

Python for Accounting Applications

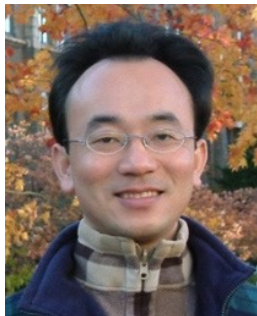
Python Programming and Data Science

1121PAA02

ACC2, NTPU (M5265) (Fall 2023)

Wed 6, 7, 8, (14:10-17:00) (9:10-12:00) (B3F10)

aws
educate | Cloud
Ambassador
2020 Cohort



Min-Yuh Day, Ph.D,
Associate Professor

Institute of Information Management, National Taipei University

<https://web.ntpu.edu.tw/~myday>

2023-09-20



Syllabus

Week	Date	Subject/Topics
1	2023/09/13	Introduction to Python for Accounting Applications
2	2023/09/20	Python Programming and Data Science
3	2023/09/27	Foundations of Python Programming
4	2023/10/04	Data Structures
5	2023/10/11	Control Logic and Loops
6	2023/10/18	Functions and Modules
7	2023/10/25	Files and Exception Handling
8	2023/11/01	Midterm Project Report

Syllabus

Week Date Subject/Topics

9 2023/11/08 Data Analytics and Visualization with Python

10 2023/11/15 Obtaining Data From the Web with Python

11 2023/11/22 Statistical Analysis with Python

12 2023/11/29 Machine Learning with Python

**13 2023/12/06 Text Analytics with Python and
Large Language Models (LLMs)**

14 2023/12/13 Applications of Accounting Data Analytics with Python

15 2023/12/20 Applications of ESG Data Analytics with Python

16 2023/12/27 Final Project Report

Python Programming and Data Science

Outline

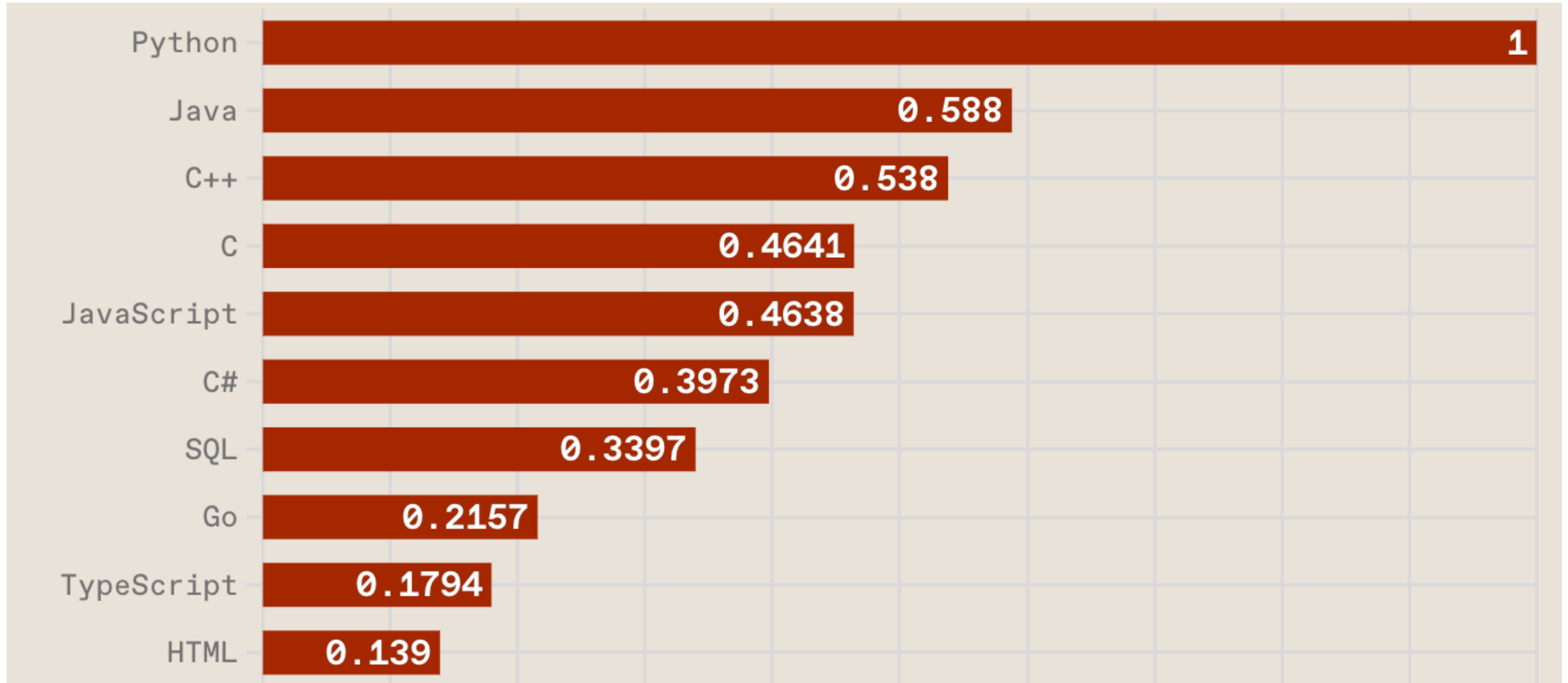
- **Python Programming**
- **Data Science**



Python

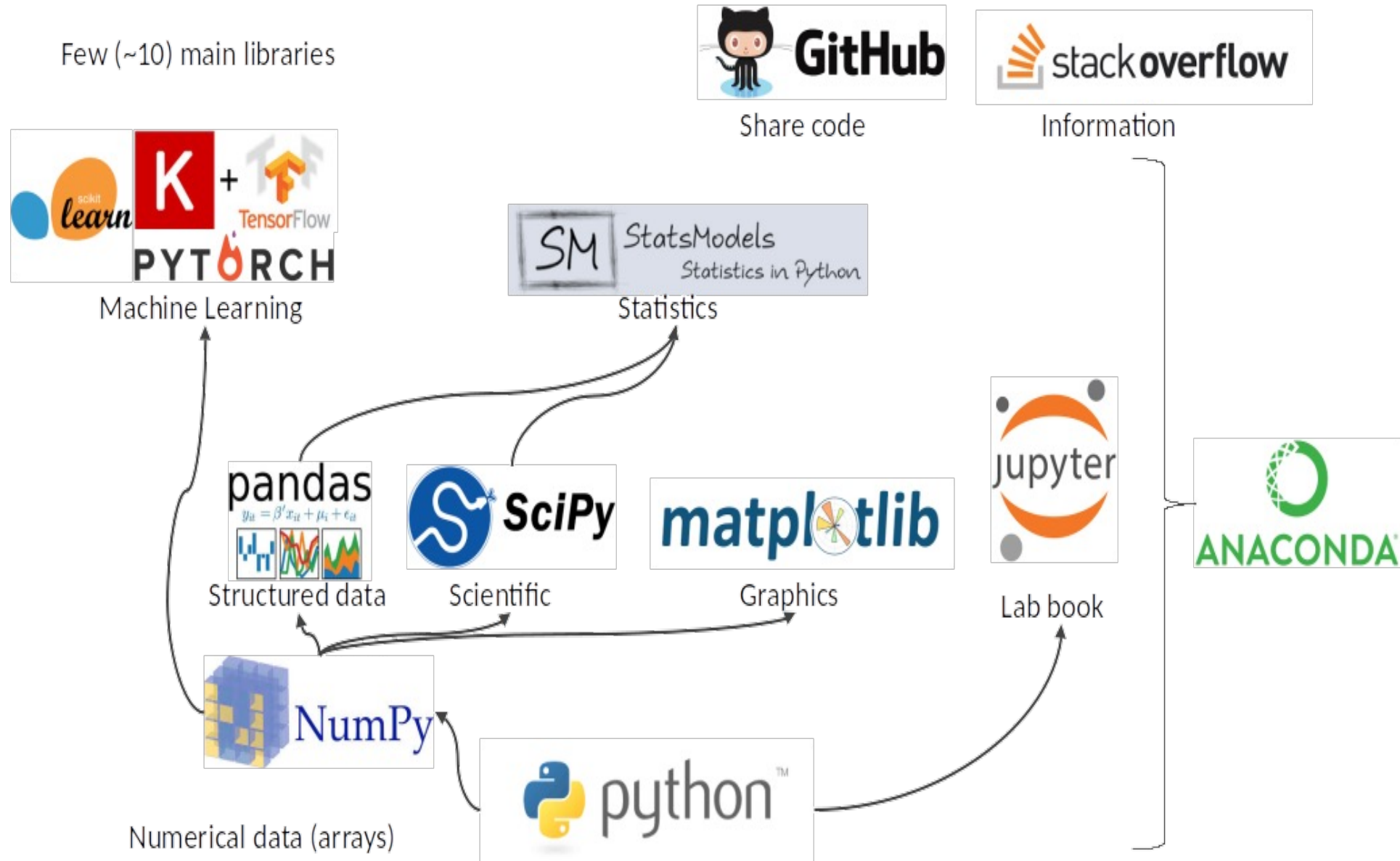
Programming

Top Programming Languages

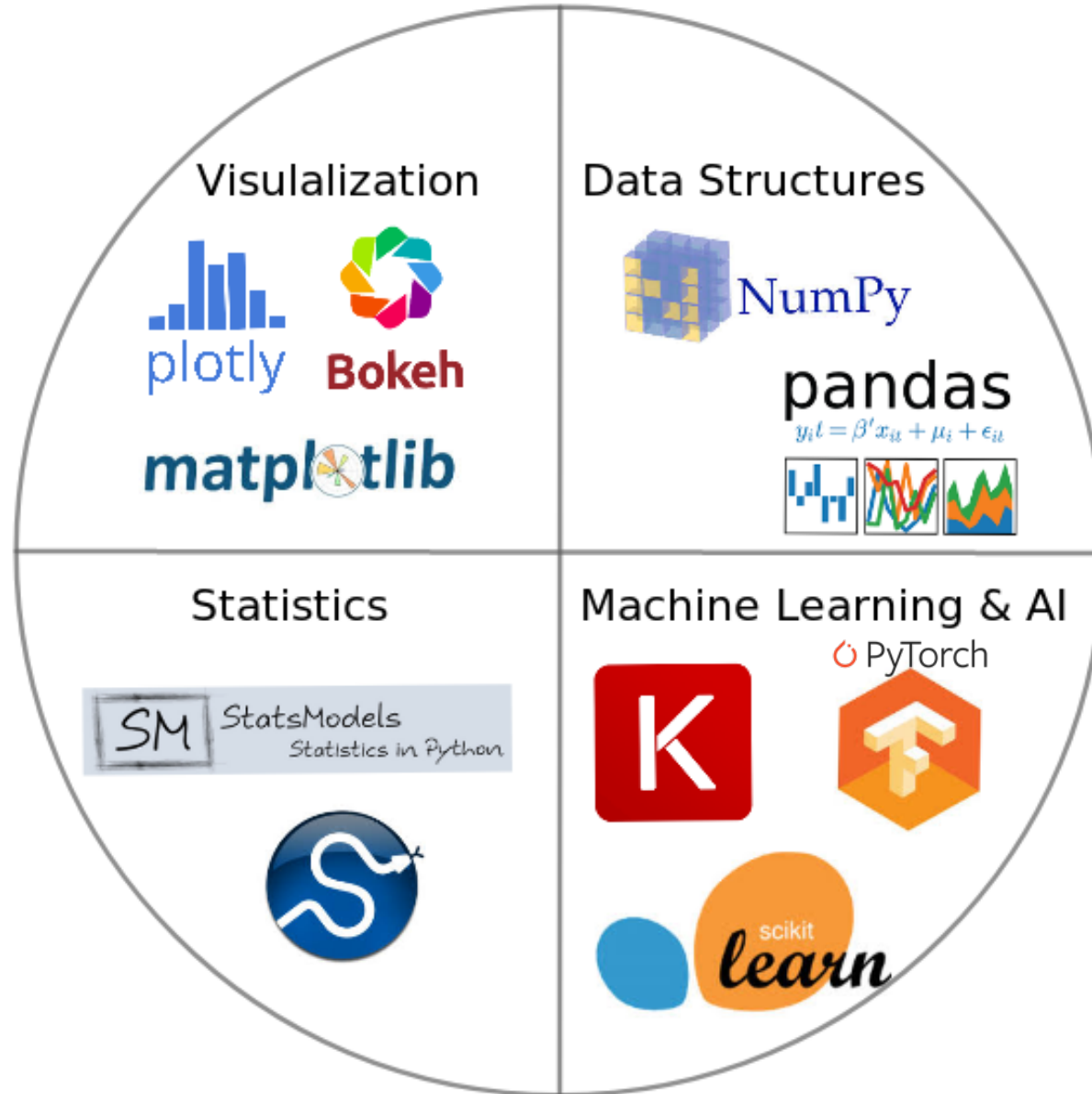


Python is an
interpreted,
object-oriented,
high-level
programming language
with
dynamic semantics.

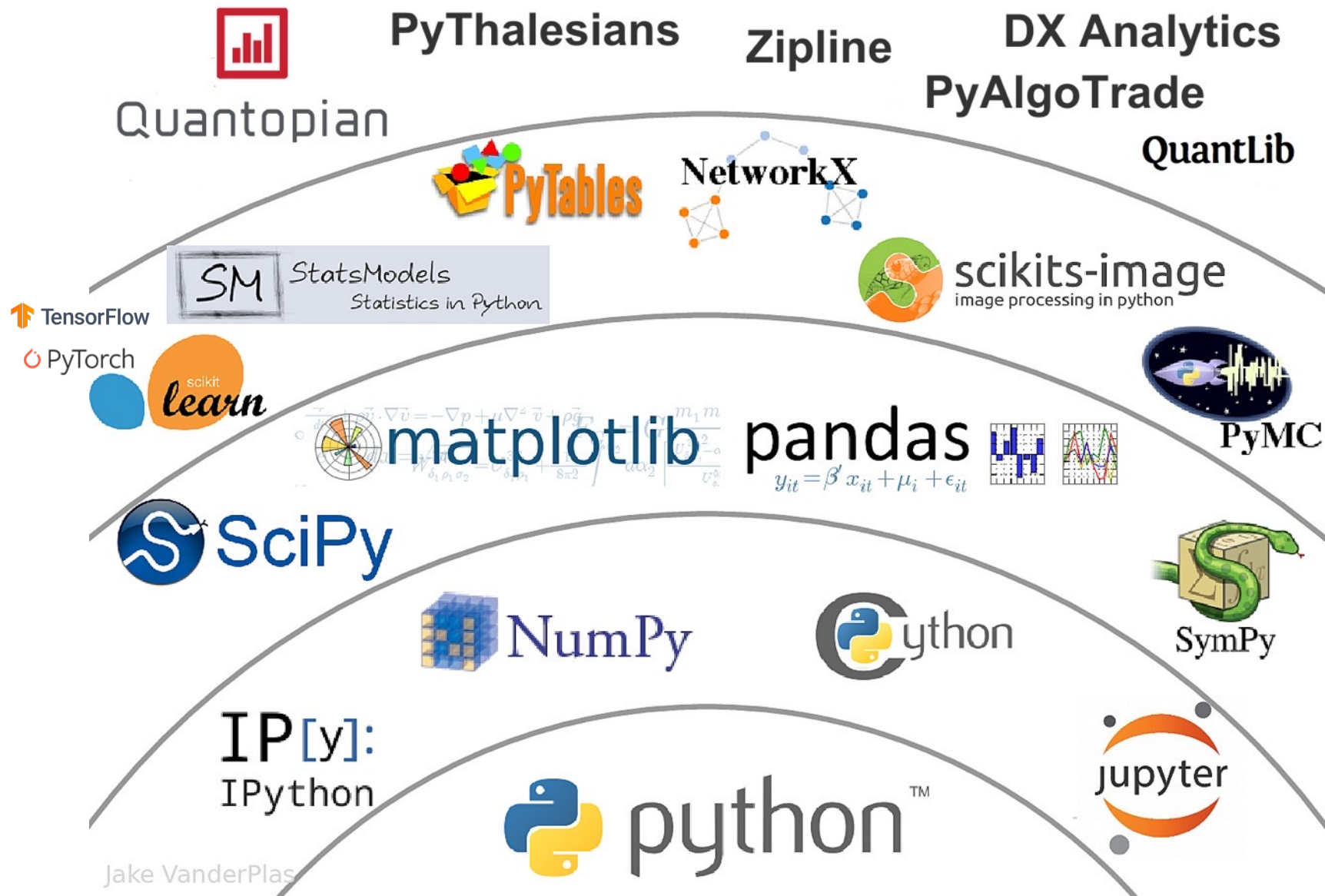
Python Ecosystem for Data Science



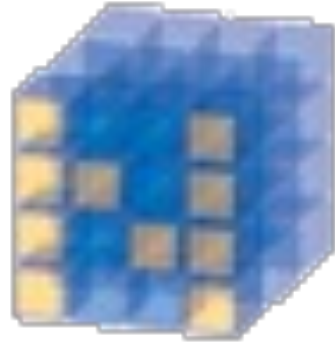
Python Ecosystem for Data Science



The Quant Finance PyData Stack



NumPy



NumPy

Base

N-dimensional array

package

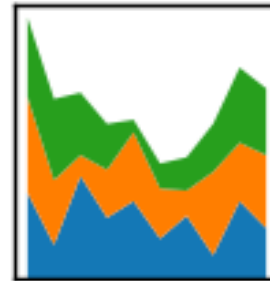
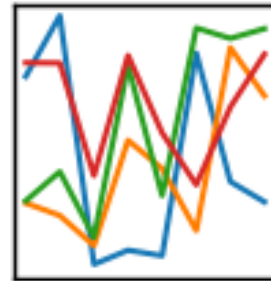
Python
matplotlib
matplotlib

