



Practices of Business Intelligence

描述性分析 I：

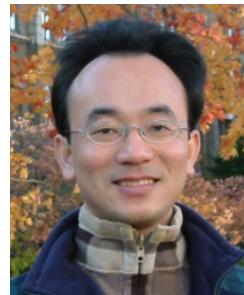
數據的性質、統計模型與可視化

(Descriptive Analytics I: Nature of Data, Statistical Modeling, and Visualization)

1071BI04

MI4 (M2084) (2888)

Wed, 7, 8 (14:10-16:00) (B217)



Min-Yuh Day

戴敏育

Assistant Professor

專任助理教授

Dept. of Information Management, Tamkang University

淡江大學 資訊管理學系

<http://mail.tku.edu.tw/myday/>

2018-10-03



課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

- 1 2018/09/12 商業智慧實務課程介紹
(Course Orientation for Practices of Business Intelligence)
- 2 2018/09/19 商業智慧、分析與資料科學
(Business Intelligence, Analytics, and Data Science)
- 3 2018/09/26 人工智慧、大數據與雲端運算
(ABC: AI, Big Data, and Cloud Computing)
- 4 2018/10/03 描述性分析I：數據的性質、統計模型與可視化
(Descriptive Analytics I: Nature of Data, Statistical Modeling, and Visualization)
- 5 2018/10/10 國慶紀念日 (放假一天) (National Day) (Day off)
- 6 2018/10/17 描述性分析II：商業智慧與資料倉儲
(Descriptive Analytics II: Business Intelligence and Data Warehousing)

課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容(Subject/Topics)

7 2018/10/24 預測性分析I：資料探勘流程、方法與演算法
(Predictive Analytics I: Data Mining Process,
Methods, and Algorithms)

8 2018/10/31 預測性分析II：文本、網路與社群媒體分析
(Predictive Analytics II: Text, Web, and
Social Media Analytics)

9 2018/11/07 期中報告 (Midterm Project Report)

10 2018/11/14 期中考試 (Midterm Exam)

11 2018/11/21 處方性分析：最佳化與模擬
(Prescriptive Analytics: Optimization and Simulation)

12 2018/11/28 社會網絡分析
(Social Network Analysis)

課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

13 2018/12/05 機器學習與深度學習
(Machine Learning and Deep Learning)

14 2018/12/12 自然語言處理
(Natural Language Processing)

15 2018/12/19 AI交談機器人與對話式商務
(AI Chatbots and Conversational Commerce)

16 2018/12/26 商業分析的未來趨勢、隱私與管理考量
(Future Trends, Privacy and
Managerial Considerations in Analytics)

17 2019/01/02 期末報告 (Final Project Presentation)

18 2019/01/09 期末考試 (Final Exam)

Business Intelligence (BI)

1 Introduction to BI and Data Science

2 Descriptive Analytics

3 Predictive Analytics

4 Prescriptive Analytics

5 Big Data Analytics

6 Future Trends

Descriptive Analytics I:

