Python:
NumPy and Pandas
Introduction

iT Centre Learning

iT services

UNIVERSITY OF OXFORD

The small print

Prerequisites

Time in the workshop is precious – it is an opportunity for you to interact with the workshop leader and other participants through questions and discussions and to share your experiences and concerns. To make the most of this time we sometimes ask you to carry out learning activities ahead of the workshop so that everyone comes into the class with the same basic knowledge. We keep this prior learning to a minimum and often make use of online videos. Online videos provided through LinkedIn Learning can be accessed by University members anytime, anywhere, through a browser or app.

Your course booking will tell you if any prior learning activity is required.

If you arrive for a workshop without having done the prior learning, the workshop leader may suggest that you come back on another session.

Copyright

About the workshop designer

Graham Addis started his first technology role in 1978 and has gathered decades of practical experience in industry. He has always been passionate about passing on his knowledge and undertook his first formal teaching position as a Customer Training Specialist for Intel back in 1984.

Since that time his career has combined extensive real world experience with teaching and mentoring. In 2017 he joined the academic world at the University of Oxford and currently specialises in teaching spreadsheets, databases and programming.

Revision history

Version	Date	Author	Comments
1.2	December 2023	Graham Addis	Merge NumPy Introduction and Aggregation
1.1	January 2023	Graham Addis	Update to new template
1.0	July 2022	Graham Addis	Created

About this workshop

This workshop will take you through the basics of using the NumPy and Pandas packages in Python with an introduction to the Grammar of Graphics approach to producing visual representations of your data. The workshop also provides an introduction to using Jupyter Notebooks for data analysis and documenting your work.

We will include pointers to other workshops and further resources that will help you go on later to analyse and organise your data.

What you will learn

We will cover the basics of using Jupyter Notebooks, followed by an introduction to the python NumPy package, then Pandas and finally onto the Grammar of Graphics approach to presenting your data using the plotnine Python package.

The format of the course comprises of demonstrated examples followed by hands-on exercises.

We will include pointers to further resources that will help you go on later to create and manage documents.

What you need to know

The ideas and techniques covered in this workshop will apply to a range of environments We will demonstrate using Jupyter Notebooks, which are widely available. However, the concepts will be the same or similar, whatever Python development environment you decide to use.

I will assume that you are reasonably confident with the Python programming language, including topics such as:

- Python syntax and operators
- List definition and indexing
- Importing and using Python packages
- Python print command and formatted strings

The resources you need

Sample data that you can use to experiment with will be made available, but you may like to bring along your own.

The resources for most workshops, including any pre-course activity, are in the IT Learning Portfolio: visit skills.it.ox.ac.uk/it-learning-portfolio and search for “Python: NumPy and Pandas Introduction”.

Unless you have been told otherwise, in classroom workshops there will be a computer available for you to use with Jupyter Notebooks available.

You can use your own computer with your preferred installation of Jupyter Notebooks installed if you want to – just bear in mind that I am not an expert in every environment (although I am sure that between us we will be able to sort out most problems!).

Learning Objectives

This workshop has the following learning objectives:

Learning Objective One: NumPy Introduction

A series of exercises are available in the Jupyter Notebook:
`Ex_01_NumPy_Introduction_Exercises.ipynb`

There are blank cells available in the Notebook for you to write your answers, there are also some cells which contain python setup commands or definitions of data to be used in the exercises, which need to be run before running the cell containing your answers.

Example solutions are provided in the Notebook:

`Ex_01_NumPy_Introduction_Solutions.ipynb`

Learning Objective Two: Pandas Introduction

A series of exercises are available in the Jupyter Notebook:
`Ex_02_Pandas_Introduction_Exercises.ipynb`

There are blank cells available in the Notebook for you to write your answers, there are also some cells which contain python setup commands or definitions of data to be used in the exercises, which need to be run before running the cell containing your answers.

Example solutions are provided in the Notebook:

`Ex_02_Pandas_Introduction_Solutions.ipynb`

Learning Objective Three: Python Plotting

Create suitable Jupyter Notebooks and work through some of the examples from the plotnine documentation:

https://plotnine.readthedocs.io/en/stable/gallery.html

Further information

Getting extra help

Course Clinics

The IT Learning Centre offers bookable clinics where you can get pre- or post-course advice. Contact us using courses@it.ox.ac.uk.

