

MMU RISE 4-day Hands-on Workshop on:

Python for Scientific Computing and TensorFlow for Artificial Intelligence

By Dr Stephen Lynch NTF FIMA SFHEA

Author of Two Patents

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

STEM Ambassador, Public Engagement Champion and Speaker for Schools



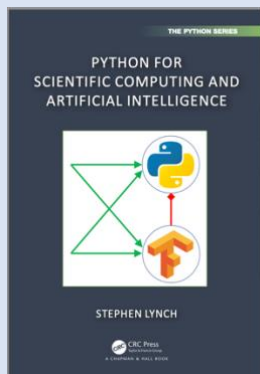
Python for Scientific Computing

Dates: Tue 28th May – Wed 29th May 2024

TensorFlow for Artificial Intelligence

Dates: Thu 30th – Fri 31st May 2024

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



A free copy of this 344-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 both CONTINUOUS and DISCRETE DYNAMICAL SYSTEMS
- about models in economics, engineering, computing, biology, chemistry, physics and mathematics
- 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.

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 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

Scientific Computing

- Jupyter notebooks and Google Colab
- Scientific Computing: Biology & Chemistry
- Scientific Computing: Data Science & Stats
- Scientific Computing: Economics
- Scientific Computing: Engineering

DAY 3: SCIENTIFIC COMPUTING in PYTHON

Topic 3

Scientific Computing

- Scientific Computing: Fractals and Multifractals
- Scientific Computing: Image Processing
- Scientific Computing: Numerical Methods
- Scientific Computing: Physics
- Brain-Inspired Computing

DAY 4: Artificial Intelligence (AI)

Topic 4

Neural Networks and AI

- Neural Networks & Neurodynamics
- KERAS and TensorFlow
- Recurrent Neural Networks
- Convolutional Neural Networks
- CHATGPT and the Future of AI

The workshop includes practical, hands-on sessions where participants are given the opportunity to apply in practice the theory they have learnt. All Python and TensorFlow program files can be downloaded through GitHub:

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

Delegates can view Python programs online via Jupyter notebooks:

<https://www.routledge.com/Python-for-Scientific-Computing-and-Artificial-Intelligence/Lynch/p/book/9781032258713#>



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

ResearchGate: <https://www.researchgate.net/profile/Stephen-Lynch-5>



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 MMU 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 45 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 in to teaching.

He 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 concurrently 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:

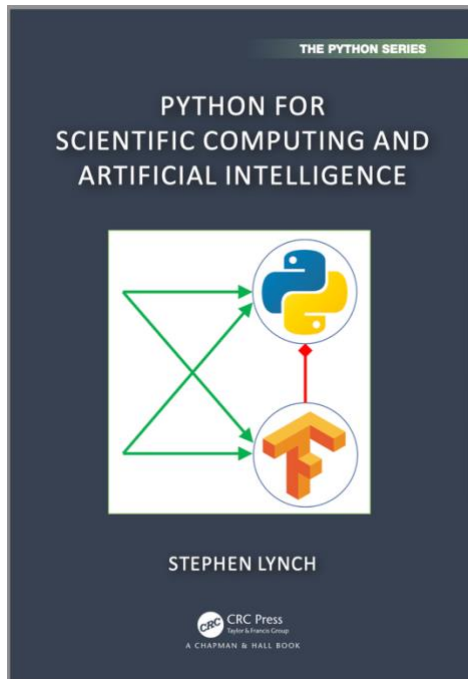
<https://ima.org.uk/events/conferences/>

Stephen is also the author of **MATLAB®**, **Maple™** and **Mathematica®** books – all published by Springer International Publishing. According to **Springer**, there have been nearly **800,000** chapter downloads for all of his books up to December 2023. The chapters from the Python book alone have been downloaded over **180,000** times since late 2018.

The Mathematics degrees offered at MMU (student population over 41,000) are heavily technology-based and loved by our students. In 2020, 2018 and 2012, Mathematics was voted **Best Course** 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	Economics	2pm-3pm
Biology & Chemistry	11am-12pm	Engineering	3pm-4pm
Data Science & Statistics	12pm-1pm		
Day 3			
Fractals and Multifractals	10am-11am	Physics	2pm-3pm
Image Processing	11am-12pm	Brain-Inspired Computing	3pm-4pm
Numerical Methods ODEs/PDEs	12pm-1pm		
Day 4			
Neural Networks & Neurodynamics	10am-11am	Convolutional Neural Networks	2pm-3pm
KERAS and TensorFlow	11am-12pm	Chat GPT-4 & the Future of AI	3pm-4pm
Recurrent Neural Networks	12pm-1pm		

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

[Link to CRC Press Python Book](#)