Nature of Data,

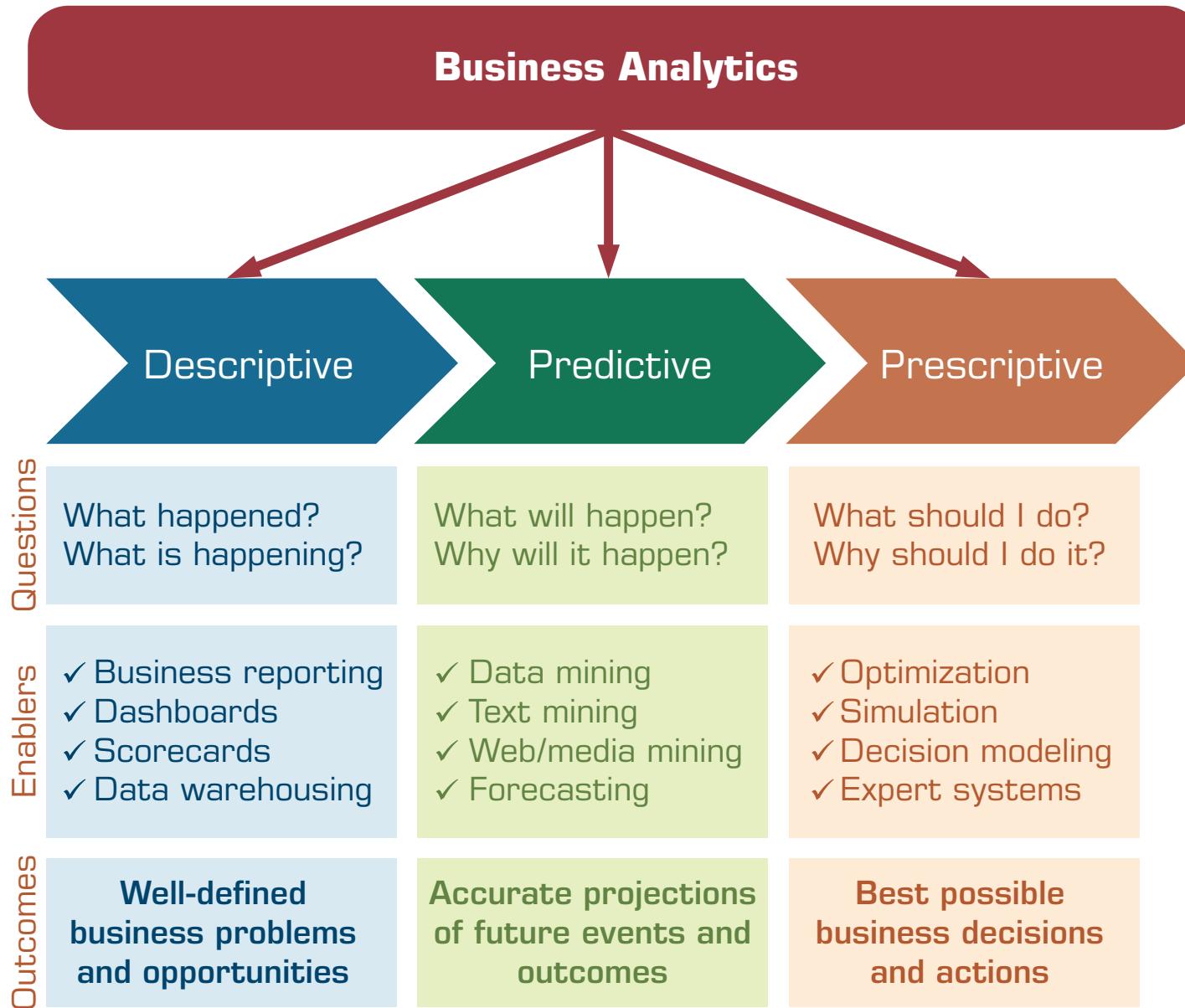
Statistical Modeling,

and Visualization

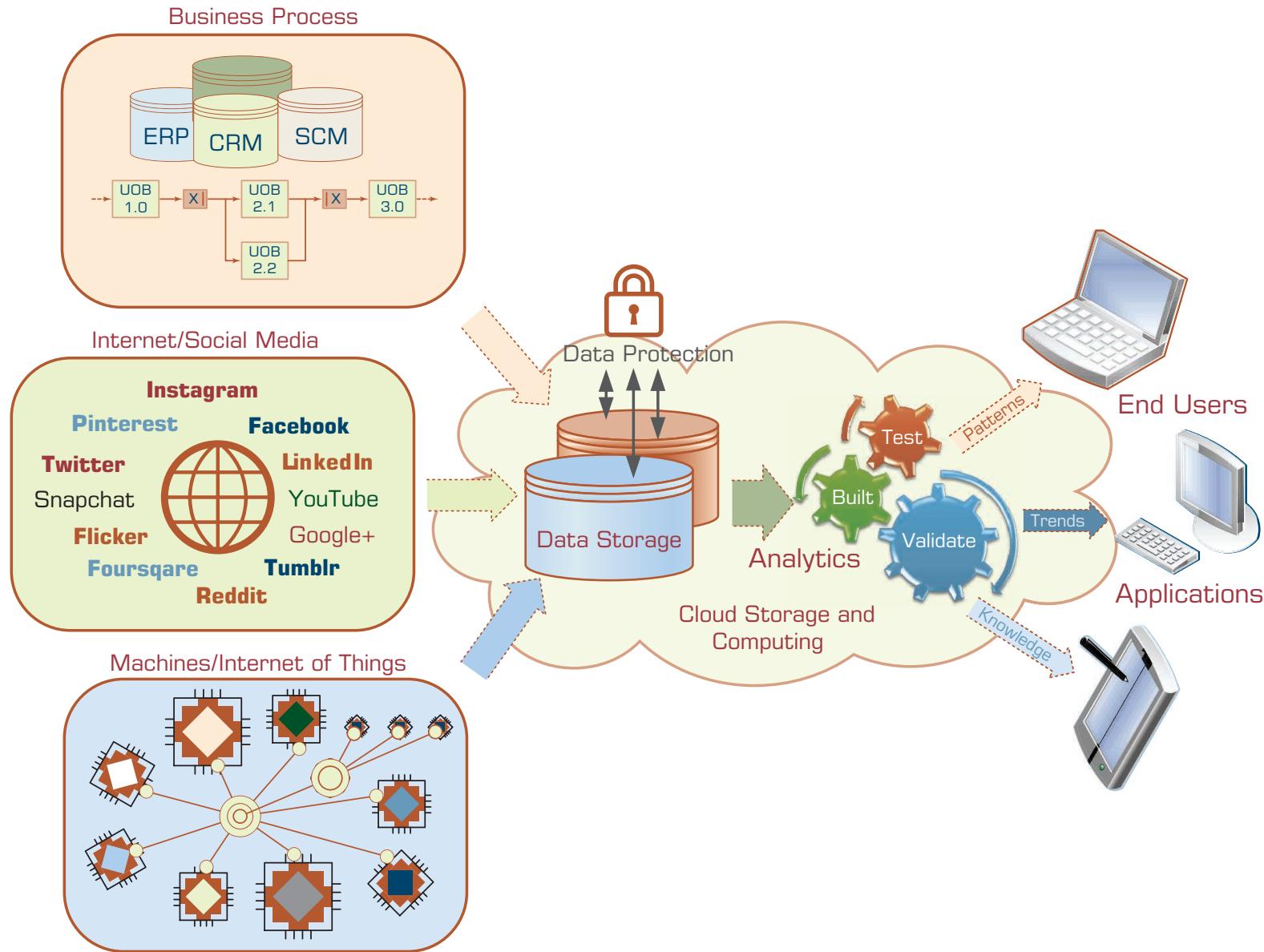
Outline

- Descriptive Analytics I
- Nature of Data
- Statistical Modeling
- Visualization