Python

Pandas

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



- Python Tutorial
- Python HOME**
- Python Intro
- Python Get Started
- Python Syntax
- Python Comments
- Python Variables
- Python Data Types
- Python Numbers
- Python Casting
- Python Strings
- Python Booleans
- Python Operators
- Python Lists
- Python Tuples
- Python Sets
- Python Dictionaries
- Python If...Else
- Python While Loops
- Python For Loops
- Python Functions

Python Tutorial

[← Home](#)

[Next >](#)

Learn Python

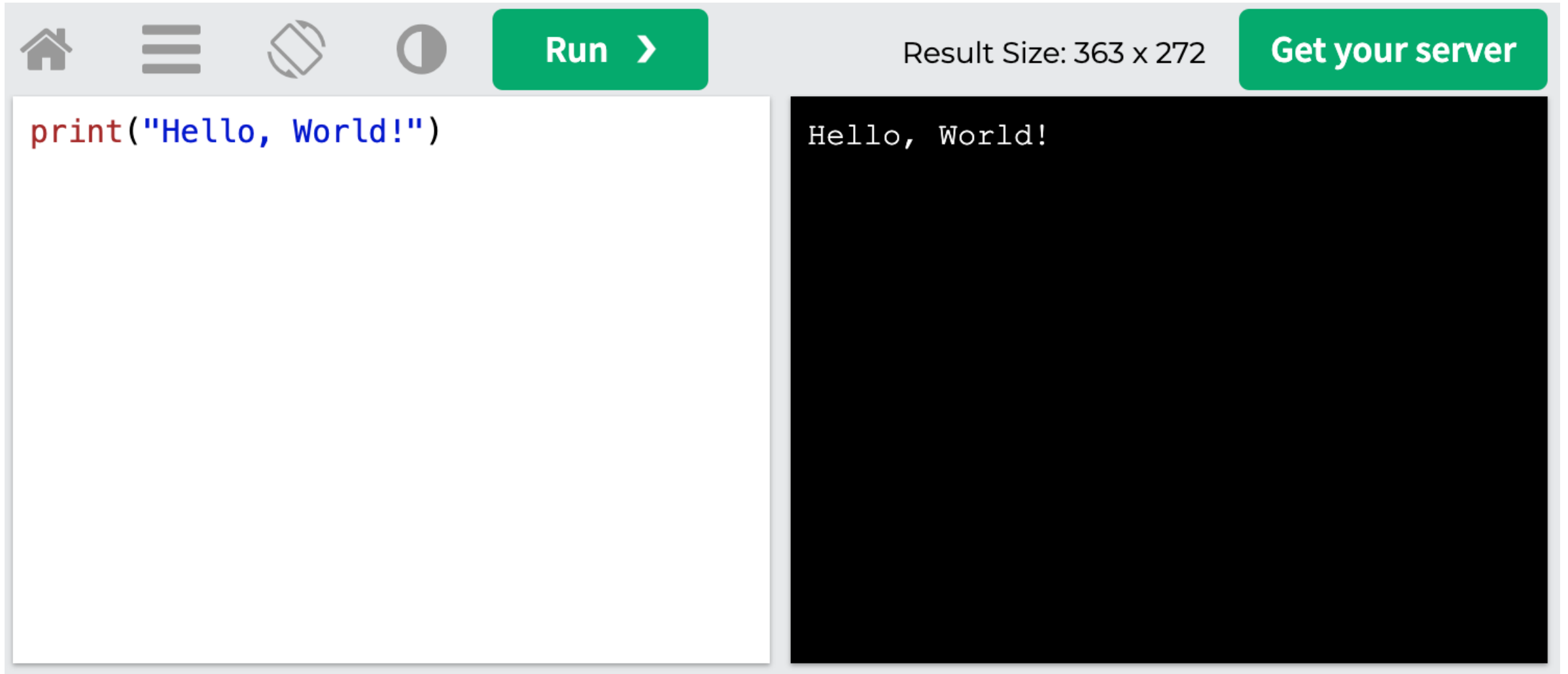
Python is a popular programming language.
Python can be used on a server to create web applications.

[Start learning Python now »](#)

Learning by Examples

With our "Try it Yourself" editor, you can edit Python code and view the result.

W3Schools Python: Try Python

A screenshot of the W3Schools Python 'Try Python' interface. The interface has a light gray header with navigation icons (home, menu, refresh, moon) on the left, a green 'Run >' button in the center, and 'Result Size: 363 x 272' and a green 'Get your server' button on the right. Below the header, there is a white code editor on the left containing the Python code `print("Hello, World!")` and a black terminal window on the right displaying the output 'Hello, World!'.

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Welcome

Welcome to the LearnPython.org interactive Python tutorial.

Whether you are an experienced programmer or not, this website is intended for everyone who wishes to learn the Python programming language.

You are welcome to join our group on [Facebook](#) for questions, discussions and updates.

After you complete the tutorials, you can get certified at [LearnX](#) and add your certification to your LinkedIn profile.

Just click on the chapter you wish to begin from, and follow the instructions. Good luck!

<https://www.learnpython.org/>

Google's Python Class

Google for Education > Python

Search

English



Filter

Overview

Python Set Up

Python Intro

Strings

Lists

Sorting

Dicts and Files

Regular Expressions

Utilities

Lecture Videos

1.1 Introduction, strings [↗](#)

1.2 Lists and sorting [↗](#)

1.3 Dicts and files [↗](#)

2.1 Regular expr [↗](#)

2.2 Utilities [↗](#)

2.3 Utilities urllib [↗](#)

2.4 Conclusions [↗](#)

Python Exercises



Home > Products > Google for Education > Python

Was this helpful? [👍](#) [🗨️](#)

Google's Python Class [📄](#)

Welcome to Google's Python Class -- this is a free class for people with a little bit of programming experience who want to learn Python. The class includes written materials, lecture videos, and lots of code exercises to practice Python coding. These materials are used within Google to introduce Python to people who have just a little programming experience. The first exercises work on basic Python concepts like strings and lists, building up to the later exercises which are full programs dealing with text files, processes, and http connections. The class is geared for people who have a little bit of programming experience in some language, enough to know what a "variable" or "if statement" is. Beyond that, you do not need to be an expert programmer to use this material.

To get started, the Python sections are linked at the left -- [Python Set Up](#) to get Python installed on your machine, [Python Introduction](#) for an introduction to the language, and then [Python Strings](#) starts the coding material, leading to the first exercise. The end of each written section includes a link to the code exercise for that section's material. The lecture videos parallel the written materials, introducing Python, then strings, then first exercises, and so on. At Google, all this material makes up an intensive 2-day class, so the videos are organized as the day-1 and day-2 sections.

This material was created by [Nick Parlante](#) working in the engEDU group at Google. Special thanks for the help from my Google colleagues John Cox, Steve Glassman, Piotr Kaminski, and Antoine Picard. And finally thanks to Google and my director Maggie Johnson for the enlightened generosity to put these materials out on the internet for free under the [Creative Commons Attribution 2.5](#) license -- share and enjoy!

<https://developers.google.com/edu/python>

Google Colab

Table of contents

- Getting Started
- Highlighted Features
 - TensorFlow execution
- GitHub
- Visualization
- Forms
- Examples
- Local runtime support

SECTION

Welcome to Colaboratory!

Colaboratory is a free Jupyter notebook environment that requires no setup and runs entirely in the cloud. See our [FAQ](#) for more info.

Getting Started

- [Overview of Colaboratory](#)
- [Loading and saving data: Local files, Drive, Sheets, Google Cloud Storage](#)
- [Importing libraries and installing dependencies](#)
- [Using Google Cloud BigQuery](#)
- [Forms, Charts, Markdown, & Widgets](#)
- [TensorFlow with GPU](#)
- [Machine Learning Crash Course: Intro to Pandas & First Steps with TensorFlow](#)

Highlighted Features

Seedbank

Looking for Colab notebooks to learn from? Check out [Seedbank](#), a place to discover interactive machine learning examples.

TensorFlow execution

Colaboratory allows you to execute TensorFlow code in your browser with a single click. The example below adds two matrices.

$$\begin{bmatrix} 1. & 1. & 1. \end{bmatrix} + \begin{bmatrix} 1. & 2. & 3. \end{bmatrix} = \begin{bmatrix} 2. & 3. & 4. \end{bmatrix}$$

Connect Google Colab in Google Drive

The image shows a browser window with the Google Drive interface. The address bar displays 'https://drive.google.com/drive/u/2/my-drive'. The main navigation bar includes the Drive logo, a search bar, and utility icons. On the left, a sidebar lists navigation options: 'New', 'My Drive', 'Computers', 'Shared with me', 'Recent', 'Starred', 'Trash', 'Backups', and 'Storage'. The 'New' button is highlighted with a red dashed border. A dropdown menu is open from 'New', listing options: 'New folder...', 'Upload files...', 'Upload folder...', 'Google Docs', 'Google Sheets', 'Google Slides', and 'More'. The 'More' option is also highlighted with a red dashed border. A second dropdown menu is open from 'More', listing: 'Google Forms', 'Google Drawings', 'Google My Maps', 'Google Sites', and 'Connect more apps'. The 'Connect more apps' option is highlighted with a red dashed border. The main content area shows a 'Files' section with a 'Name' column header and an upward arrow. A storage usage indicator shows '0 bytes of 15 GB used' with an 'UPGRADE STORAGE' link. A notification banner at the bottom left reads 'Get Backup and Sync for Mac'.

Google Colab

The screenshot shows the Google Drive interface with a 'Connect apps to Drive' dialog box open. The dialog box has a search bar at the top with 'colab' entered and highlighted by a red dashed border. Below the search bar, there are six app cards arranged in a 2x3 grid:

- ZIP Extractor**: Extract ZIP files to Google Drive. Extraction complete. 307,585 users.
- Lumin PDF**: Beautiful PDF Editor. 289,310 users.
- CloudConvert**: 373,161 users.
- Sejda**: Merge PDF - Split PDF - Sejda.com. 1106 reviews.
- DocHub**: Edit and Sign PDF Documents. 2,131,600 users.
- Google Forms**: 4,803,614 users.


The background shows the Google Drive sidebar with options like 'My Drive', 'Computers', 'Shared with me', 'Recent', 'Starred', 'Trash', 'Backups', and 'Storage'. The top navigation bar includes a search bar and various utility icons.

Google Colab

The image shows a browser window with the Google Drive interface. A modal dialog titled "Connect apps to Drive" is open, displaying a search for "colab". The search results show the "Colaboratory" app, which is highlighted with a red dashed border. The app's details include its logo, name, URL, description, category, and rating.

Connect apps to Drive

All

 **Colaboratory**
offered by <https://colab.research.google.com>
A data analysis tool that combines code, output, and descriptive text into one collaborative document.
Productivity
★★★★★ (195)

+ CONNECT

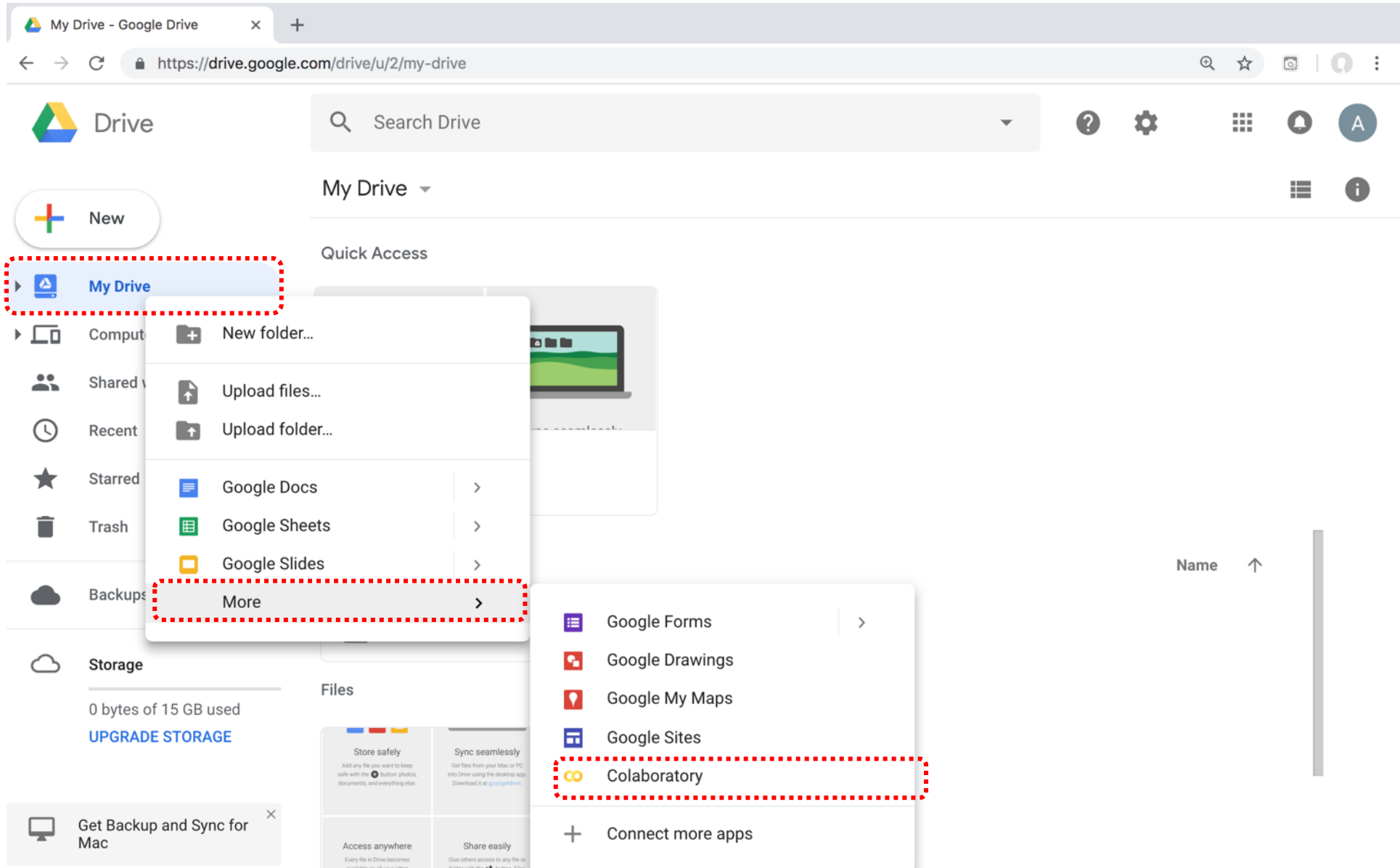
Name ↑

Get Backup and Sync for Mac

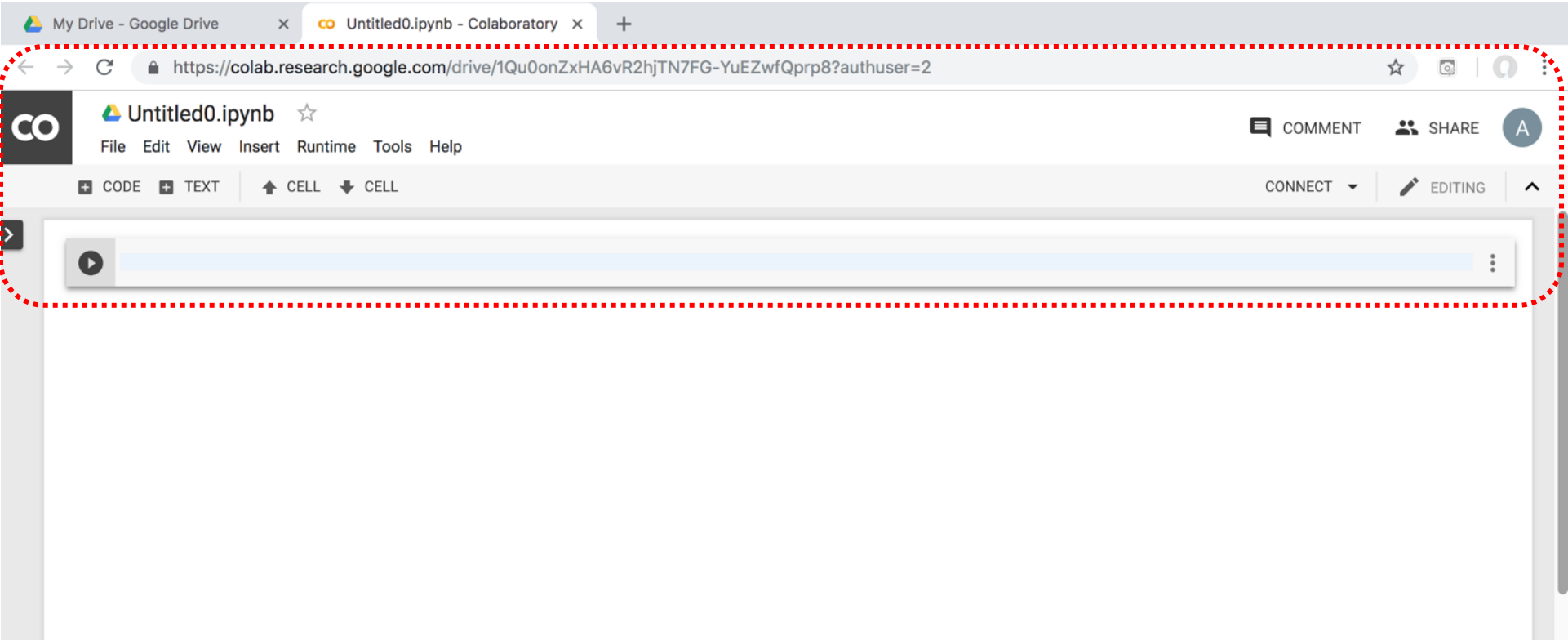
Connect Colaboratory to Google Drive

The screenshot shows the Google Drive web interface. A dialog box titled "Connect apps to Drive" is open, displaying a search for "colab". A confirmation message from Colaboratory is shown in the center, stating "Colaboratory was connected to Google Drive." and "Make Colaboratory the default app for files it can open" with a checked checkbox. An "OK" button is visible at the bottom right of the message. The background shows the Drive sidebar with categories like "My Drive", "Computers", "Shared with me", "Recent", "Starred", "Trash", "Backups", and "Storage". The storage status indicates "0 bytes of 15 GB used" with an "UPGRADE STORAGE" link. The top navigation bar includes the Drive logo, search bar, and various utility icons.

