

Github: https://github.com/ReneStander/BMG_Intro_R_Python

Introduction to Python Programming

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Department of Statistics, University of Pretoria

29 & 30 September 2025

BILL & MELINDA
GATES *foundation*

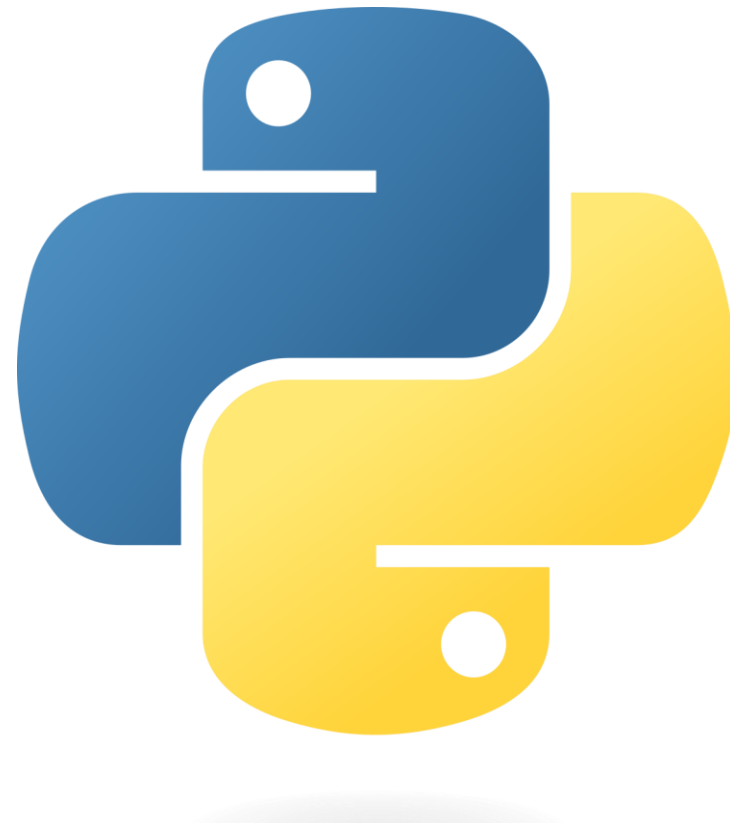


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Outline

1. Introduction to Python
2. Basics of the programming language
3. Data manipulation
4. Data visualization
5. Basic statistical analysis



Program

09:00 – 10:30	Session 1
10:30 – 10:45	Break
10:45 – 12:00	Session 2
12:00 – 13:00	Lunch
13:00 – 14:30	Session 3
14:30 – 14:45	Break
14:45 – 16:00	Session 4

Resources

- Downey, A.B., 2012. *Think python*. O'Reilly Media, Inc.
<https://alldowney.github.io/ThinkPython/#>
- Adhikari, A., DeNero, J. and Wagner, D., 2022. *Computational and Inferential Thinking: The Foundations of Data Science*, Second edition, University of California, Berkeley.
<https://inferentialthinking.com/>

Introduction to Python

Why Python?

- Mature programming language.
- Has excellent properties for newbie programmers.
- Currently one of the most flexible programming languages.
- Has a large ecosystem of libraries making it easy for Data Scientists.



Applications developed with Python you may know...



NETFLIX



Running Python in Google Colab

Google Colab

- Hosted **Jupyter Notebook** service.
- Required **no** hardware or software to be installed on your device.
- Provides free access to computing resources such as GPUs.

<https://colab.google/notebooks/>

Running Python in Google Colab

The screenshot shows the Google Colab web interface. At the top, the file name 'Untitled1.ipynb' is displayed next to a star icon. A green box labeled 'Name your file' has an arrow pointing to the file name. Below the file name is a menu bar with options: File, Edit, View, Insert, Runtime, Tools, Help, and a link for 'All changes saved'. On the right side of the top bar are icons for 'Comment', 'Share', a settings gear, and a user profile picture. A green box labeled 'You can share the file with your collaborators' has an arrow pointing to the 'Share' icon. The main workspace has a left sidebar with icons for file management and a top bar with '+ Code' and '+ Text' buttons. A green box labeled 'You can add code chunks and text boxes' has an arrow pointing to these buttons. The main area contains a code cell with a play button icon and the text 'Start coding or generate with AI.'. On the right side of the code cell is a context menu with icons for undo, redo, link, comment, settings, insert, delete, and a more options menu.