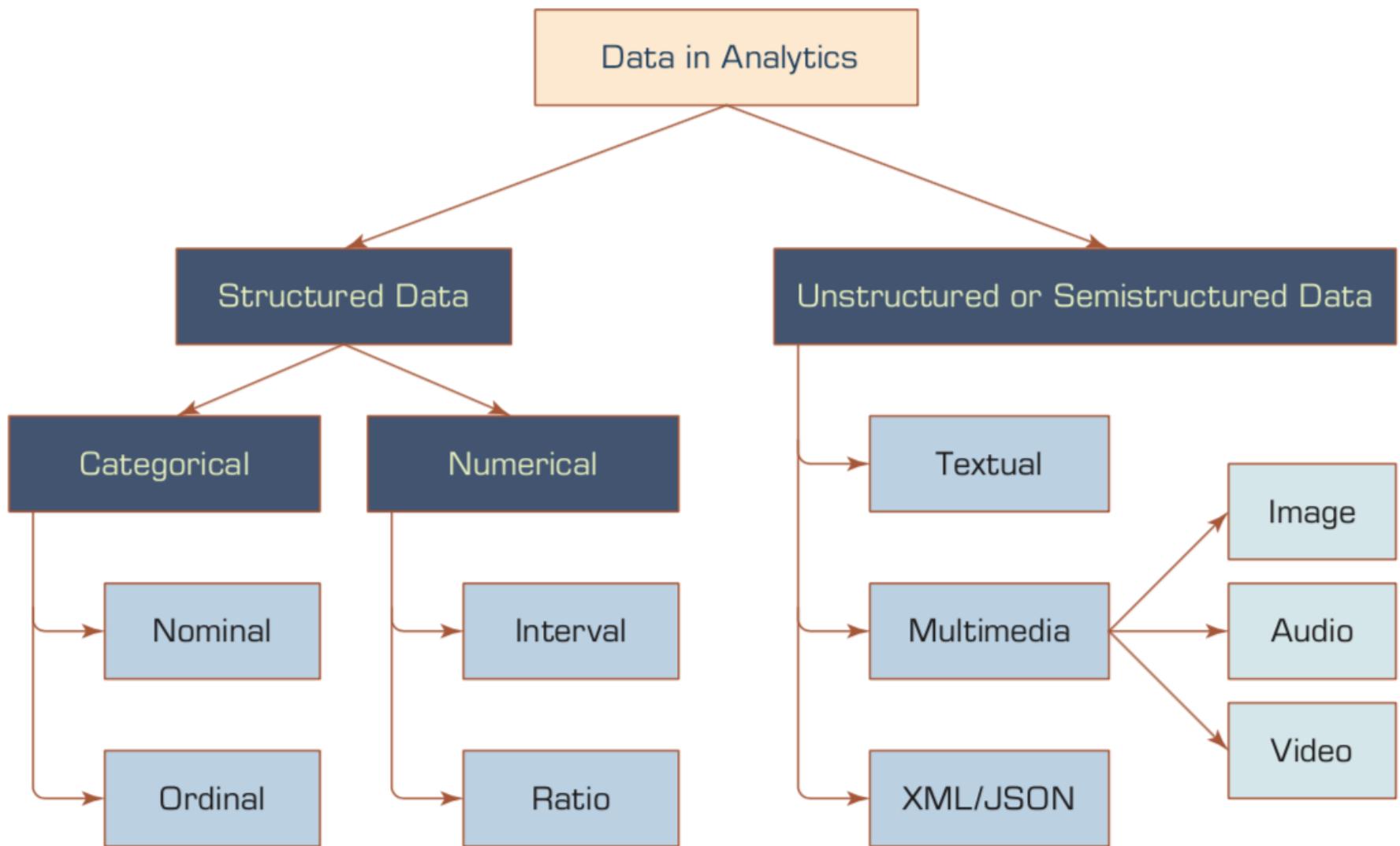
Three Types of Analytics



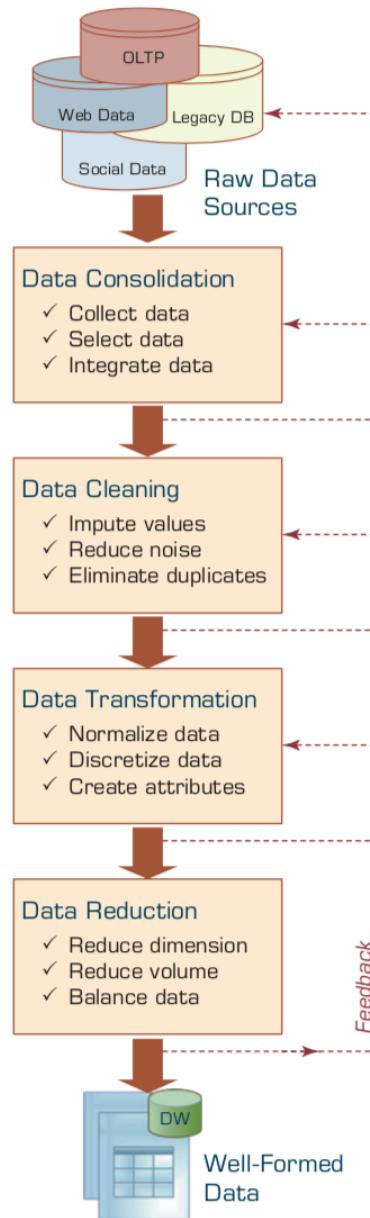
A Data to Knowledge Continuum



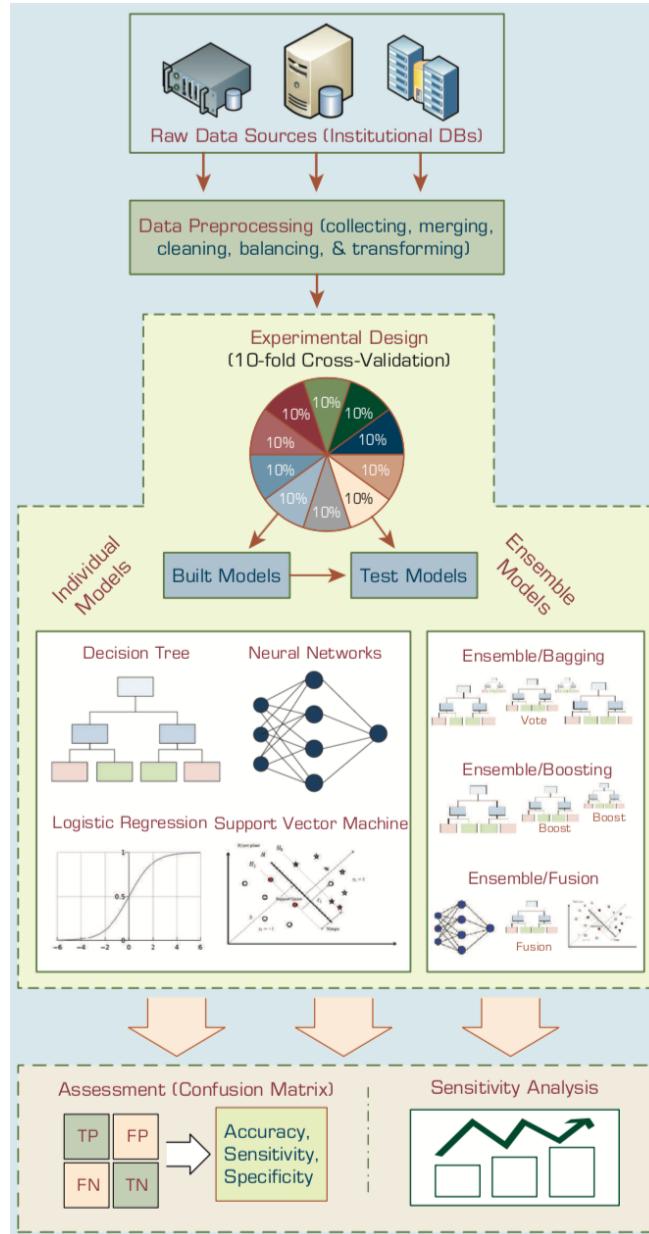
A Simple Taxonomy of Data



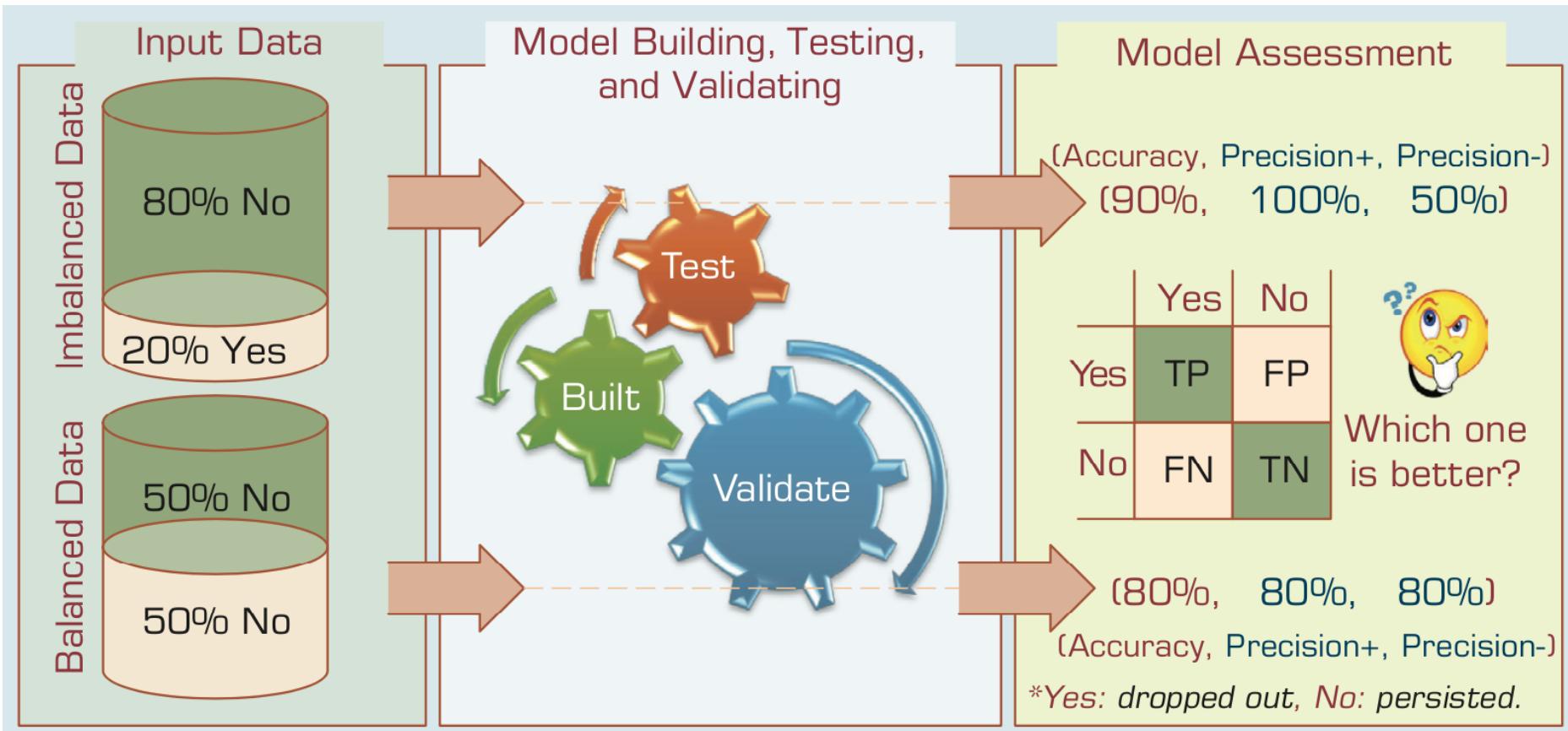