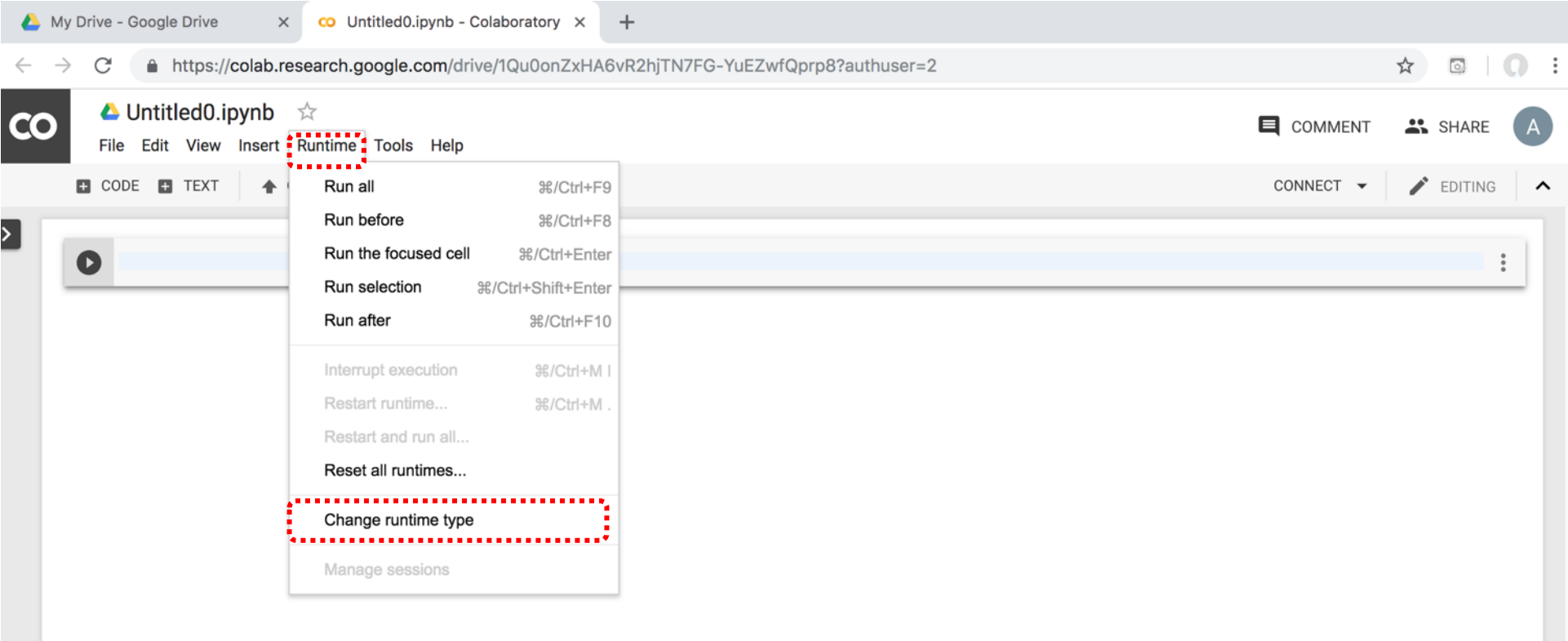
Google Colab



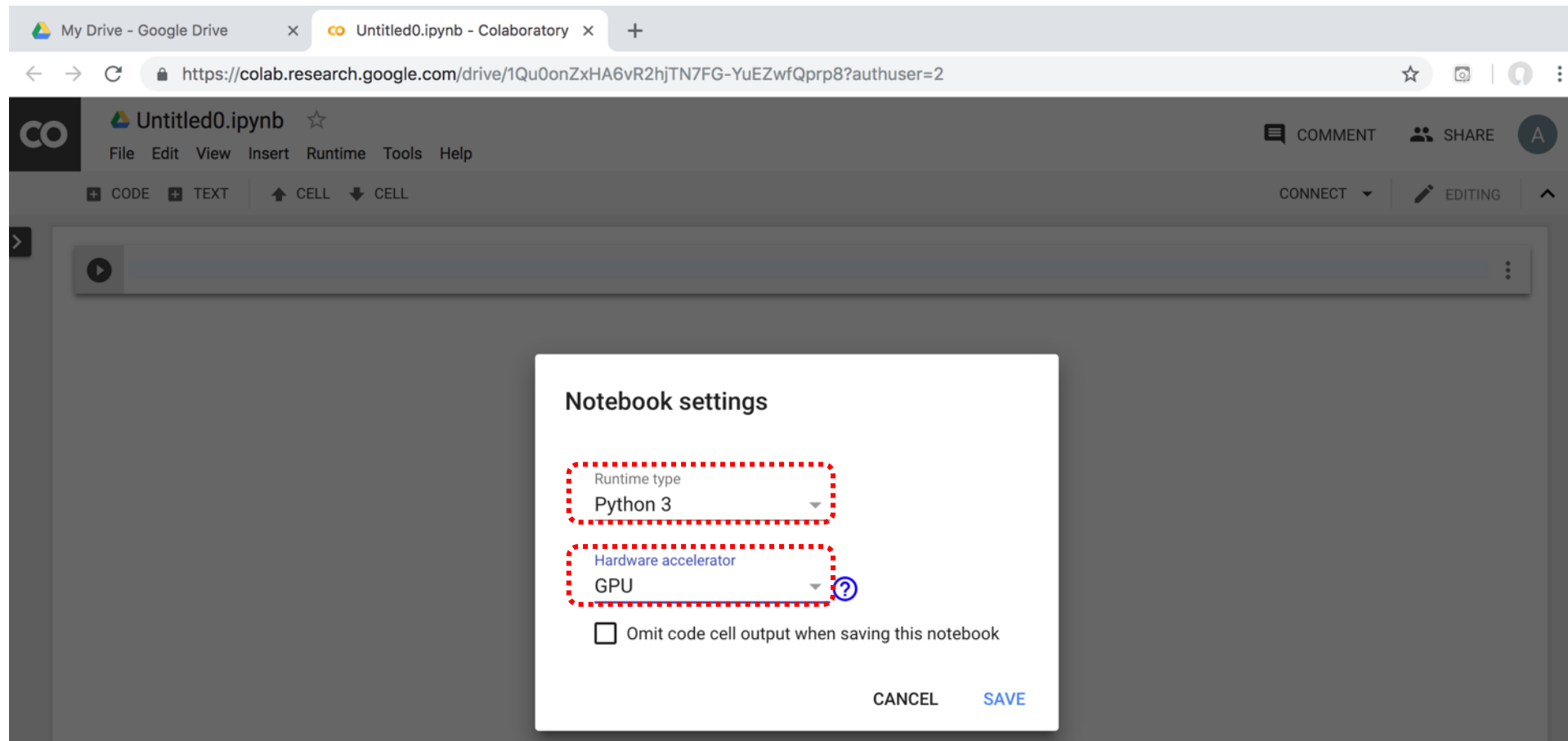
Google Colab



Google Colab



Run Jupyter Notebook Python3 GPU Google Colab



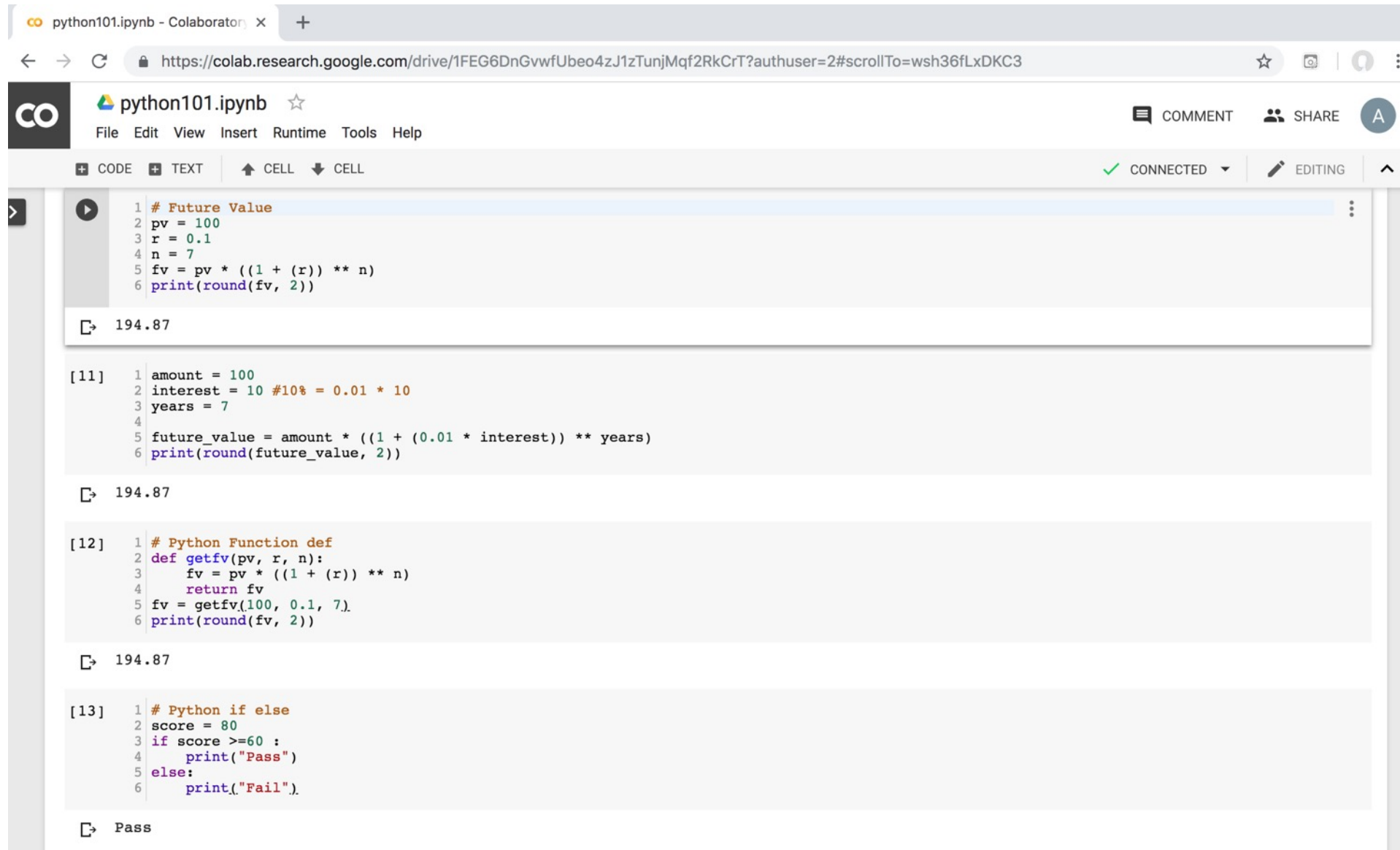
Google Colab Python Hello World

```
print('Hello World')
```



Python in Google Colab (Python101)

<https://colab.research.google.com/drive/1FEG6DnGvwfUbeo4zJ1zTunjMqf2RkCrT>



The screenshot shows a Google Colab notebook titled "python101.ipynb". The interface includes a browser address bar, a menu bar (File, Edit, View, Insert, Runtime, Tools, Help), and a toolbar with options for CODE, TEXT, CELL, and a status indicator showing "CONNECTED" and "EDITING".

The notebook contains four code cells, each followed by its output:

- Cell 1:** A code cell with the following Python code:

```
1 # Future Value
2 pv = 100
3 r = 0.1
4 n = 7
5 fv = pv * ((1 + (r)) ** n)
6 print(round(fv, 2))
```

The output is "194.87".
- Cell 2:** A code cell with the following Python code:

```
[11] 1 amount = 100
2 interest = 10 #10% = 0.01 * 10
3 years = 7
4
5 future_value = amount * ((1 + (0.01 * interest)) ** years)
6 print(round(future_value, 2))
```

The output is "194.87".
- Cell 3:** A code cell with the following Python code:

```
[12] 1 # Python Function def
2 def getfv(pv, r, n):
3     fv = pv * ((1 + (r)) ** n)
4     return fv
5 fv = getfv(100, 0.1, 7).
6 print(round(fv, 2))
```

The output is "194.87".
- Cell 4:** A code cell with the following Python code:

```
[13] 1 # Python if else
2 score = 80
3 if score >=60 :
4     print("Pass")
5 else:
6     print("Fail").
```

The output is "Pass".

<https://tinyurl.com/aintpupython101>



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Get Additional Installers



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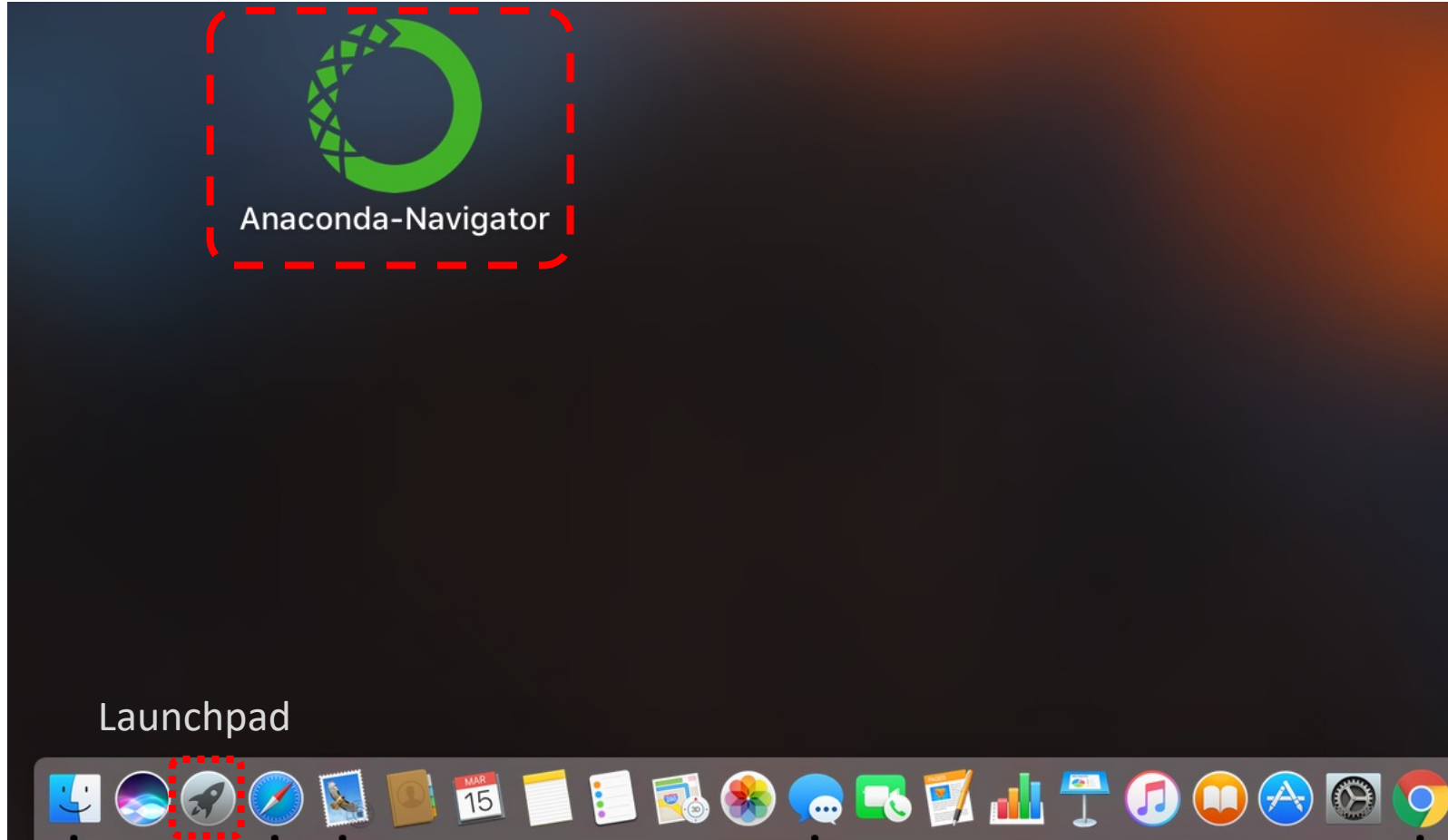




Python

HelloWorld

Anaconda-Navigator



Anaconda Navigator

The screenshot displays the Anaconda Navigator desktop application. At the top, the title bar reads "Anaconda Navigator". Below it, the application header features the "ANACONDA NAVIGATOR" logo on the left and a "Sign in to Anaconda Cloud" button on the right. A left-hand sidebar contains navigation options: "Home", "Environments", "Learning", and "Community". At the bottom of the sidebar are links for "Documentation", "Developer Blog", and "Feedback", along with social media icons for Twitter, YouTube, and GitHub.

