamics, physics, and statistics.

The workshop will help to develop a practical understanding of how Python can be used to solve real-world problems and provide scientists with a means of presenting their results.

Python for employability:

<https://www.mathscareers.org.uk/python-for-a-level-maths-undergraduate-maths-and-employability/>

WORKSHOP LEADER: DR Stephen Lynch NTF FIMA SFHEA



Stephen is a **world leader** in the use of mathematics packages in teaching, learning, assessment, research and employability. He started using packages in the mid 1980's whilst studying for his PhD in pure mathematics. Upon completion of his PhD, he started his lecturing career at Southampton University at the age of 24.

This Python workshop has developed from a series of mathematics lectures to undergraduates and from both national and international Python and TensorFlow workshops.

Although educated as a pure mathematician, Stephen's many interests now include applied mathematics, cell biology, electrical engineering, computing, neural networks, nonlinear optics and binary oscillator computing, which he co-invented with a colleague.

He has authored 2 international patents for inventions, 8 books, 4 book chapters, over 40 journal articles and a few conference proceedings.

In 2022, Stephen was awarded a **National Teaching Fellowship** for his work in Widening Participation, programming in the Maths curriculum, and interdisciplinary research feeding into teaching.

Stephen is a Fellow of the Institute of Mathematics and Its Applications (FIMA) and a Senior Fellow of the Higher Education Academy (SFHEA). He is currently a Reader with MMU and was an Associate Lecturer with the Open University from 2008-2012. In 2010, Stephen volunteered as a **STEM Ambassador**, in 2012, he was awarded MMU **Public Engagement Champion** status and in 2014 he became a **Speaker for Schools**.

Stephen runs national workshops with the IMA on **Python for A-Level Mathematics and Beyond**, for pupils and teachers:

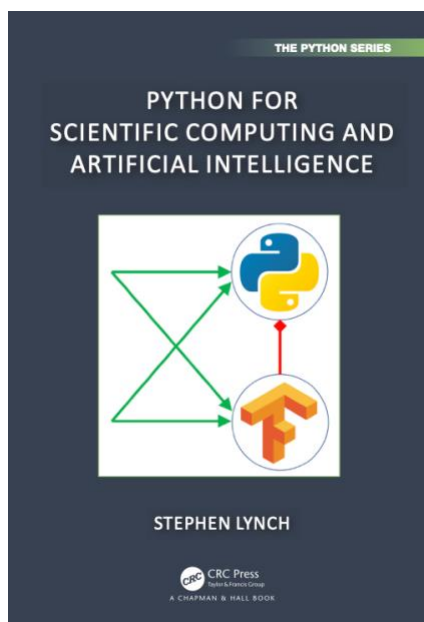
<https://ima.org.uk/20420/online-workshop-python-for-a-level-mathematics-and-beyond-winter-2023/>

Stephen is also the author of **MATLAB[®]**, **Maple[™]** and **Mathematica[®]** books – all published by Springer International Publishing. According to **Springer**, there have been over **650,000** chapter downloads for all of his books up to January 2023. The chapters from the Python book alone have been downloaded over **155,000** times since late 2018.

The Mathematics degrees offered at MMU (student population over 38,000) are heavily technology-based and loved by our students. In 2020, 2018 and 2012, Mathematics was voted **Course of the Year** at the Students' Union Teaching Awards.

PYTHON for SCIENTIFIC COMPUTING and TENSORFLOW for ARTIFICIAL INTELLIGENCE

Workshop Itinerary
Dr Stephen Lynch NTF FIMA SFHEA



Day 1			
Using Python as a Calculator	10am-11am	Numpy and Matplotlib	2pm-3pm
Simple Programming	11am-12pm	Sympy – Symbolic Computation	3pm-4pm
Simple Plots using Turtle	12pm-1pm		
Day 2			
Jupyter and Colab Notebooks	10am-11am	Chemistry Models	2pm-3pm
More Programming	11am-12pm	Data Science Models	3pm-4pm
Biological Models	12pm-1pm		
Day 3			
Economics Models	10am-11am	Image Processing	2pm-3pm
Engineering Models	11am-12pm	Numerical Methods ODEs/PDEs	3pm-4pm
Fractals and Multifractals	12pm-1pm		
Day 4			
Physics Models	10am-11am	Neural Networks	2pm-3pm
Statistics Models	11am-12pm	Neurodynamics	3pm-4pm
Brain-Inspired Computing	12pm-1pm		
Day 5			
TensorFlow and Keras	10am-11am	TensorBoard	2pm-3pm
Recurrent Neural Networks	11am-12pm	The Future of AI & Feedback	3pm-4pm
Convolutional Neural Networks	12pm-1pm		

New Book: Lynch S (2023) *Python for Scientific Computing and Artificial Intelligence*, CRC Press ISBN 9781032258713.