Study Videos from LinkedIn Learning

On our website, you will find our collection of self-service courses and resources. This includes providing LinkedIn Learning video-based courses free to all members of the University. Visit skills.it.ox.ac.uk/linkedin-learning and sign in with your Single Sign-On (SSO) credentials.

Some courses recommend pre- and/or post-course activities to support your learning. You can watch the online videos anywhere, anytime, and even download them onto a tablet or smartphone for off-line viewing.

About the IT Learning Portfolio online

Many of the resources used in the IT Learning Centre courses and workshops are made available as Open Educational Resources (OER) via our Portfolio website at skills.it.ox.ac.uk/it-learning-portfolio.

About the IT Learning Centre

The IT Learning Centre delivers over 100 IT-related teacher-led courses, which are provided in our teaching rooms and online, and we give you access to thousands of on-line self-service courses through powered by LinkedIn Learning.

Our team of teachers have backgrounds in academia, research, business and education and are supported by other experts from around the University and beyond.

Our courses are open to all members of the University at a small charge. Where resources allow, we can deliver closed courses to departments and colleges, which can be more cost-effective than signing up individually. We can also customize courses to suit your needs.

Our fully equipped suite of seven teaching and training rooms are usually available for hire for your own events and courses.

For more information, contact us at courses@it.ox.ac.uk.

About IT Customer Services

The IT Learning Centre is part of the Customer Services Group. The group provides the main user support services for the department, assisting all staff and students within the University as well as retired staff and other users of University IT services. It supports all the services offered by IT Services plus general IT support queries from any user, working in collaboration with local IT support units.

The Customer Services Group also offers a data back-up service; an online shop; and a computer maintenance scheme. Customer Services is further responsible for desktop computing services – for staff and in public/shared areas – throughout UAS and the Bodleian Libraries.

NumPy and Pandas Introduction

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Resources for your learning

Activities for you to practice today

- In the coursebook
- Work at your own pace!
- Be selective

Videos with today's topics

LinkedIn Learning

Follow-up work

- Continue with exercises after the session
- Bookable Course Clinics later

Overview

Environment – JupyterHub (Binder)