The main content area is titled "Applications on" and shows a dropdown menu set to "base (root)" and a "Channels" button. A "Refresh" button is located in the top right of this section. The applications are arranged in a grid:

- jupyterlab** (0.31.5): An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture. [Launch]
- jupyter notebook** (5.4.0): Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis. [Launch]
- qtconsole** (4.3.1): PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more. [Launch]
- spyder** (3.2.6): Scientific PYTHON Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features. [Launch]
- vscode** (1.22.2): Streamlined code editor with support for development operations like debugging, task running and version control. [Launch]
- glueviz** (0.12.4): Multidimensional data visualization across files. Explore relationships within and among related datasets. [Install]

The "jupyter notebook" application card is highlighted with a red dashed border, and its "Launch" button is enclosed in a solid red box.

Jupyter Notebook

Home x

localhost:8888/tree/Documents/Data/BDA

jupyter Logout

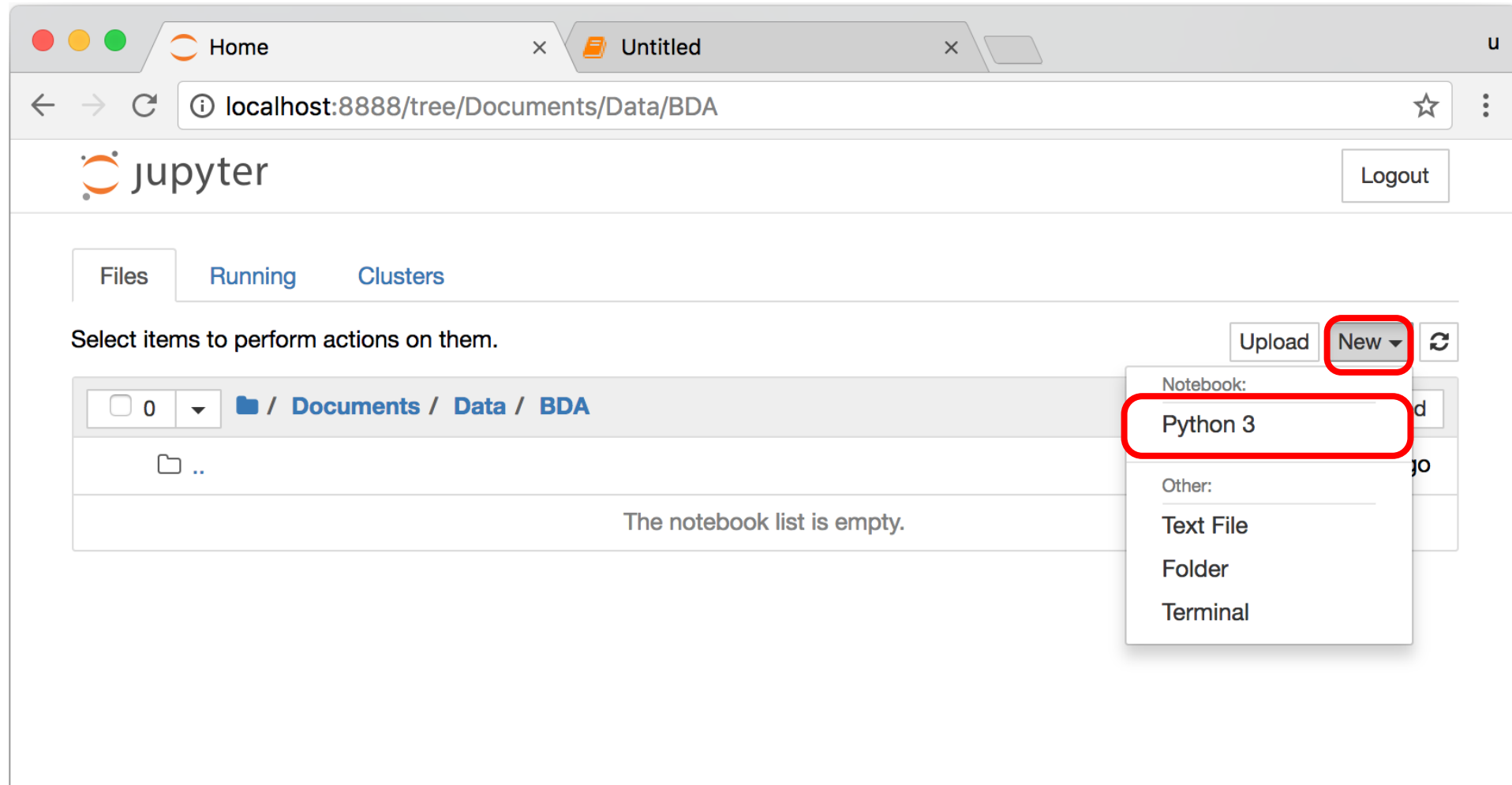
Files Running Clusters

Select items to perform actions on them. Upload New ↕ ↻

<input type="checkbox"/> 0	/ Documents / Data / BDA	Name ↓	Last Modified
<input type="checkbox"/>	..		seconds ago
The notebook list is empty.			

Jupyter Notebook

New Python 3



The screenshot shows a web browser window with the Jupyter Notebook interface. The browser's address bar displays `localhost:8888/tree/Documents/Data/BDA`. The Jupyter logo and a "Logout" button are visible at the top. Below the logo, there are tabs for "Files", "Running", and "Clusters". A message says "Select items to perform actions on them." To the right of this message are buttons for "Upload", "New", and a refresh icon. The "New" button is highlighted with a red circle. A dropdown menu is open, showing options under "Notebook:" and "Other:". The "Python 3" option under "Notebook:" is highlighted with a red rectangle. Other options include "Text File", "Folder", and "Terminal". The file browser below shows the path `/ Documents / Data / BDA` and a message that says "The notebook list is empty."

```
print("hello, world")
```

The screenshot shows a Jupyter Notebook interface in a web browser. The browser tabs include 'Home' and 'HelloWorld'. The address bar shows the URL 'localhost:8888/notebooks/Documents/Data/BDA/HelloWorld.ipynb'. The Jupyter logo and 'HelloWorld (autosaved)' are visible in the top left, along with a 'Logout' button and a Python logo. A menu bar contains 'File', 'Edit', 'View', 'Insert', 'Cell', 'Kernel', 'Widgets', and 'Help'. Below the menu is a toolbar with icons for file operations and a 'Run' button, which is circled in red. The main area contains a code cell with the text 'In [1]: print("hello, world")' and its output 'hello, world'. The code cell is also circled in red. Below it is an empty code cell labeled 'In []:'.



Python Fiddle

The screenshot shows the Python Fiddle web application in a browser. The browser's address bar displays 'pythonfiddle.com'. The application's header includes navigation buttons: 'Run', 'Reset', 'Share', 'Import', and 'Login', along with a 'Language' dropdown menu. The Python Fiddle logo, featuring a cloud with Python icons, is positioned on the right side of the header, with the text 'Python Cloud IDE' below it. A 'G+1' button and a '2.6k' counter are also visible. The main workspace is a code editor with two lines of Python code: '1 print("Hello Python Fiddle")' and '2'. On the left, a sidebar contains a list of 'Examples' such as 'Chaining comparison operators', 'Decorators', and 'Enumerate', along with 'Packages' and 'Hotkeys' sections. On the right, a form for saving the code is visible, with fields for 'Title', 'Description', and 'Tags', and a 'Save' button at the bottom.

Hello Python Fiddle

Text input and output

```
print("Hello World")
```

```
print("Hello World\nThis is a message")
```

```
x = 3  
print(x)
```

```
x = 2  
y = 3  
print(x, ' ', y)
```

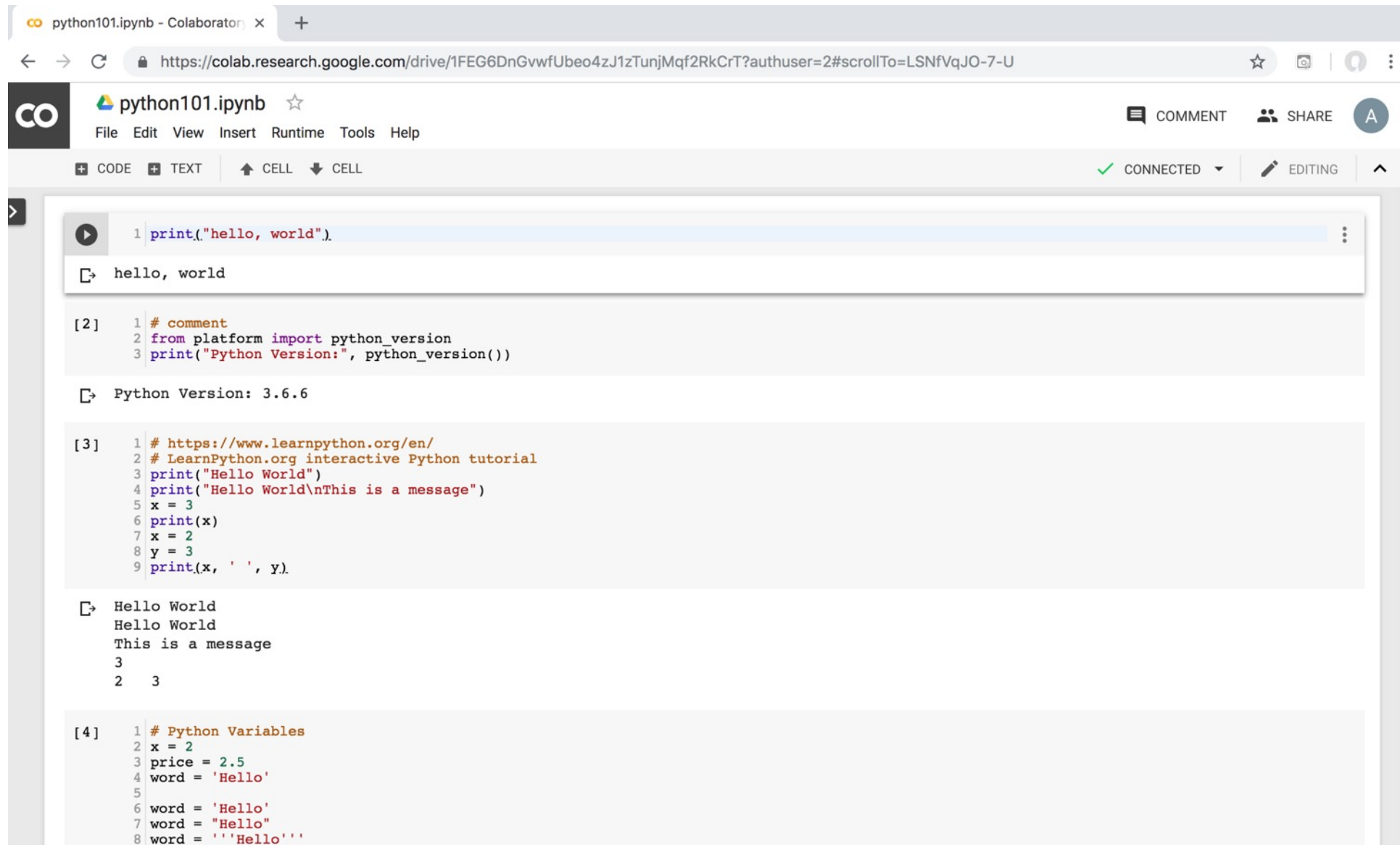
```
name = input("Enter a name: ")
```

```
x = int(input("What is x? "))
```

```
x = float(input("Write a number "))
```


Python in Google Colab

<https://colab.research.google.com/drive/1FEG6DnGvwfUbeo4zJ1zTunjMqf2RkCrT>



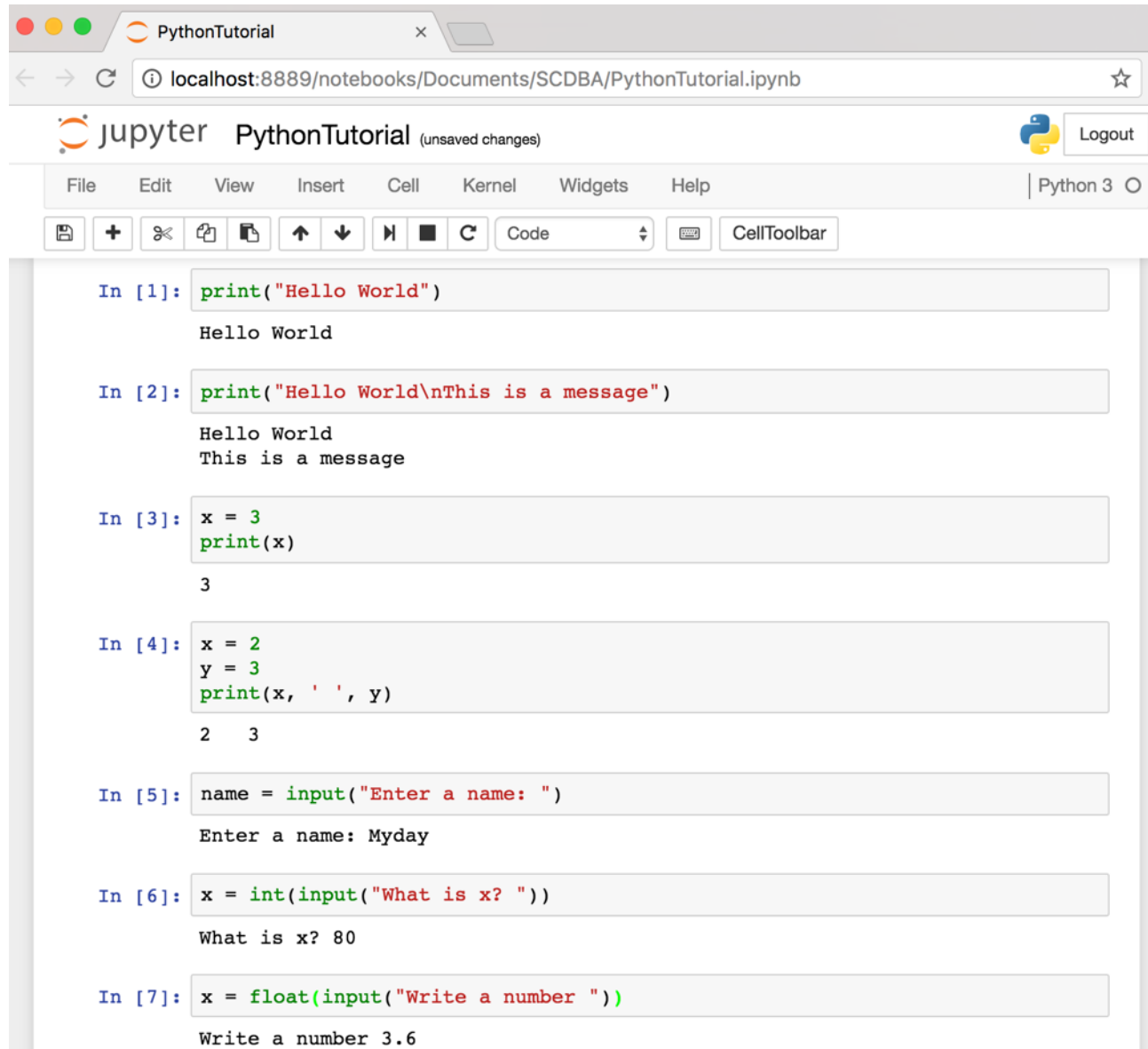
The screenshot shows a Google Colab notebook interface. The browser address bar displays the URL: <https://colab.research.google.com/drive/1FEG6DnGvwfUbeo4zJ1zTunjMqf2RkCrT?authuser=2#scrollTo=LSNfVqJO-7-U>. The notebook title is "python101.ipynb". The interface includes a menu bar (File, Edit, View, Insert, Runtime, Tools, Help) and a toolbar with options for CODE, TEXT, CELL, and a status indicator showing "CONNECTED" and "EDITING".