Data Preprocessing Steps



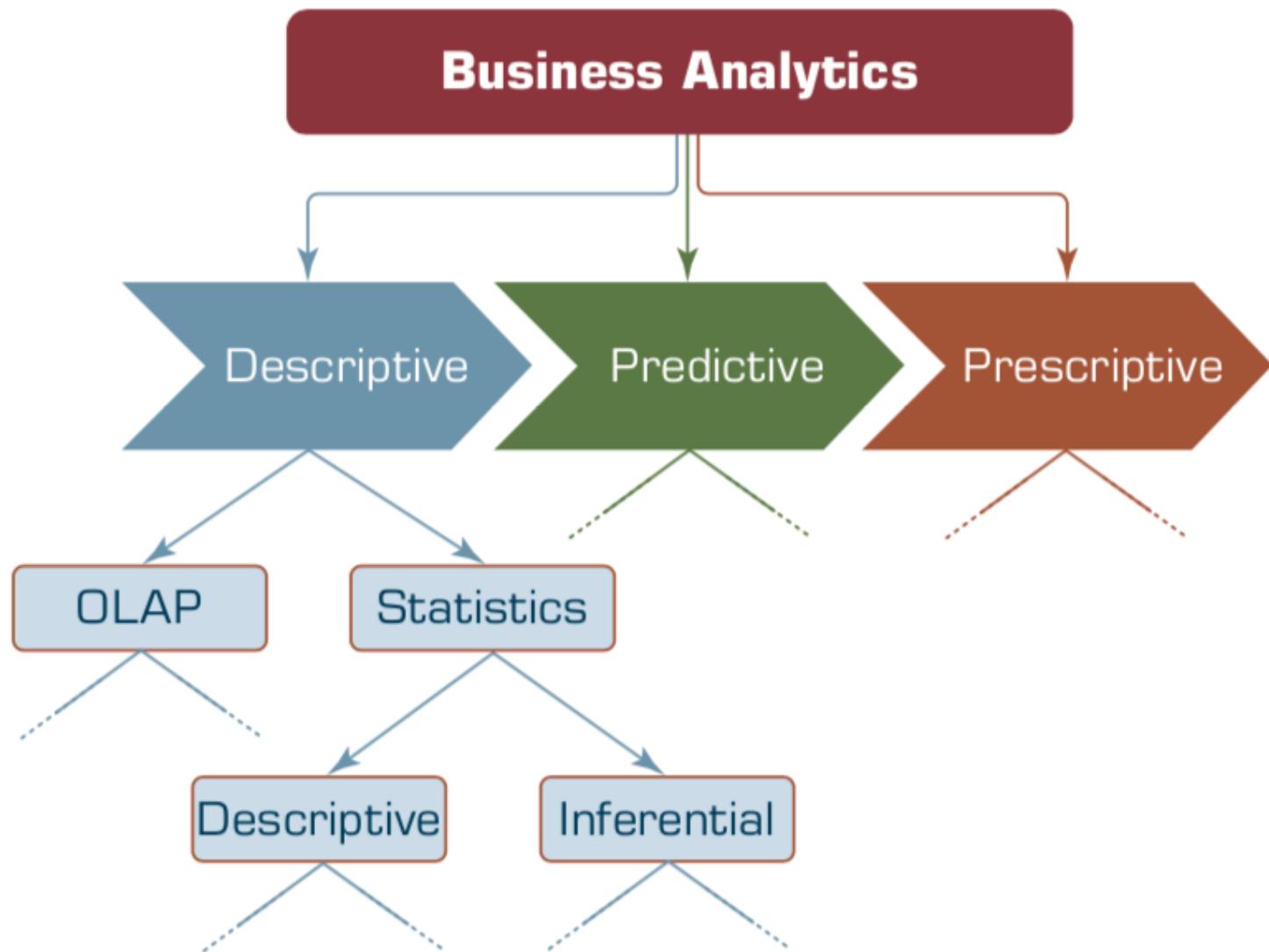
An Analytics Approach to Predicting Student Attrition



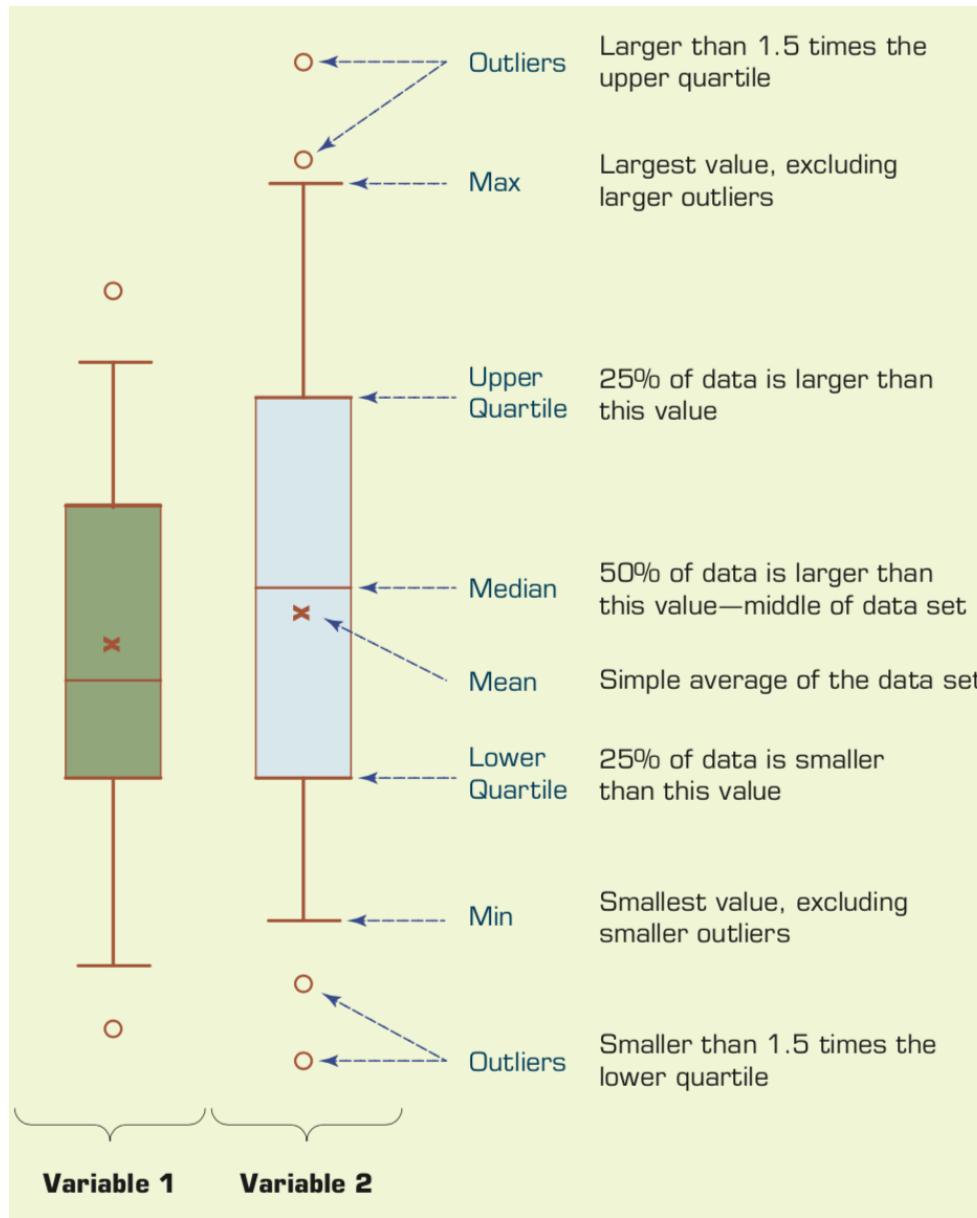
A Graphical Depiction of the Class Imbalance Problem