NumPy - Introduction

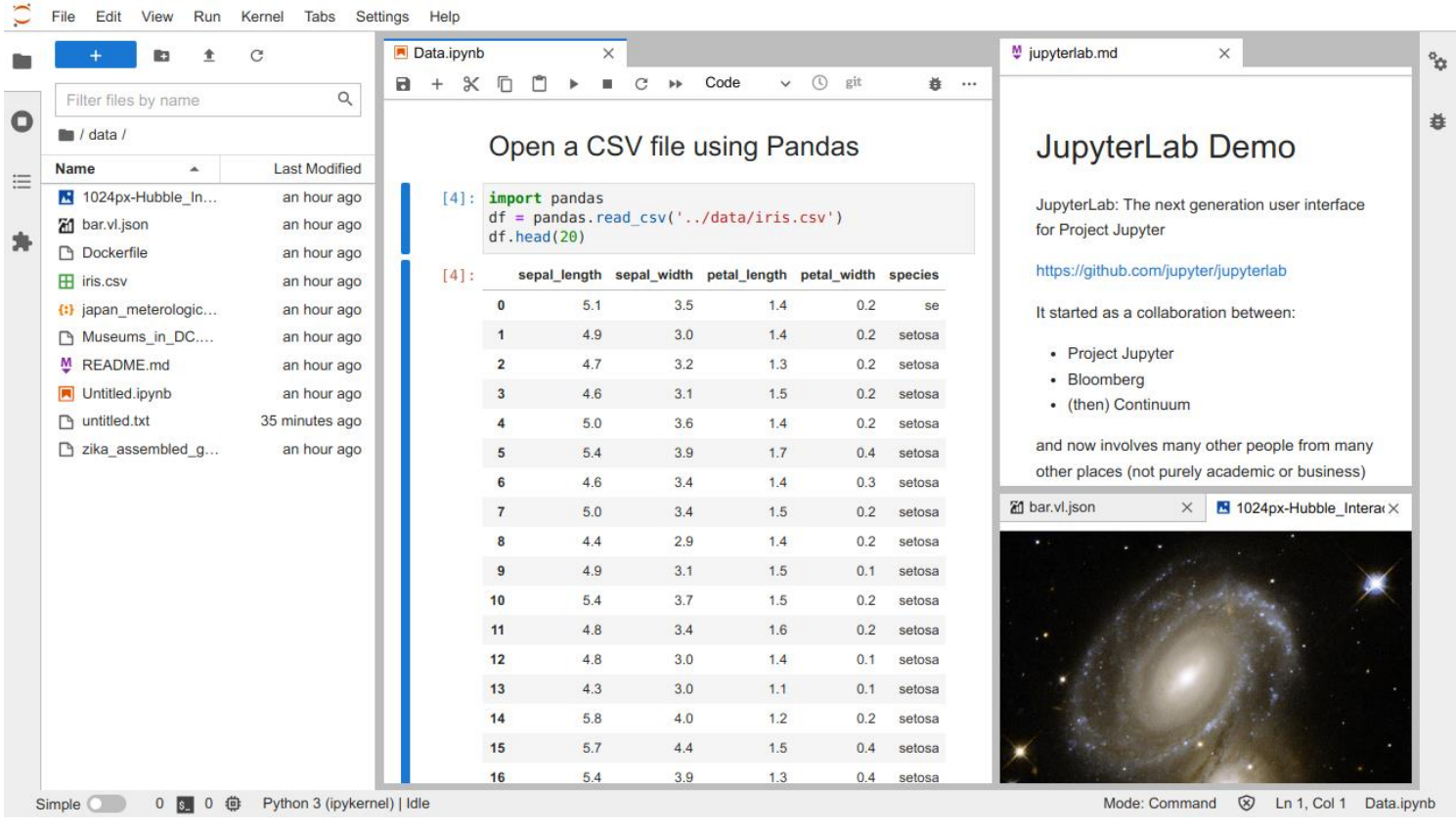
Pandas – Introduction

Python Plotting - plotnine

Jupyter

jupyter

binder



Environment

python >= 3.7

jupyter >= 1.0.0

numpy >= 1.23.1

pandas >= 1.4.3

plotnine >= 0.9.0

scikit-misc >= 0.1.4 (optional)

NumPy Introduction

Demonstration:

`01_NumPy_Introduction.ipynb`

Exercises (Learning Objective 1):

`Ex_01_NumPy_Introduction_Exercises.ipynb`

Example solutions to exercises:

`Ex_01_NumPy_Introduction_Solutions.ipynb`

Pandas Introduction

Demonstration:

`02_Pandas_Introduction.ipynb`

Exercises (Learning Objective 3):

`Ex_02_Pandas_Introduction_Exercises.ipynb`

Example solutions to exercises:

`Ex_02_Pandas_Introduction_Solutions.ipynb`

Python Plotting

Demonstration:

`03_Python_Plotting.ipynb`

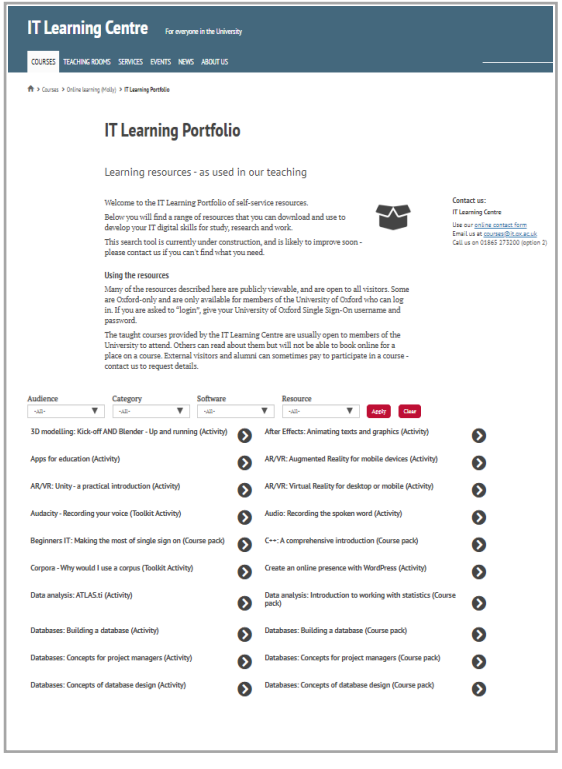
Exercises (Learning Objective 4):

Try out some examples from here:
https://plotnine.readthedocs.io/en/stable/gallery.html

Find the resources for this workshop in our IT Learning Portfolio

Download the files (and more) from the IT Learning Portfolio at

skills.it.ox.ac.uk/it-learning-portfolio



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