The notebook contains four code cells:

- Cell 1:** `print("hello, world").` Output: `hello, world`
- Cell 2:** `# comment`, `from platform import python_version`, `print("Python Version:", python_version())`. Output: `Python Version: 3.6.6`
- Cell 3:** `# https://www.learnpython.org/en/`, `# LearnPython.org interactive Python tutorial`, `print("Hello World")`, `print("Hello World\nThis is a message")`, `x = 3`, `print(x)`, `x = 2`, `y = 3`, `print(x, ' ', y).` Output: `Hello World`, `Hello World`, `This is a message`, `3`, `2 3`
- Cell 4:** `# Python Variables`, `x = 2`, `price = 2.5`, `word = 'Hello'`, `word = 'Hello'`, `word = "Hello"`, `word = '''Hello'''`

<https://tinyurl.com/aintpupython101>

Text input and output



The screenshot shows a Jupyter Notebook window titled "PythonTutorial" with the URL `localhost:8889/notebooks/Documents/SCDBA/PythonTutorial.ipynb`. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations and execution. The notebook contains seven input-output pairs:

```
In [1]: print("Hello World")
Hello World

In [2]: print("Hello World\nThis is a message")
Hello World
This is a message

In [3]: x = 3
print(x)
3

In [4]: x = 2
y = 3
print(x, ' ', y)
2  3

In [5]: name = input("Enter a name: ")
Enter a name: Myday

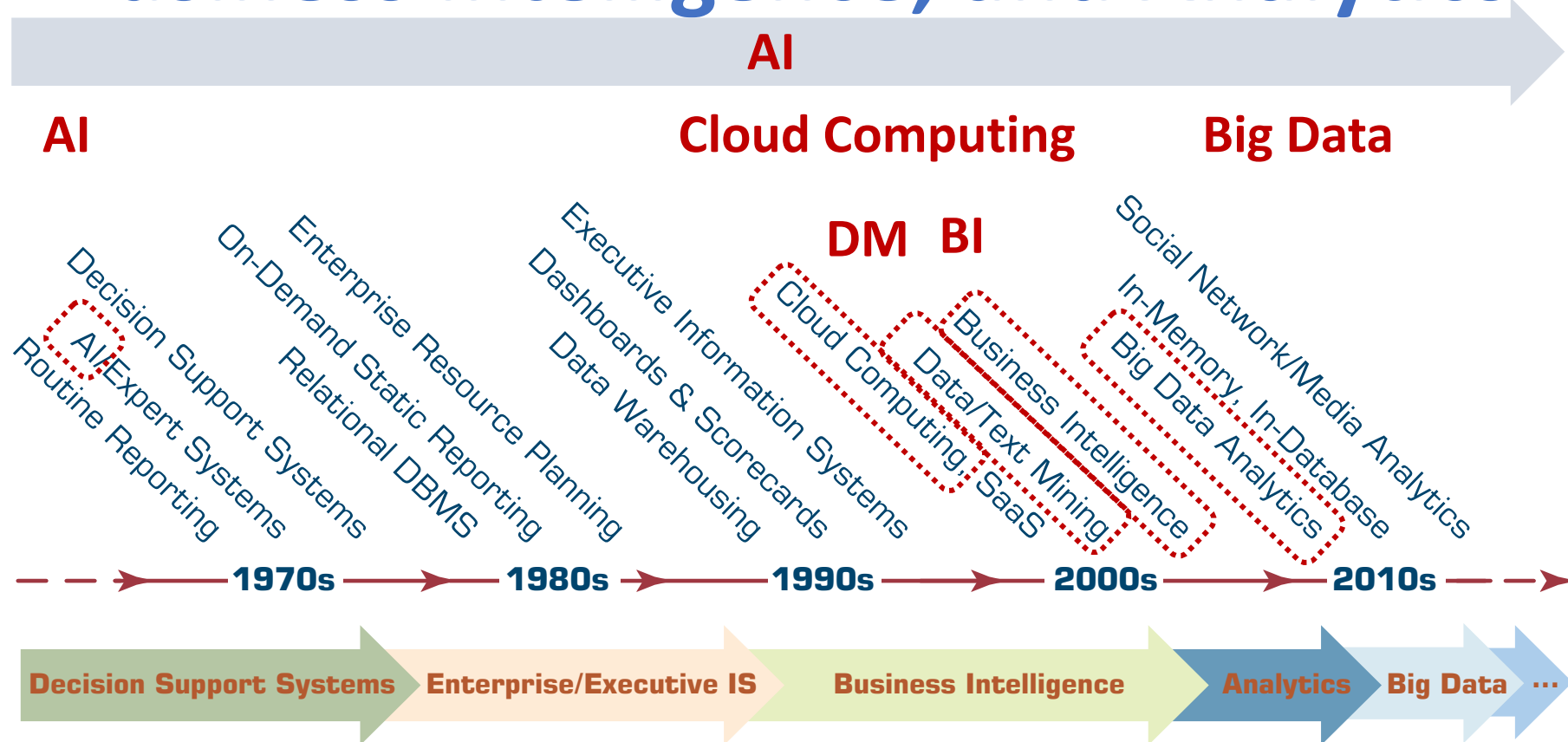
In [6]: x = int(input("What is x? "))
What is x? 80

In [7]: x = float(input("Write a number "))
Write a number 3.6
```

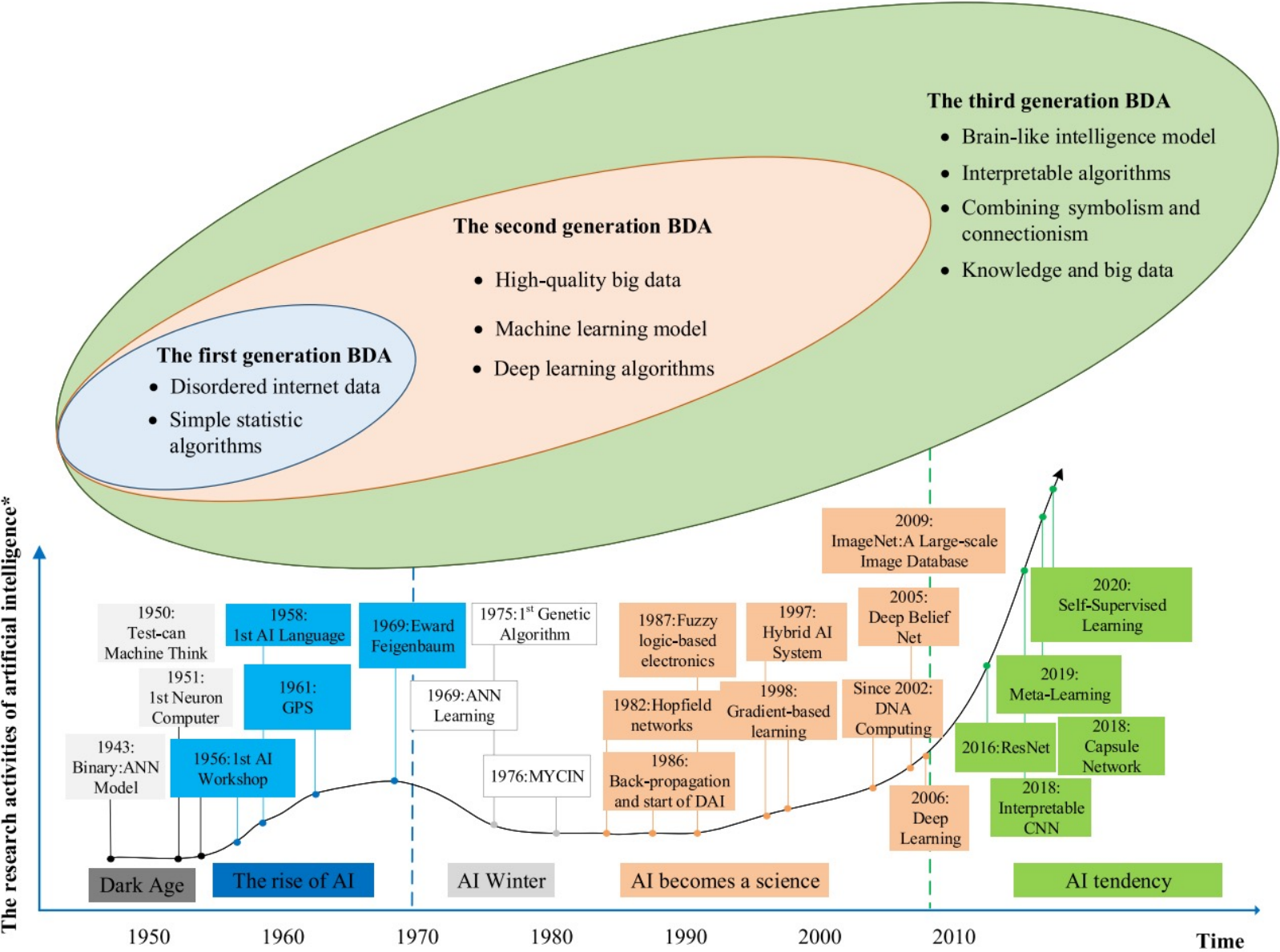
Data Science

AI, Big Data, Cloud Computing

Evolution of Decision Support, Business Intelligence, and Analytics



The Development of Big Data Analytics



Source: Wang, Junliang, Chuqiao Xu, Jie Zhang, and Ray Zhong (2022). "Big data analytics for intelligent manufacturing systems: A review." Journal of Manufacturing Systems 62 (2022): 738-752.

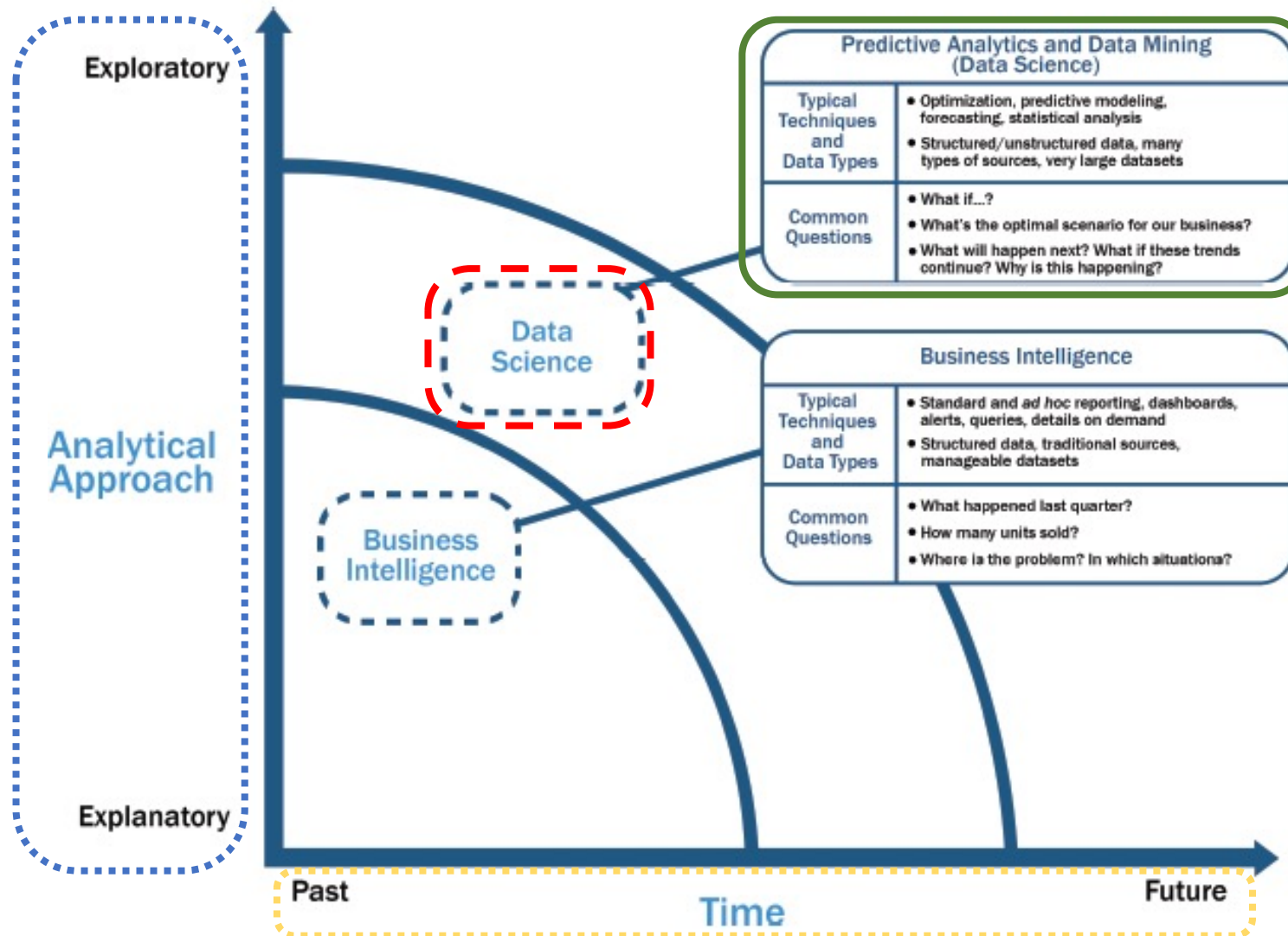
Data Analyst

- Data analyst is just another term for professionals who were doing **BI** in the form of **data compilation, cleaning, reporting,** and perhaps some **visualization.**
- Their skill sets included Excel, some SQL knowledge, and reporting.
- You would recognize those capabilities as **descriptive or reporting analytics.**

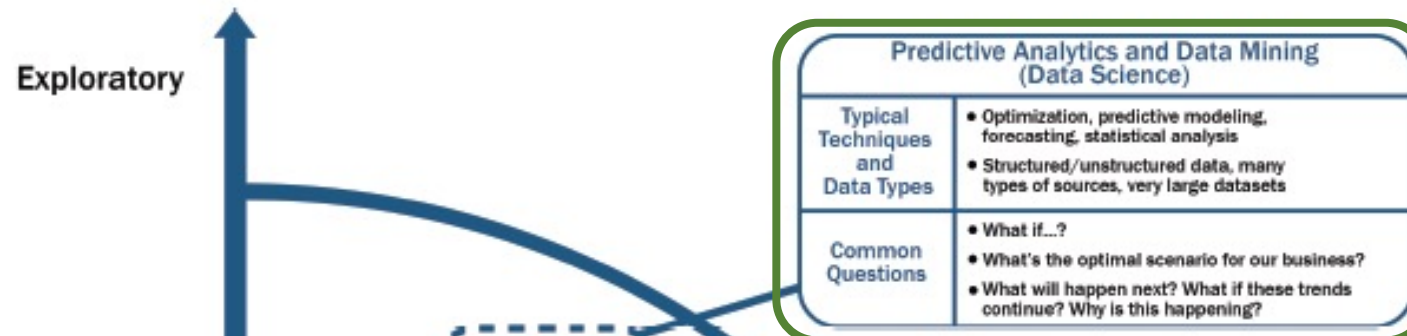
Data Scientist

- Data scientist is responsible for **predictive analysis, statistical analysis,** and more **advanced analytical tools and algorithms.**
- They may have a deeper knowledge of algorithms and may recognize them under various labels—**data mining, knowledge discovery, or machine learning.**
- Some of these professionals may also need deeper programming knowledge to be able to write code for data cleaning/analysis in current Web-oriented languages such as Java or Python and statistical languages such as R.
- Many analytics professionals also need to build significant expertise in **statistical modeling, experimentation, and analysis.**

Data Science and Business Intelligence



Data Science and Business Intelligence



Predictive Analytics and Data Mining (Data Science)

Past

Time

Future

Predictive Analytics and Data Mining (Data Science)