Untitled1.ipynb ☆

File Edit View Insert Runtime Tools Help [All changes saved](#)

+ Code + Text

Start coding or generate with AI.

Comment Share ⚙️ 👤

Connect Gemini

↑ ↓ 🔗 💬 ⚙️ 📄 🗑️ ⋮

Name your file

You can add code chunks and text boxes

You can share the file with your collaborators

Running Python in Google Colab

The screenshot displays the Google Colab interface for a notebook titled 'Untitled1.ipynb'. The 'Runtime' menu is open, showing various execution options. The 'Change runtime type' option is highlighted with a green box. To the right, the 'Change runtime type' dialog is open, also with a green box around the 'Runtime type' dropdown which is set to 'Python 3'. The 'Hardware accelerator' section shows 'CPU' as the selected option, with other options like 'T4 GPU', 'A100 GPU', 'L4 GPU', and 'TPU v2-8' available. A link to 'Purchase additional compute units' is visible at the bottom of the dialog.

Untitled1.ipynb ☆

File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

Start coding or

Run all Ctrl+F9

Run before Ctrl+F8

Run the focused cell Ctrl+Enter

Run selection Ctrl+Shift+Enter

Run after Ctrl+F10

Interrupt execution Ctrl+M I

Restart session Ctrl+M .

Restart session and run all

Disconnect and delete runtime

Change runtime type

Manage sessions

View resources

View runtime logs

Comment Share

Connected Gemini

Change runtime type

Runtime type

Python 3

Hardware accelerator ?

☒ CPU ☐ T4 GPU ☐ A100 GPU ☐ L4 GPU

☐ TPU v2-8

Want access to premium GPUs? [Purchase additional compute units](#)

Cancel Save

Running Python in Google Colab

The screenshot displays the Google Colab interface. On the left, the 'Files' sidebar is open, showing a file explorer with a folder named 'sample_data'. A green box labeled '1' highlights the folder icon, and a green box labeled '2' highlights the upload icon. A green box labeled '3' points to a text box that says 'Navigate the file explorer that pops up to select the file that you want to import'. The main area shows a code editor with a prompt 'Start coding or generate with AI.' and a toolbar with various icons. The bottom status bar indicates 'Connected to Python 3 Google Compute Engine backend' and '74.89 GB available'.

1

2

3

Navigate the file explorer that pops up to select the file that you want to import

Files

sample_data

Start coding or generate with AI.

RAM

Disk

Gemini

<>

Disk

74.89 GB available

Connected to Python 3 Google Compute Engine backend

Installing Python

1. Download Anaconda navigator. <https://www.anaconda.com/download>



2. Access the Python IDE, **Spyder**, through the Anaconda navigator.



Fundamental Python Libraries for Data Scientists

- **NumPy:** Provides support for multidimensional **arrays with basic operations on them** and useful linear algebra functions.
- **SciPy:** Provides a collection of **numerical algorithms** and domain-specific toolboxes, including signal processing, optimization and statistics.
- **Matplotlib:** Enables **data visualization**.
- **Pandas:** Provides high performance **data structures** and data analysis tools.
- **Scikit-Learn:** Offers simple and efficient tools for **common tasks in data analysis** such as classification, regression, clustering, and many more...

Coding scripts for this course

Github:

https://github.com/ReneStander/BMG_Intro_R_Python

Coding scripts for this course



BMG_Intro_R_Python Public



Pin



Watch



main ▾



1 Branch



0 Tags



Go to file



<> Code ▾



ReneStander Created using Colab

6e7e9c9 · 3 minutes ago



11 Commits



Intro to Python

Created using Colab

3 minutes ago



Intro to R

Prepare files for BMG 2025

13 hours ago

Coding scripts for this course

The screenshot shows a GitHub repository interface. The top navigation bar includes links for Code, Issues, Pull requests, Actions, Projects, Wiki, Security, Insights, and Settings. The left sidebar shows the file explorer with a tree view under the 'Intro to Python' folder. The main content area displays the file 'BMG_Intro_R_Python / Intro to Python / BMG Workshop - Intro + Basics.ipynb'. Below the file name, it indicates the file was created using Colab by user 'ReneStander' 9 minutes ago. A green box highlights the 'Open in Colab' button. The notebook preview shows the title 'Introduction to Python workshop' by Dr Rene Stander, dated 30 September 2025, followed by a list of sources.