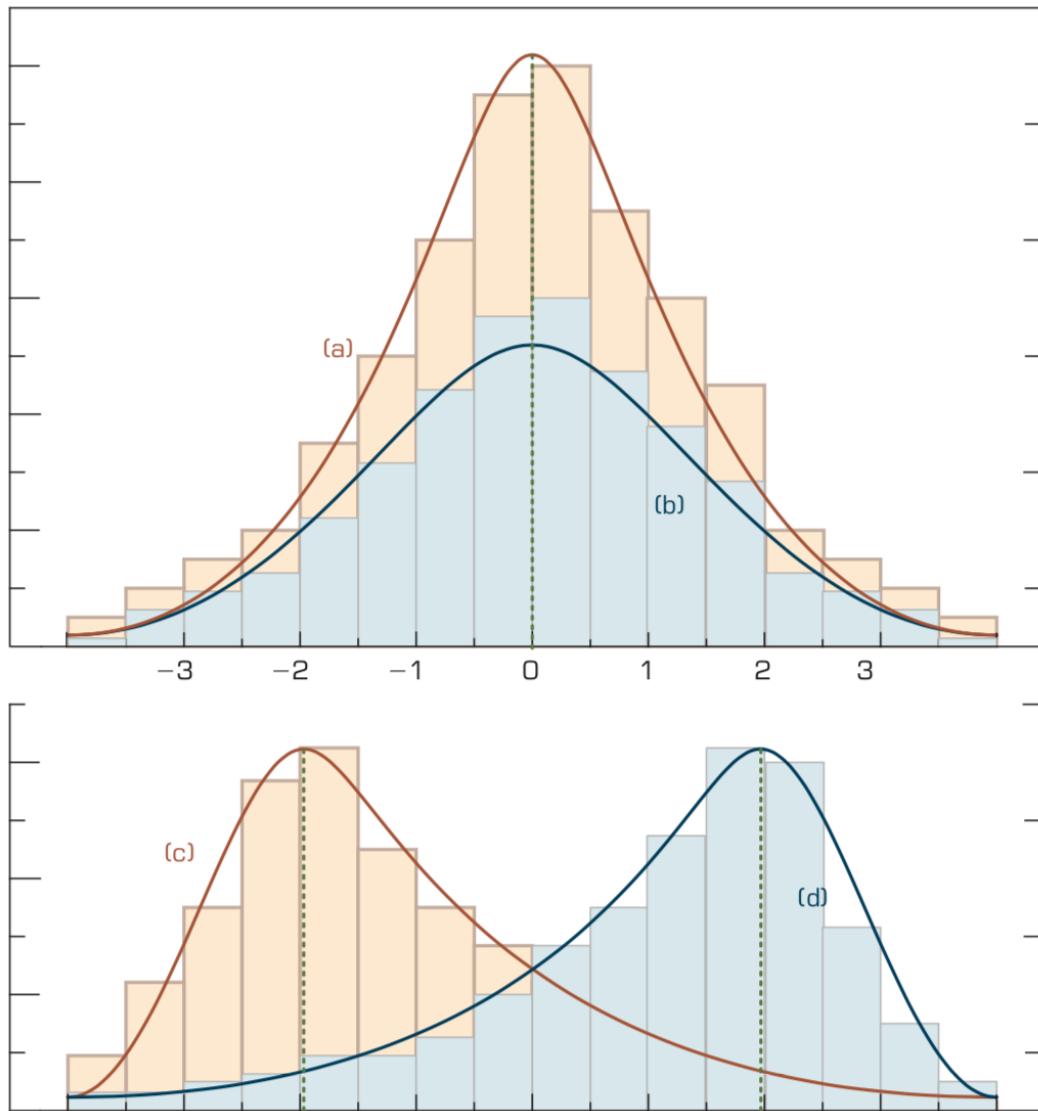
Relationship between Statistics and Descriptive Analytics



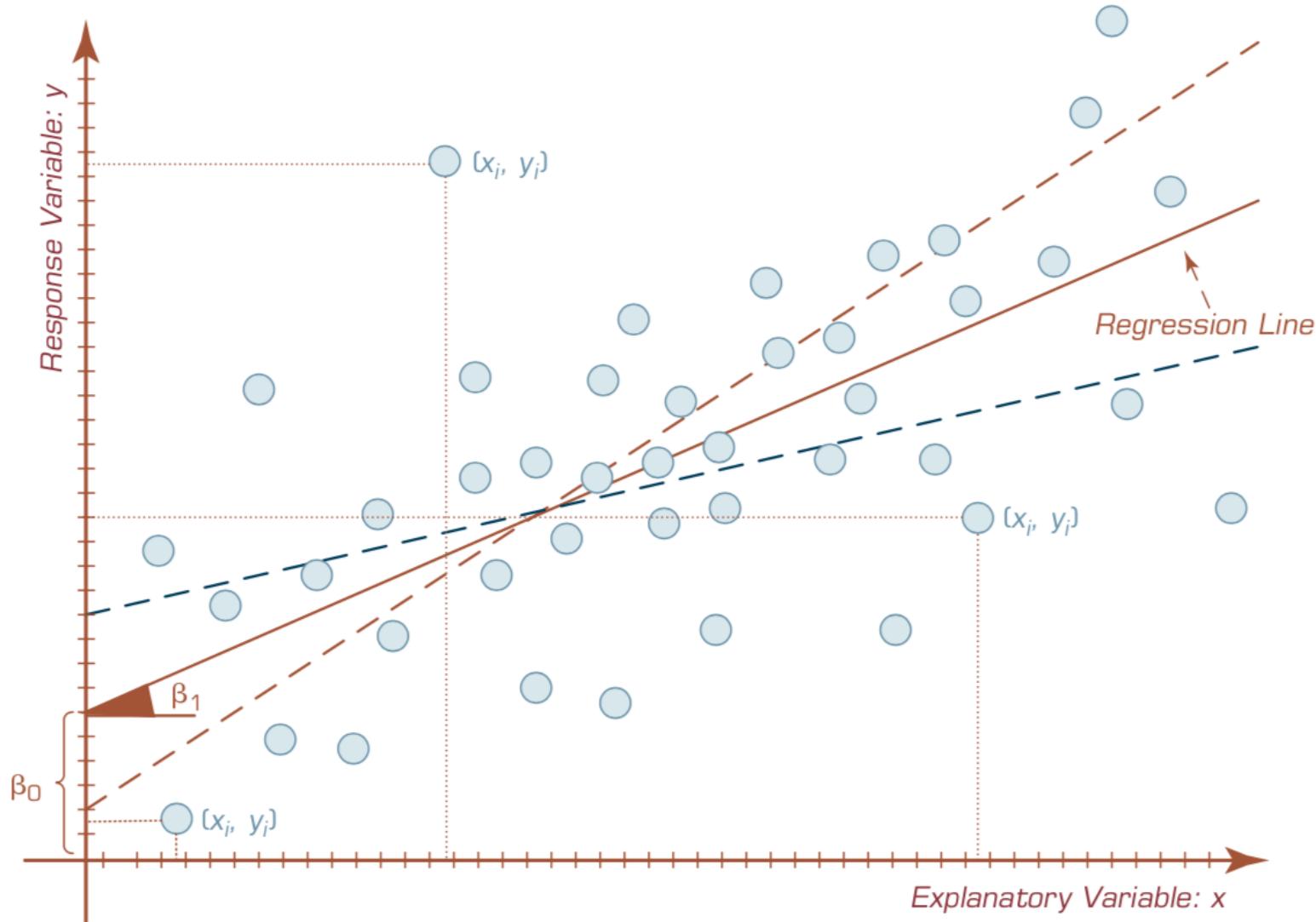
Understanding the Specifics about Box-and-Whiskers Plots