Structured/unstructured data, many types of sources,
very large datasets

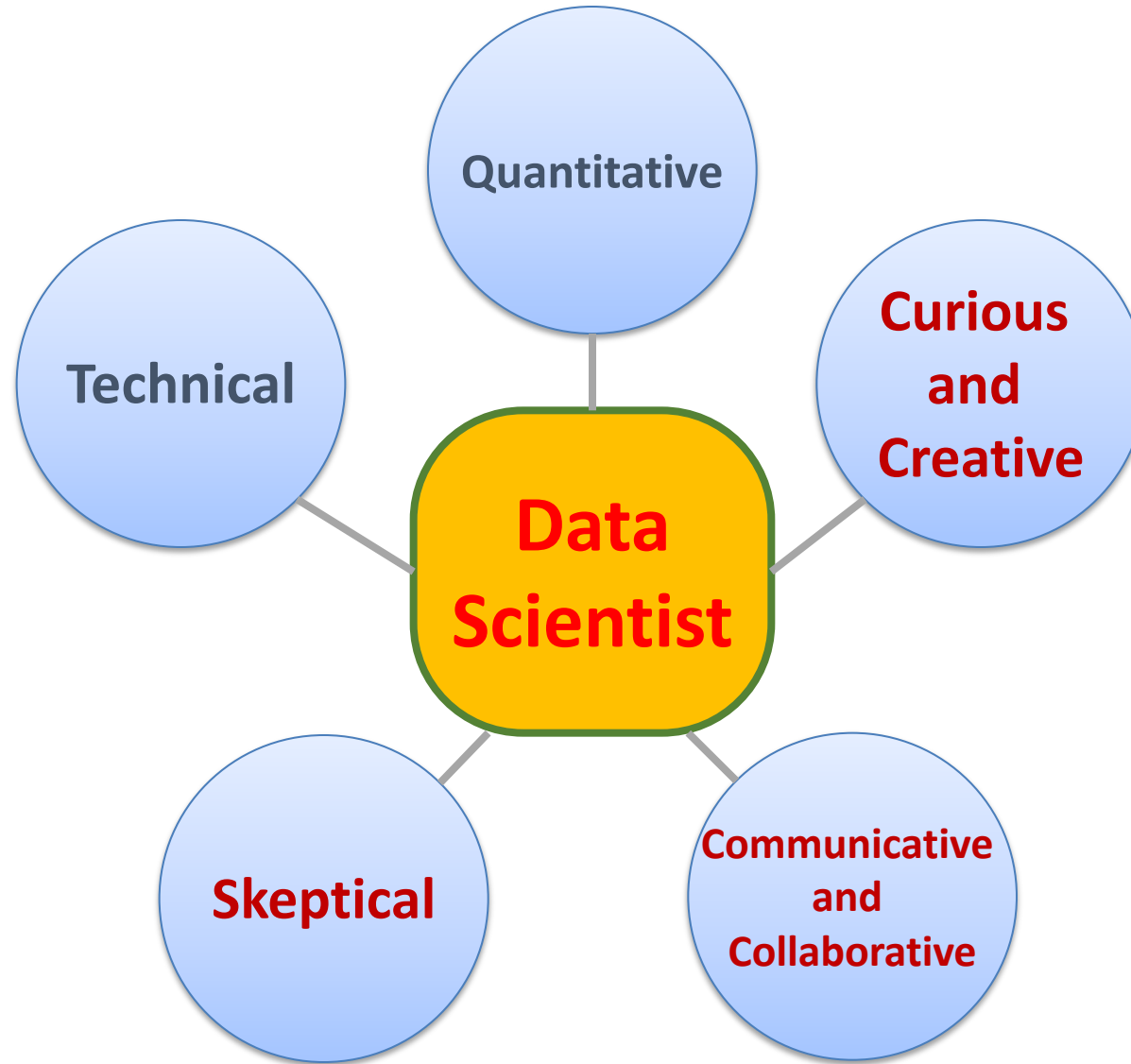
Optimization, predictive modeling, forecasting statistical analysis

What if...?
What's the optimal scenario for our business?
What will happen next?
What if these trends continue?
Why is this happening?

Profile of a Data Scientist

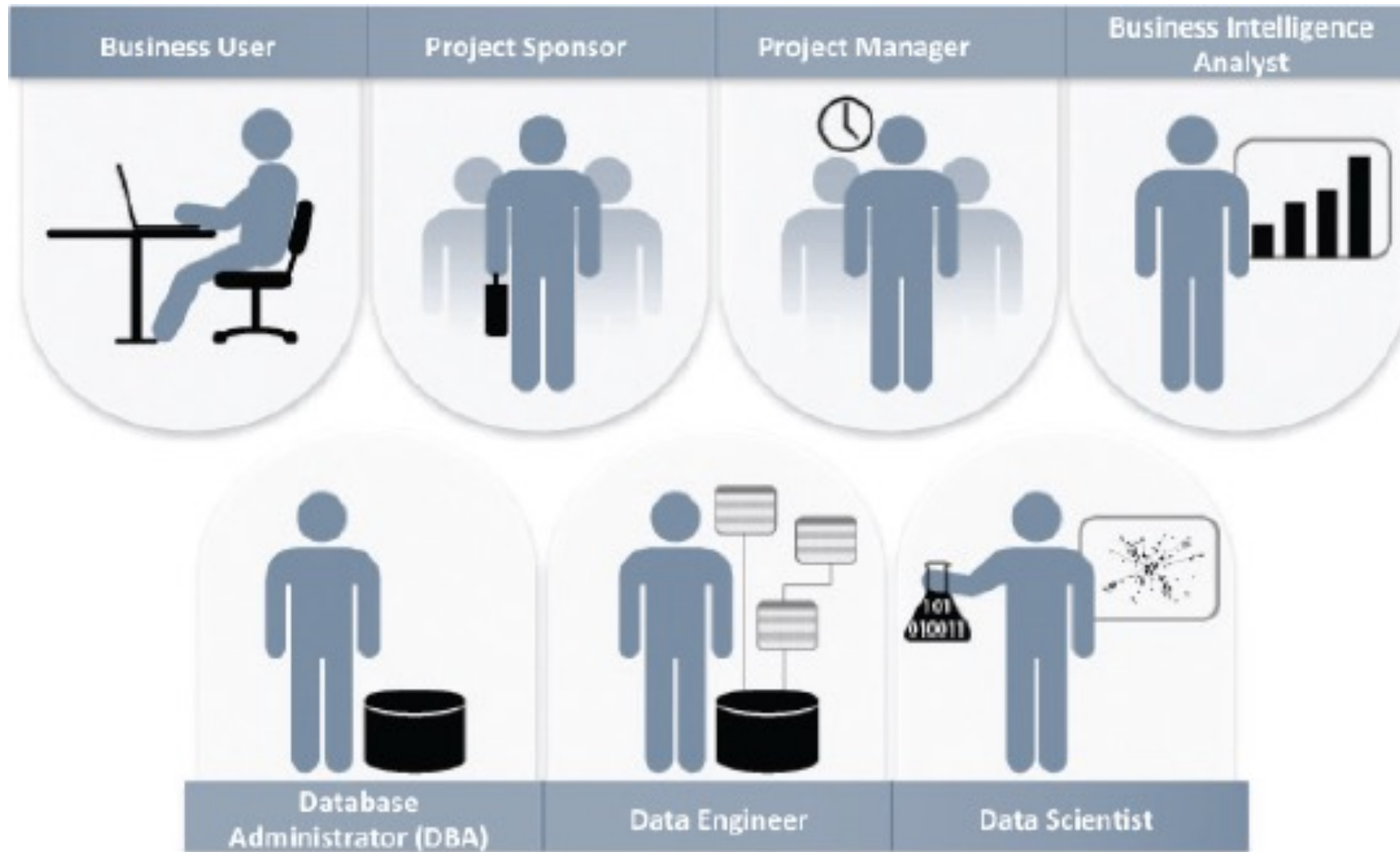
- **Quantitative**
 - **mathematics or statistics**
- **Technical**
 - **software engineering, machine learning, and programming skills**
- **Skeptical mind-set and critical thinking**
- **Curious and creative**
- **Communicative and collaborative**

Data Scientist Profile

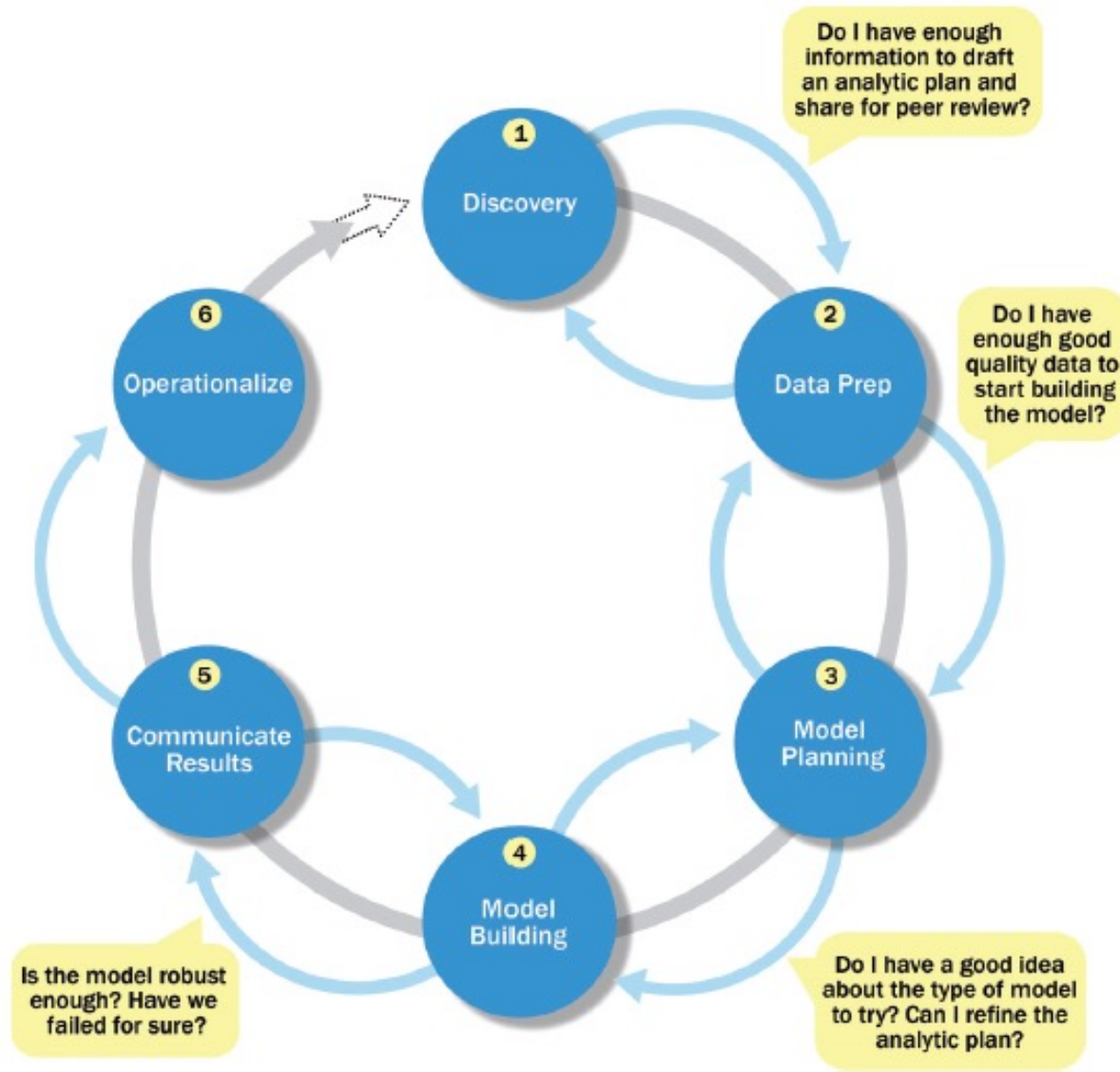


Big Data Analytics Lifecycle

Key Roles for a Successful Analytics Project



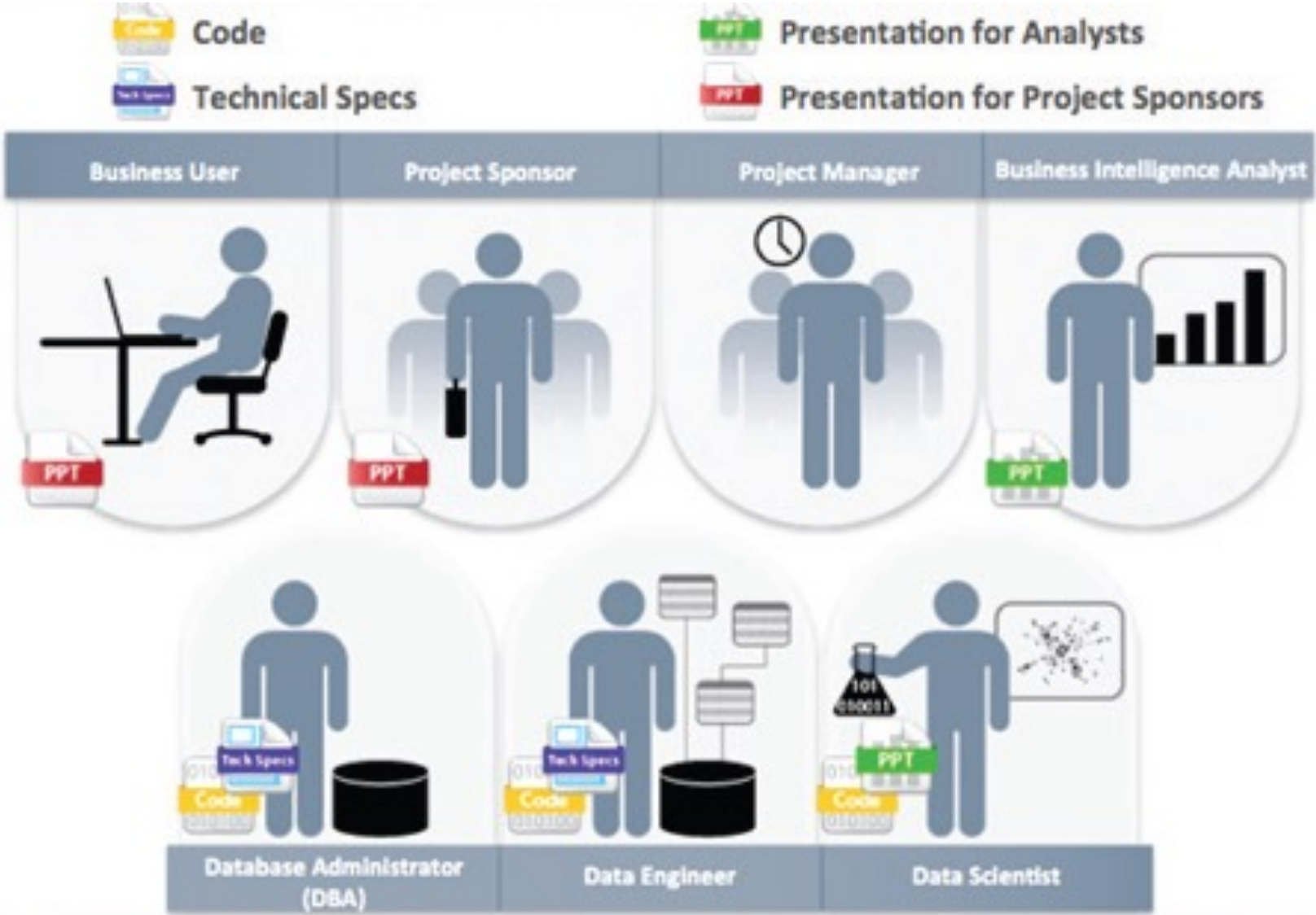
Overview of Data Analytics Lifecycle



Overview of Data Analytics Lifecycle

- 1. Discovery**
- 2. Data preparation**
- 3. Model planning**
- 4. Model building**
- 5. Communicate results**
- 6. Operationalize**