<> Code Issues Pull requests Actions Projects Wiki Security Insights Settings

Files

main

Go to file

Intro to Python

- BMG Workshop - Basic statistic...
- BMG Workshop - Basic statistic...
- BMG Workshop - Data manipul...
- BMG Workshop - Data visualisa...
- BMG Workshop - Intro + Basics....
- RacingGameData.csv
- Spiders.csv
- SuperAnimals.csv

Intro to R

BMG_Intro_R_Python / Intro to Python / BMG Workshop - Intro + Basics.ipynb

ReneStander Created using Colab 9aa7180 · 9 minutes ago History

Preview Code Blame Raw Copy Download Edit

Open in Colab

Introduction to Python workshop

Dr Rene Stander

30 September 2025

Sources:

- Downey, AB., 2012. Think Python, O'Reilly Media, Inc. (<https://alldowney.github.io/ThinkPython/>)
- Adhikari, A., DeNero, J. and Wagner, D., 2022. Computational and Inferential Thinking: The Foundations of Data Science, Second edition, University of California, Berkeley. (<https://inferentialthinking.com/chapters/intro.html>)

Coding scripts for this course

The screenshot displays the JupyterLab web interface. At the top, the header shows the Orange3 logo, the notebook title 'BMG Workshop - Intro + Basics.ipynb', and a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. On the right, there are icons for settings, a 'Share' button, and a user profile. Below the header, a toolbar contains 'Commands', '+ Code', '+ Text', 'Run all', and a 'Copy to Drive' button highlighted with a green box. To the right of this toolbar is a 'Connect' button, also highlighted with a green box. A left sidebar contains icons for a menu, search, code editor, key, and file explorer. The main workspace shows a notebook titled 'Introduction to Python workshop' by 'Dr Rene Stander' dated '30 September 2025'. It lists two sources: 'Downey, AB., 2012. Think Python, O'Reilly Media, Inc. (<https://alldowney.github.io/ThinkPython/>)' and 'Adhikari, A., DeNero, J. and Wagner, D., 2022. Computational and Inferential Thinking: The Foundations of Data Science, Second edition, University of California, Berkeley. (<https://inferentialthinking.com/chapters/intro.html>)'. Below the notebook content, a section titled 'Introduction to Python' is expanded, showing the instruction 'Check the Python version and the installed packages'. At the bottom, a code editor shows the first line of a script: `[] # Python version`.

BMG Workshop - Intro + Basics.ipynb

File Edit View Insert Runtime Tools Help

Commands + Code + Text Run all Copy to Drive

Connect

Introduction to Python workshop

Dr Rene Stander

30 September 2025

Sources:

- Downey, AB., 2012. Think Python, O'Reilly Media, Inc. (<https://alldowney.github.io/ThinkPython/>)
- Adhikari, A., DeNero, J. and Wagner, D., 2022. Computational and Inferential Thinking: The Foundations of Data Science, Second edition, University of California, Berkeley. (<https://inferentialthinking.com/chapters/intro.html>)

Introduction to Python

Check the Python version and the installed packages

```
[ ] # Python version
```

Intro + Basics

Open the notebook named **BMG Workshop - Intro + Basics.ipynb** in Google Colab

This part of the work does not require any additional data sets

Github:

https://github.com/ReneStander/BMG_Intro_R_Python



Data manipulation

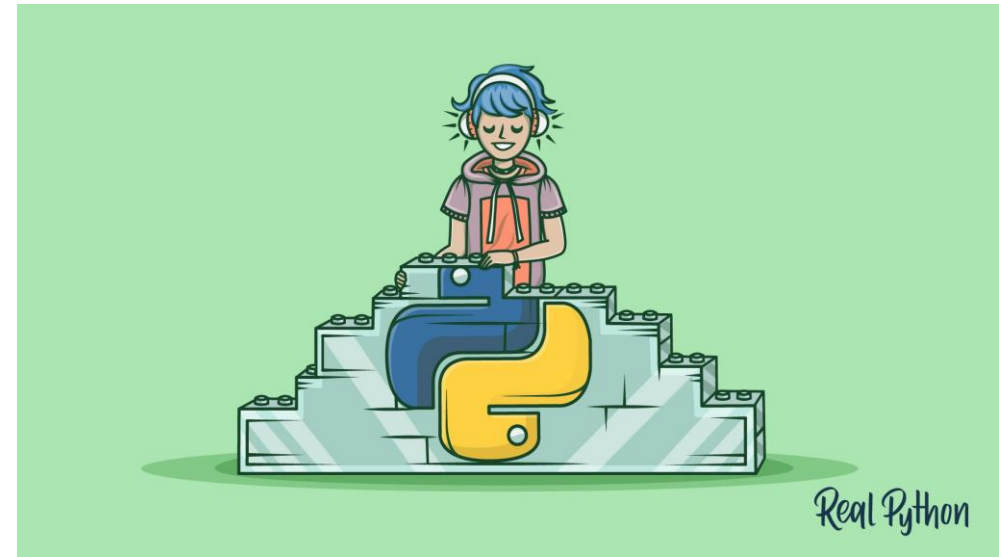
Open the notebook named **BMG Workshop – Data manipulation.ipynb** in Google Colab

To run the code in this notebook, please upload the following data sets into Google Colab:

- **RacingGameData.csv**

Github:

https://github.com/ReneStander/BMG_Intro_R_Python



Data visualisation

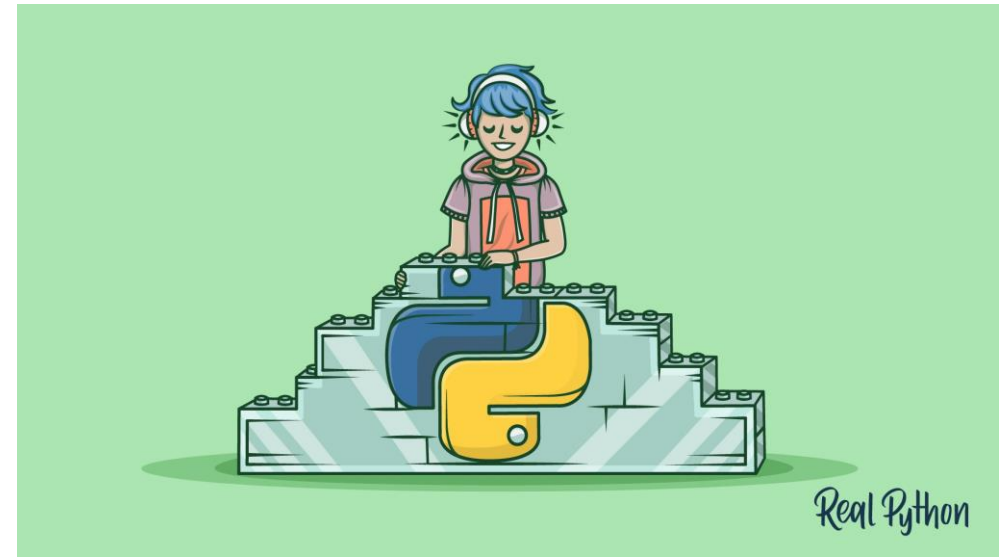
Open the notebook named **BMG Workshop – Data visualisation.ipynb** in Google Colab

To run the code in this notebook, please upload the following data sets into Google Colab:

- **SuperAnimals.csv**
- **Spiders.csv**

Github:

https://github.com/ReneStander/BMG_Intro_R_Python



Data visualisation

Open the notebook named **BMG Workshop – Data visualisation.ipynb** in Google Colab

To run the code in this notebook, please upload the following data sets into Google Colab:

- **SuperAnimals.csv**
- **Spiders.csv**

Github:

https://github.com/ReneStander/BMG_Intro_R_Python



Statistical analysis – Categorical variables

Open the notebook named **BMG Workshop – Basic statistical analysis – Categorical variables.ipynb** in Google Colab

This part of the work does not require any additional data sets

Github:

https://github.com/ReneStander/BMG_Intro_R_Python



Statistical analysis – Categorical variables

Open the notebook named **BMG Workshop – Basic statistical analysis – Numerical variables.ipynb** in Google Colab

To run the code in this notebook, please upload the following data sets into Google Colab:

- **SuperAnimals.csv**
- **Spiders.csv**

Github:

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