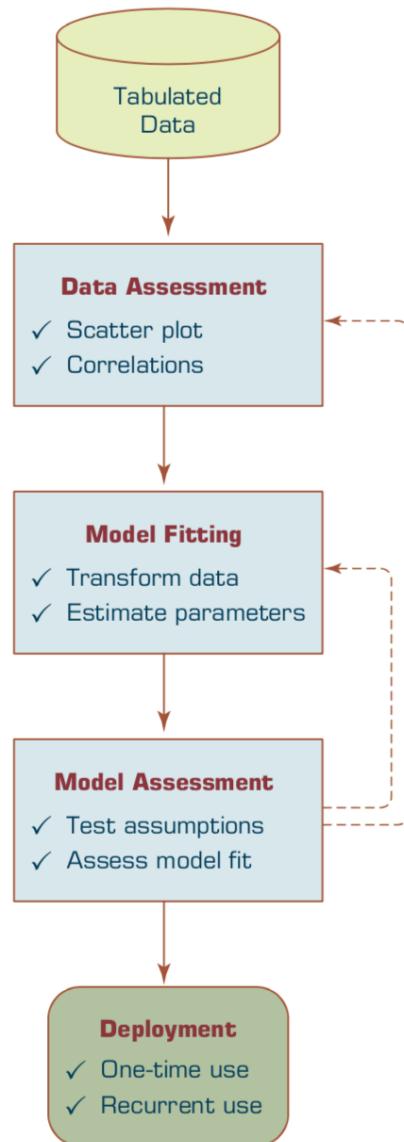
Relationship between Dispersion and Shape Properties.



A Scatter Plot and a Linear Regression Line

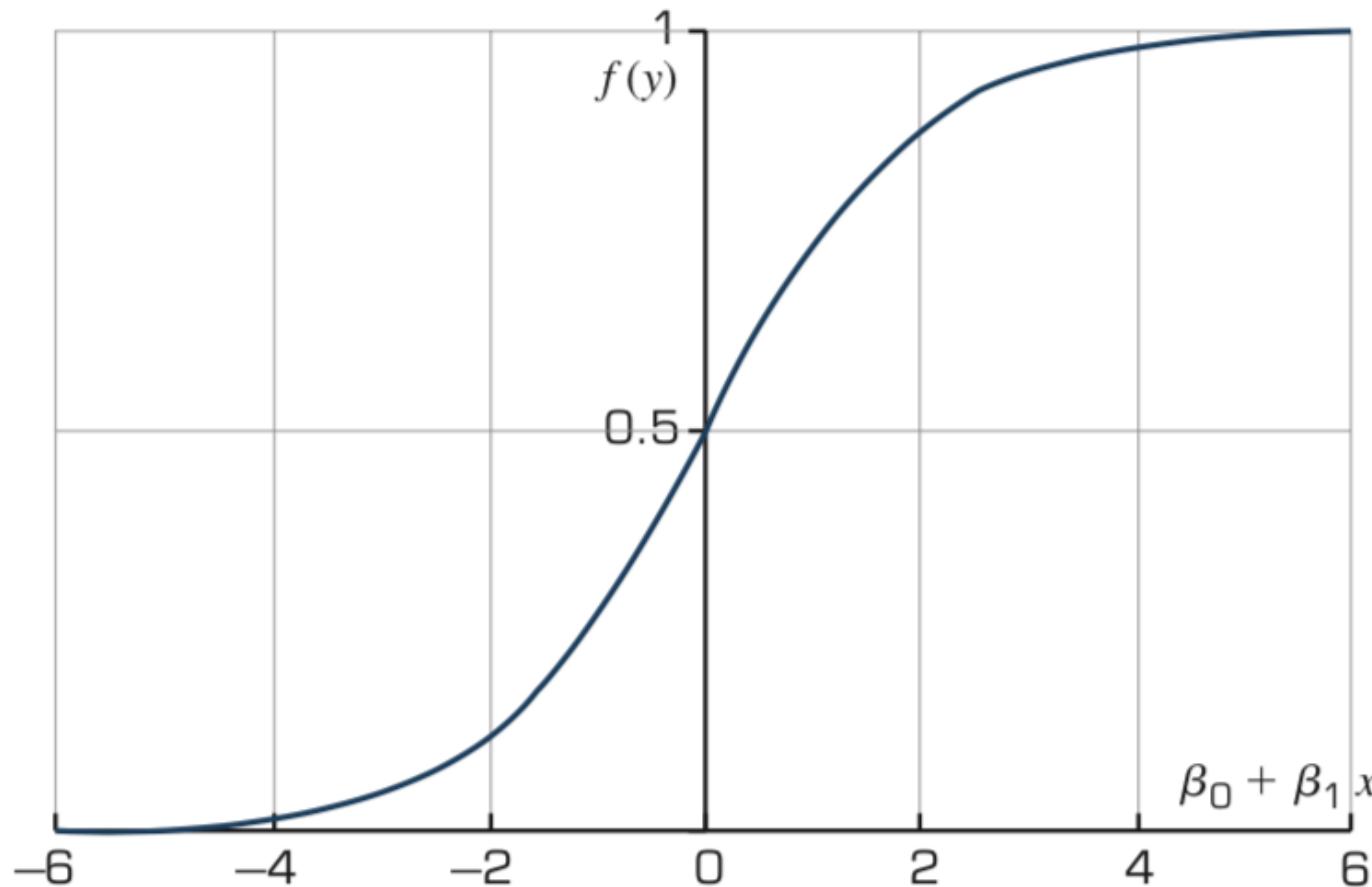


A Process Flow for Developing Regression Models.