Key Outputs from a Successful Analytics Project

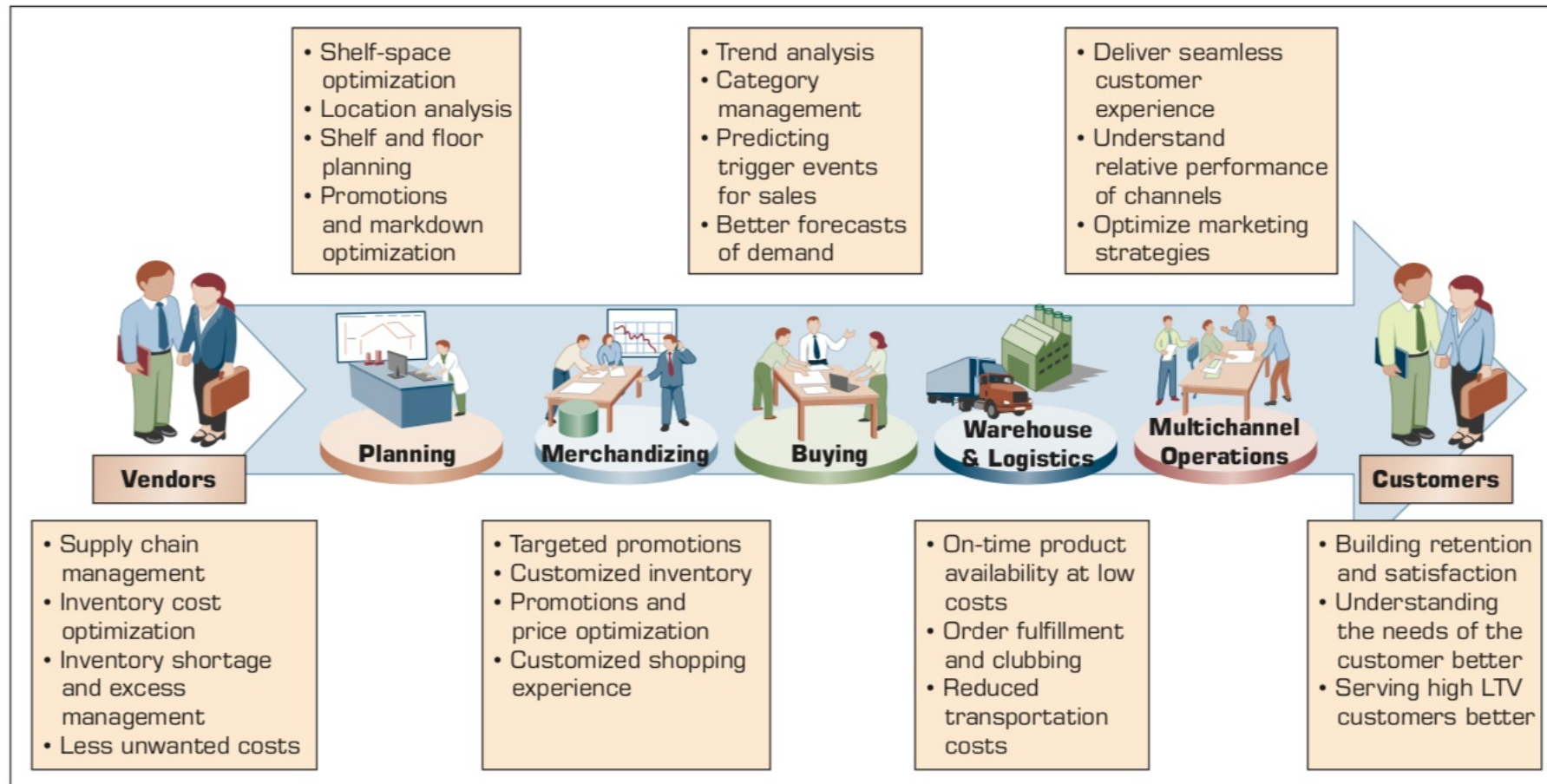


Source: EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley, 2015

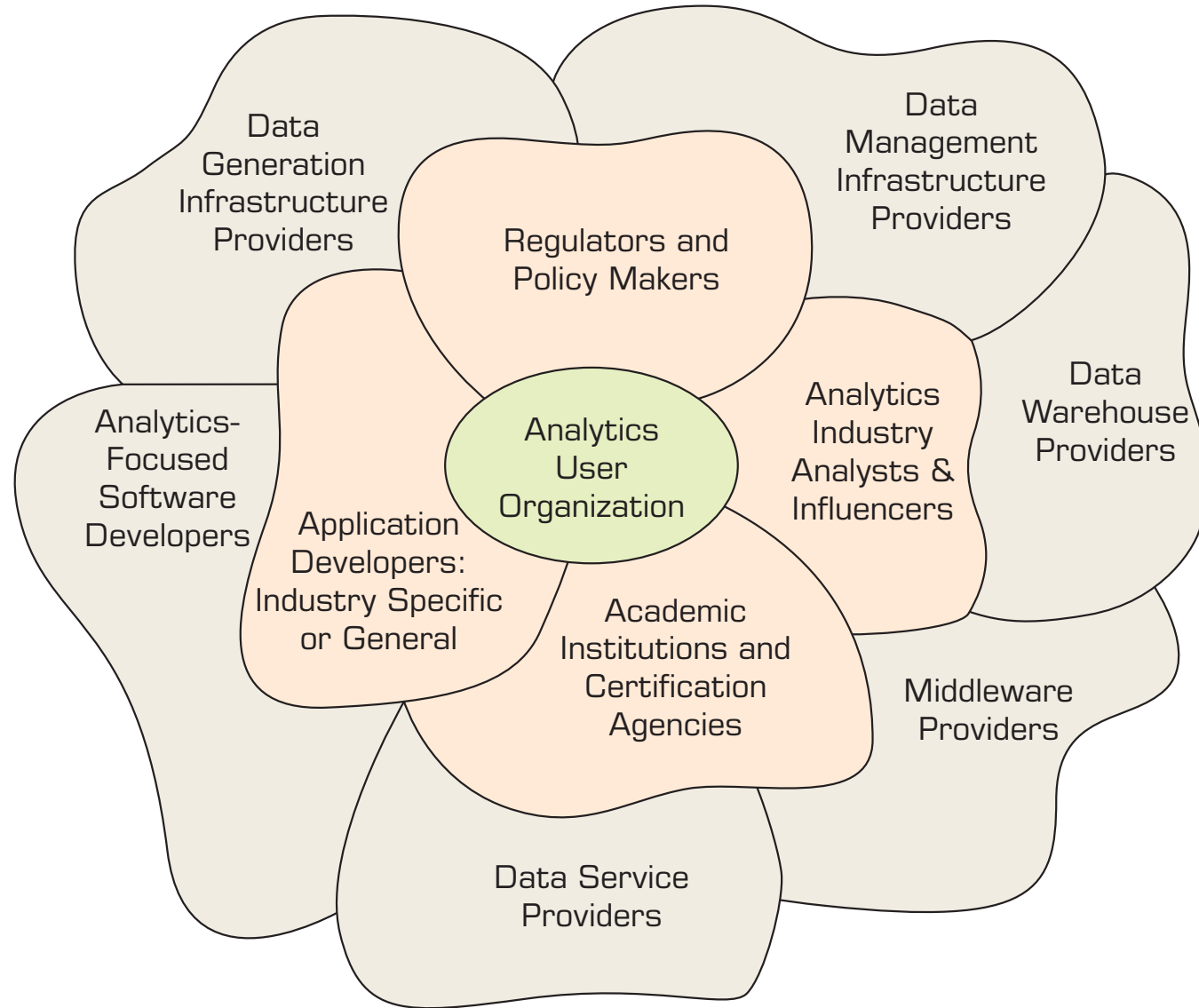
Example of Analytics Applications in a Retail Value Chain

Retail Value Chain

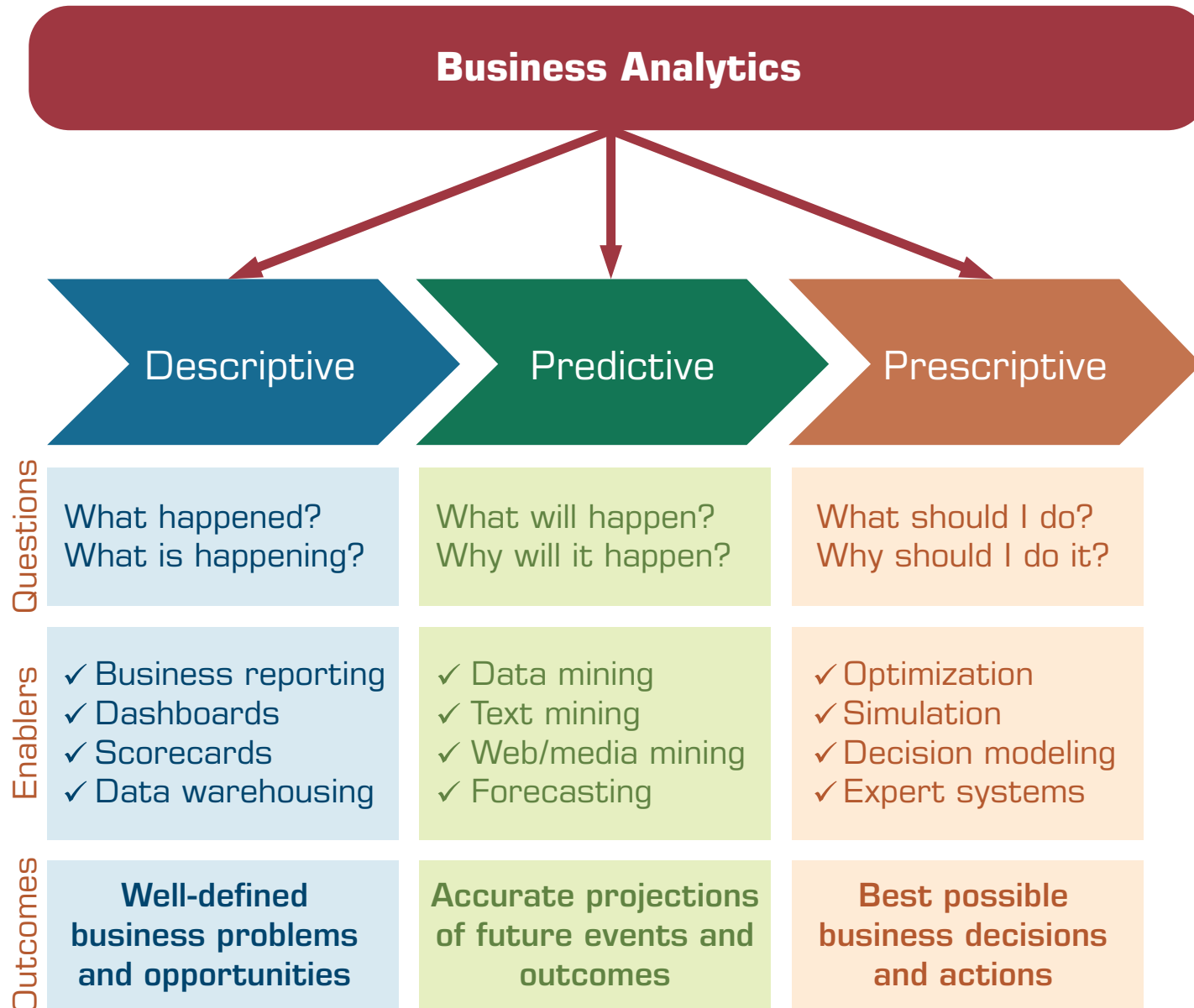
Critical needs at every touch point of the Retail Value Chain