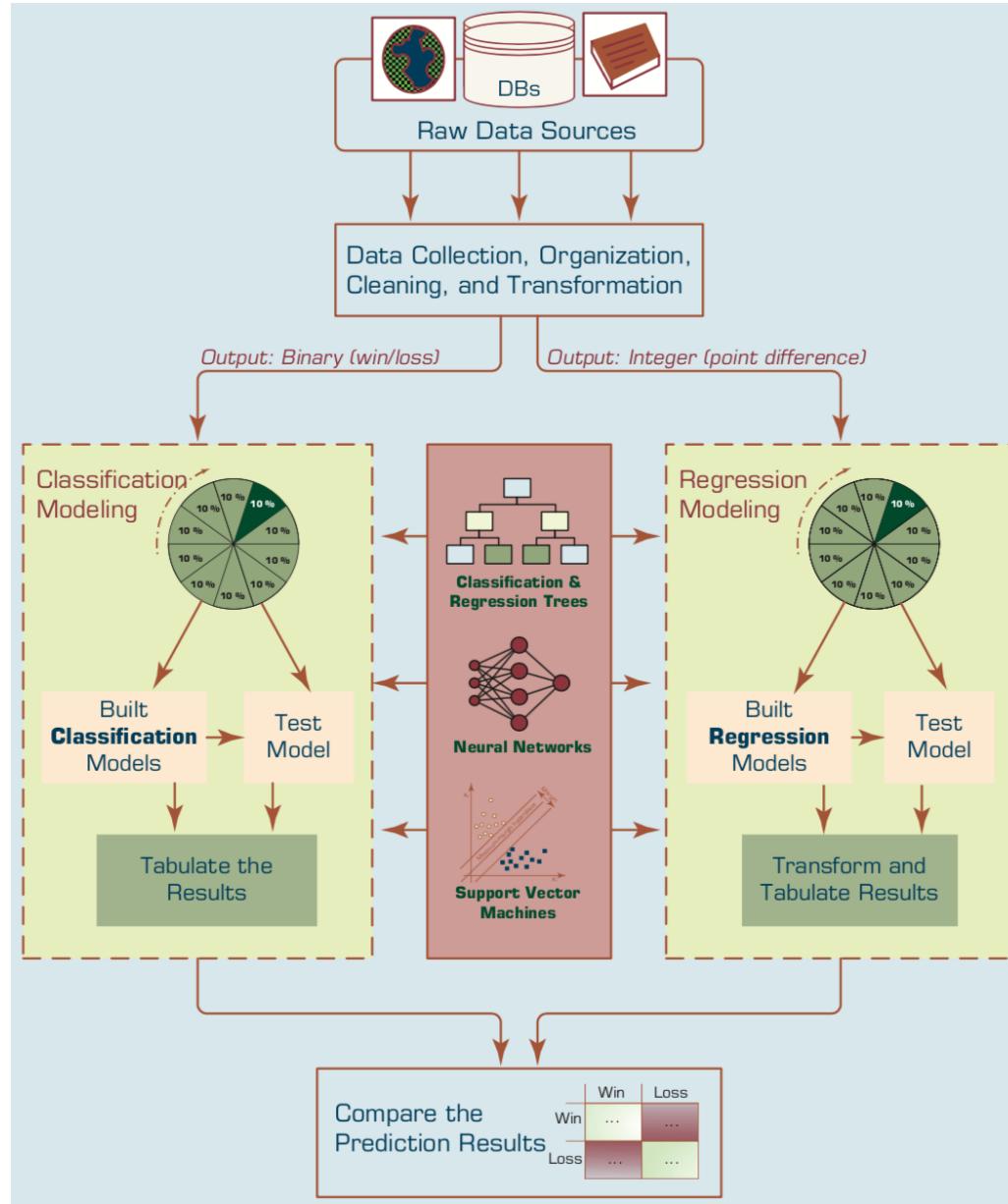


The Logistic Function

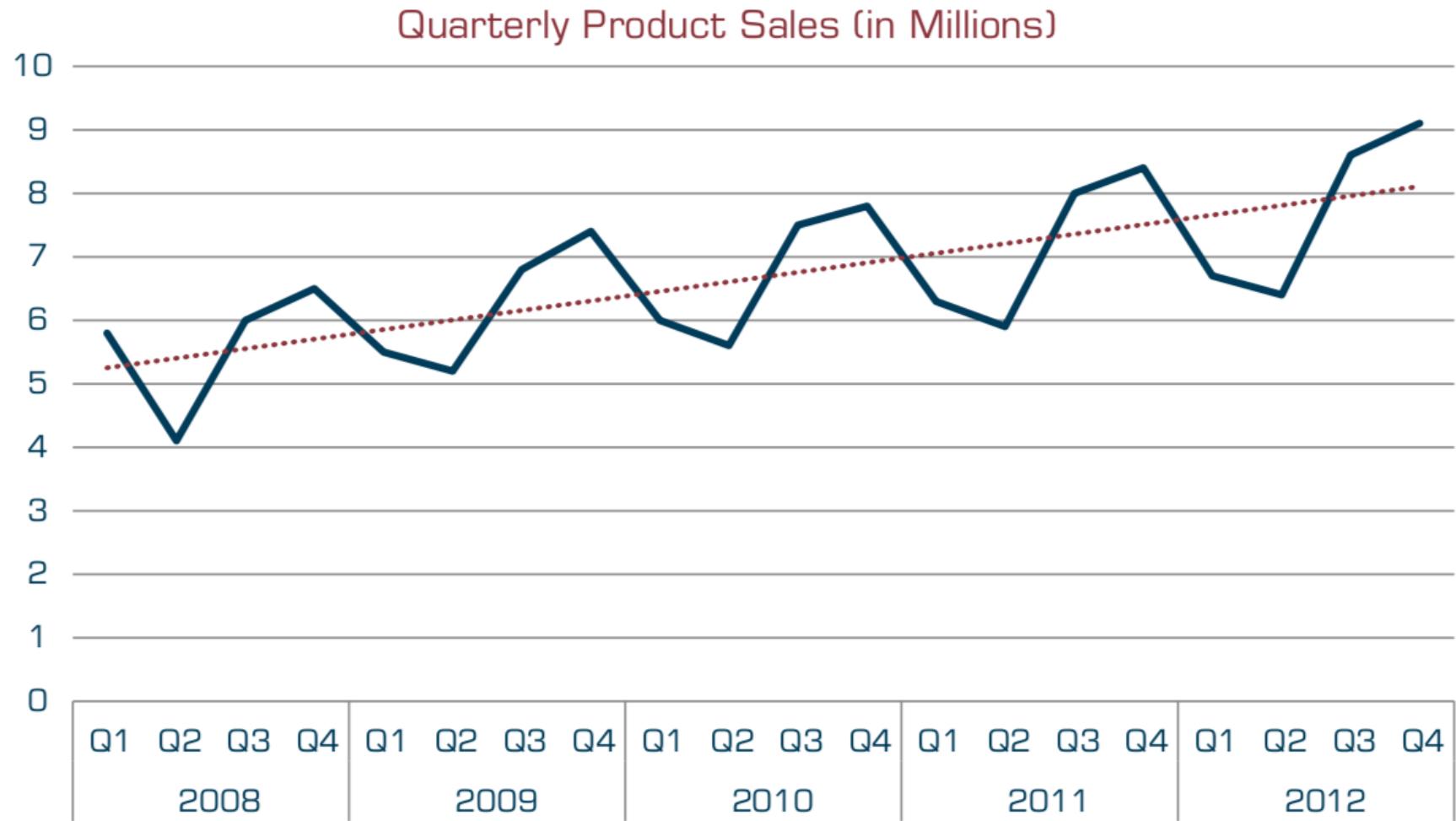
$$f(y) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}$$