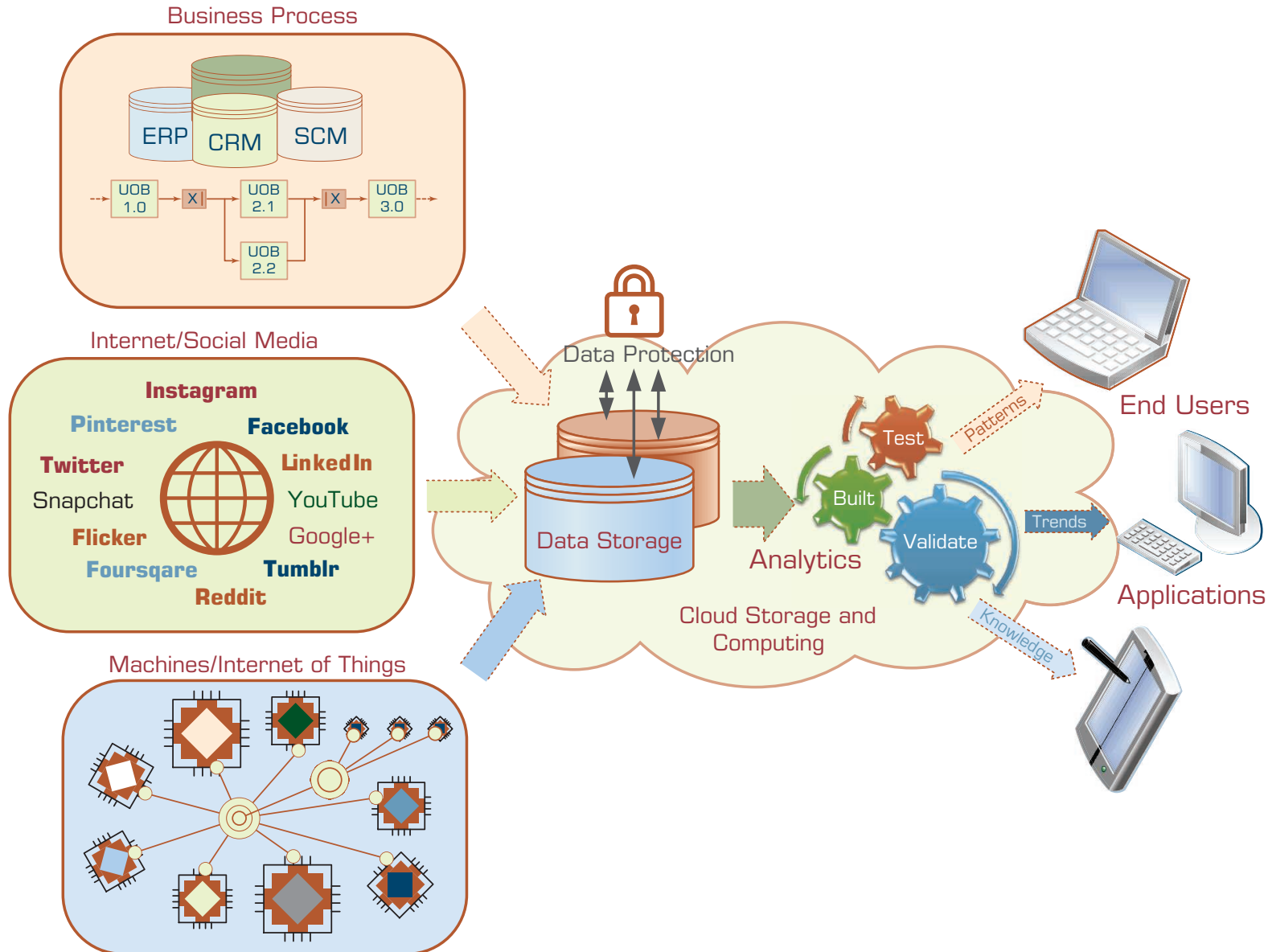
Analytics Ecosystem



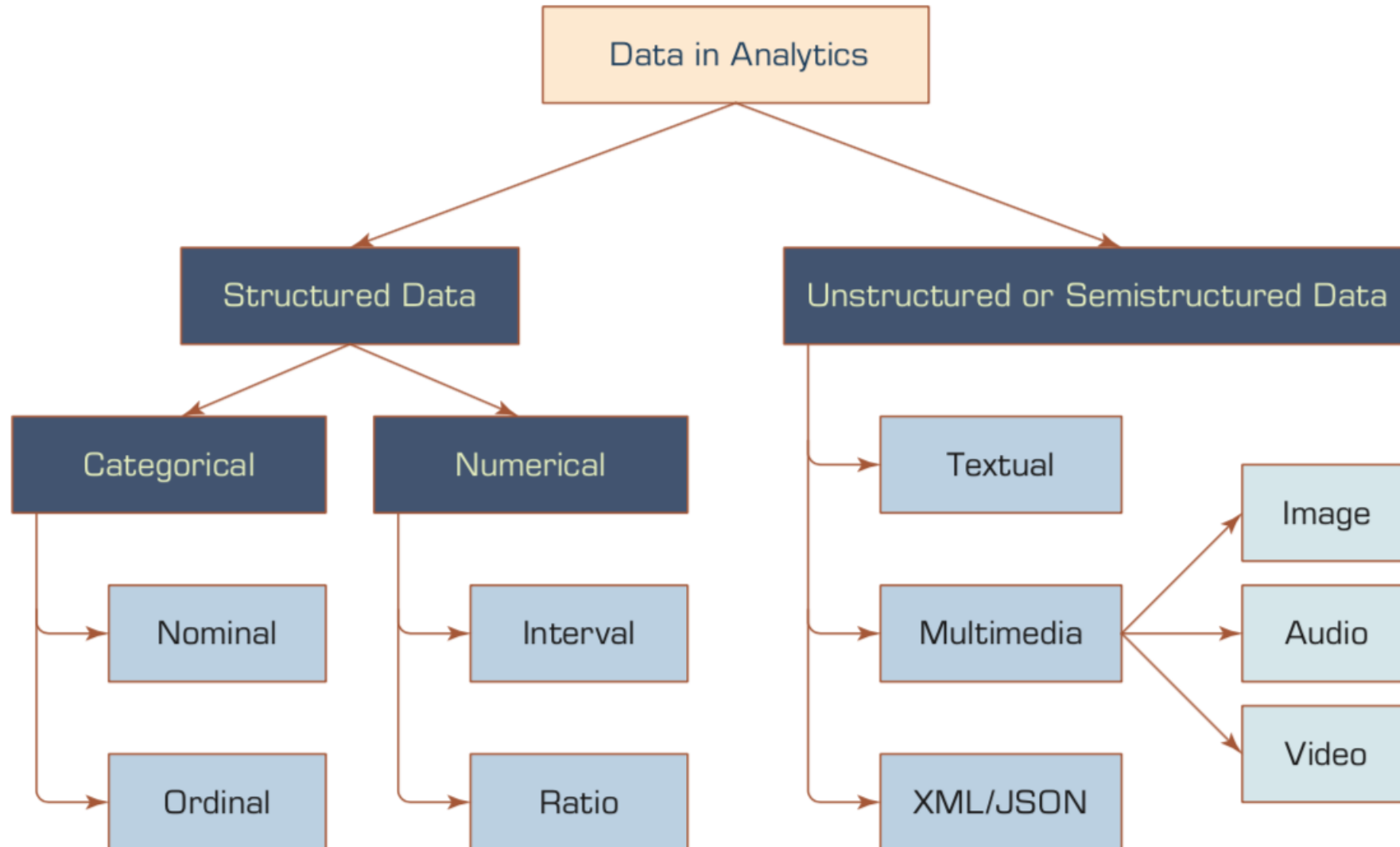
Three Types of Analytics



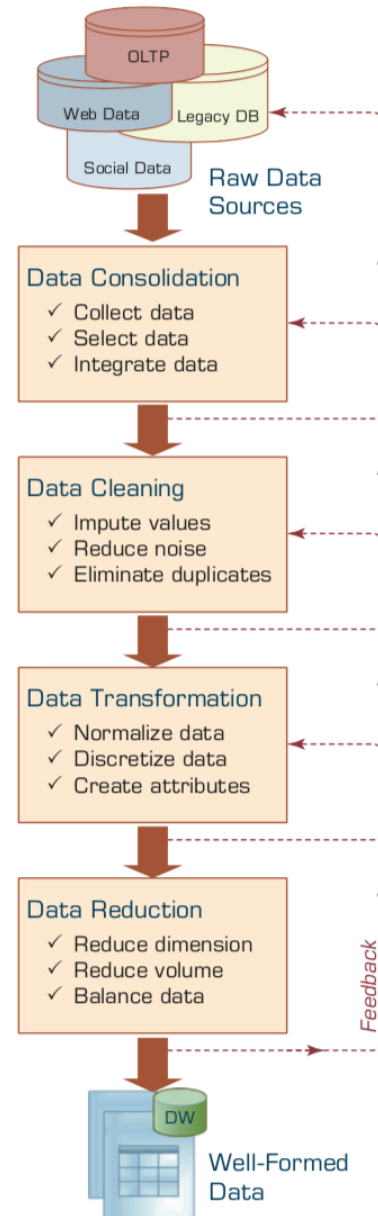
A Data to Knowledge Continuum



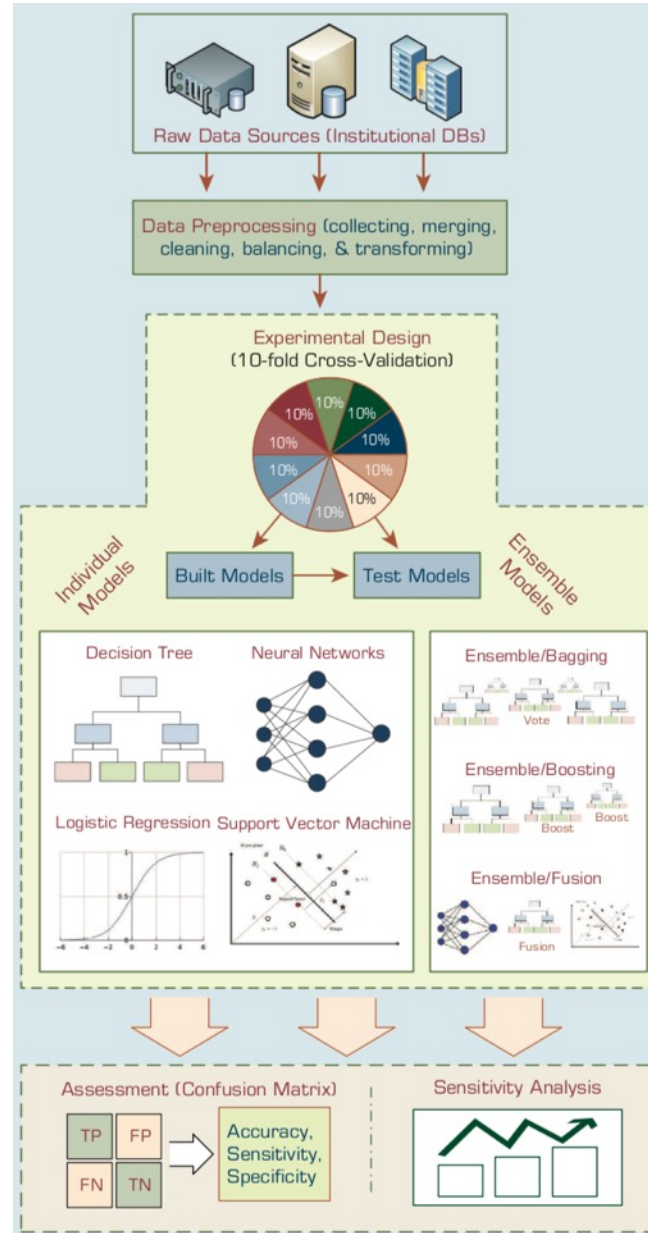
A Simple Taxonomy of Data



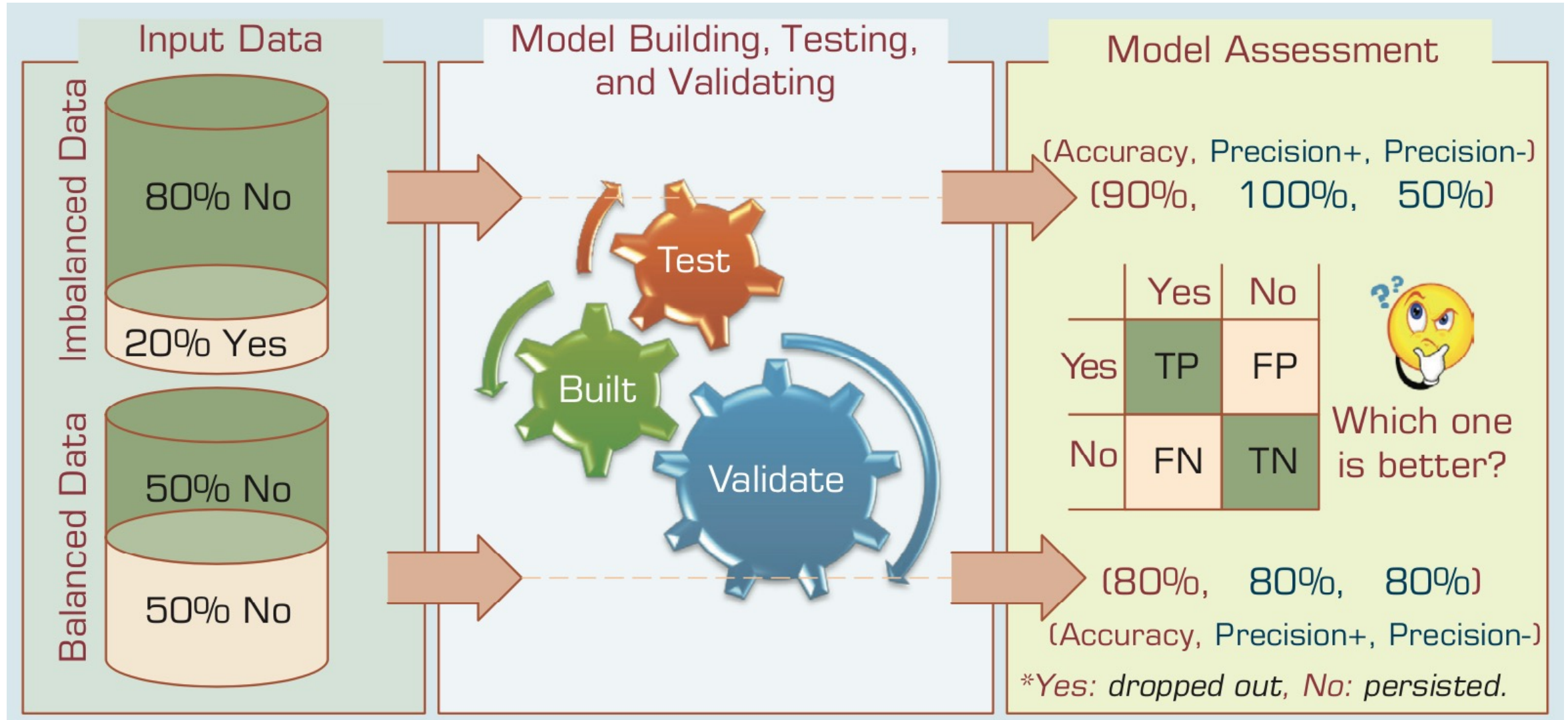
Data Preprocessing Steps



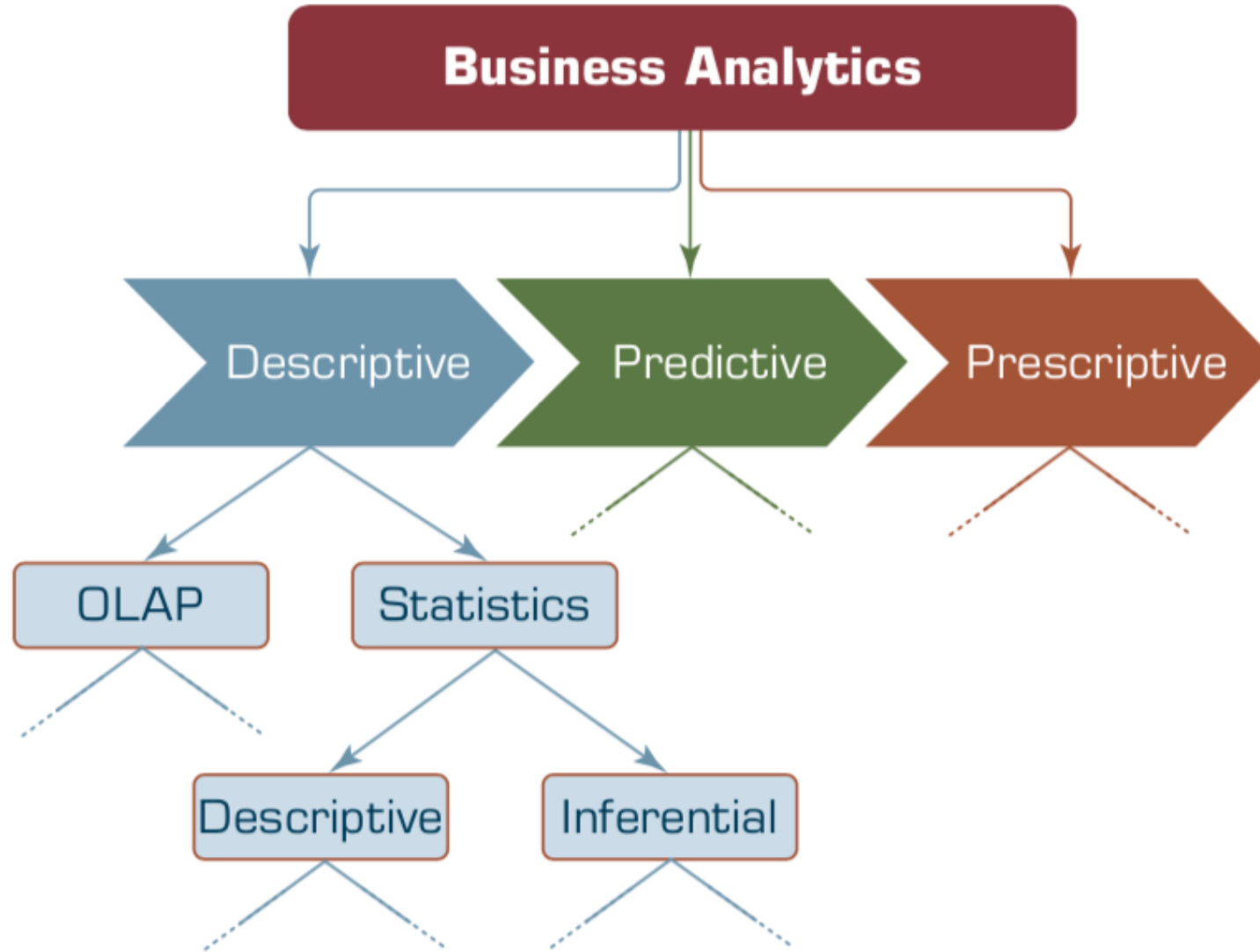
An Analytics Approach to Predicting Student Attrition



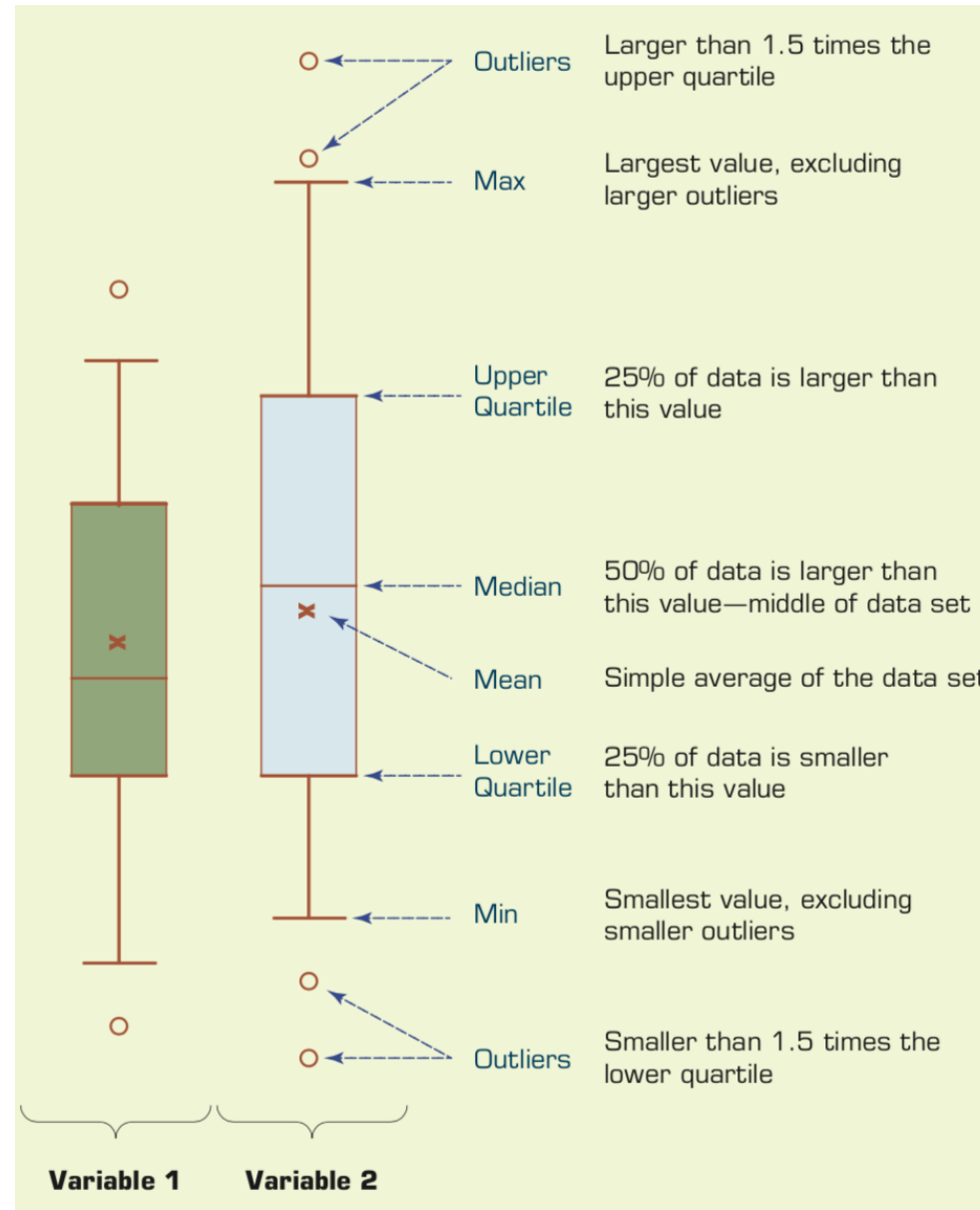
A Graphical Depiction of the Class Imbalance Problem



Relationship between Statistics and Descriptive Analytics



Understanding the Specifics about Box-and-Whiskers Plots



Summary

- **Python Programming**
- **Data Science**

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