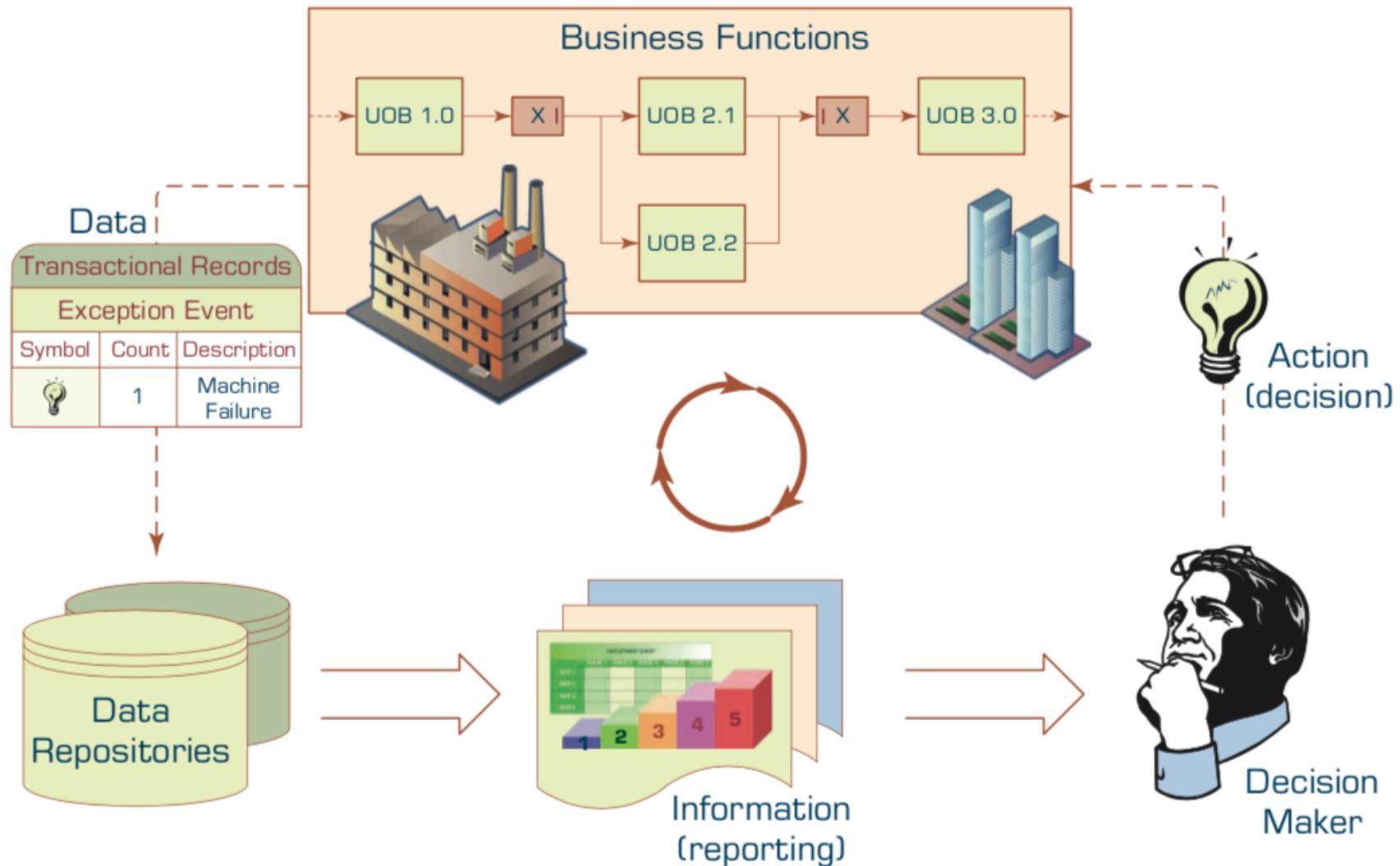
Predicting NCAA Bowl Game Outcomes



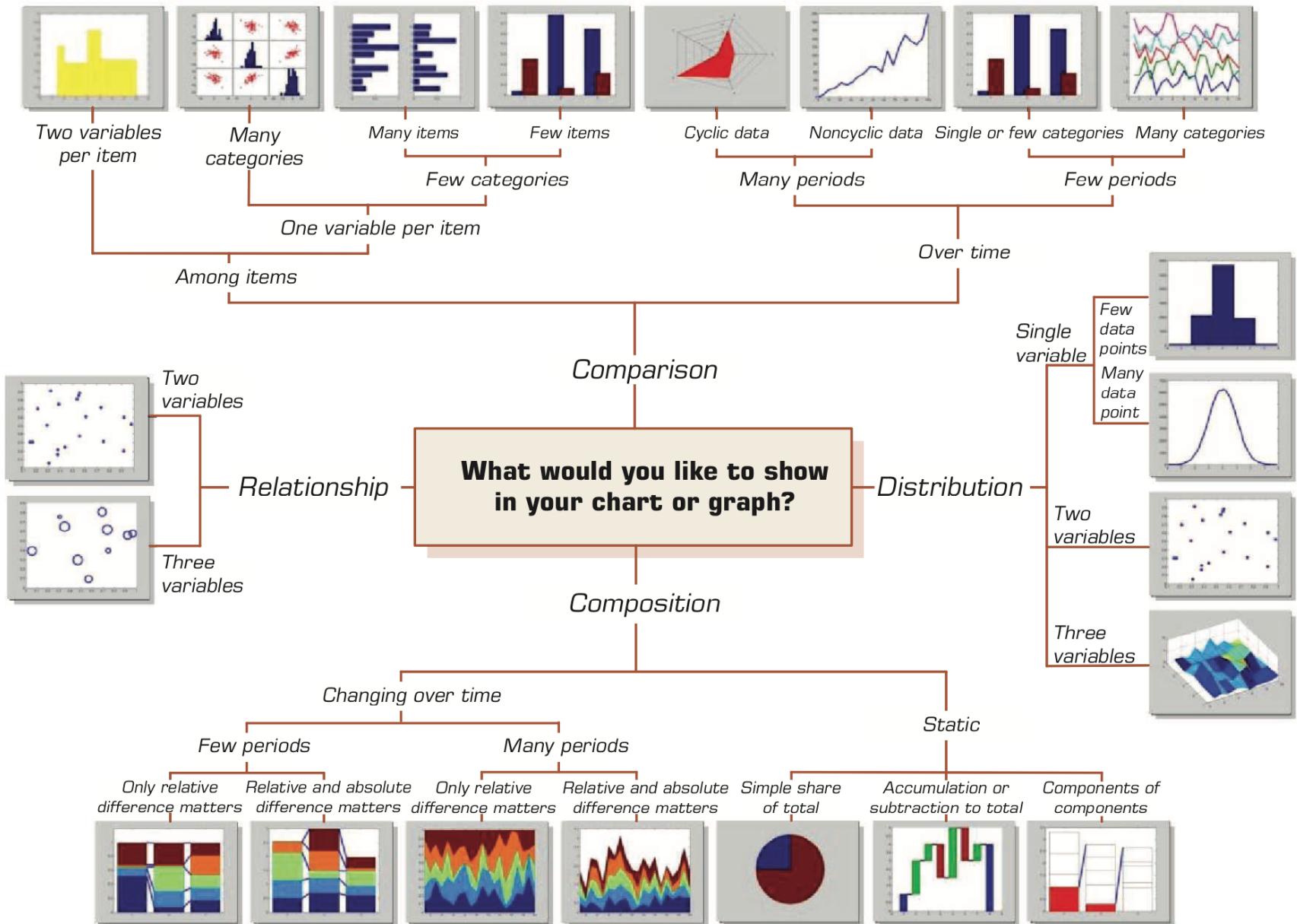
A Sample Time Series of Data on Quarterly Sales Volumes



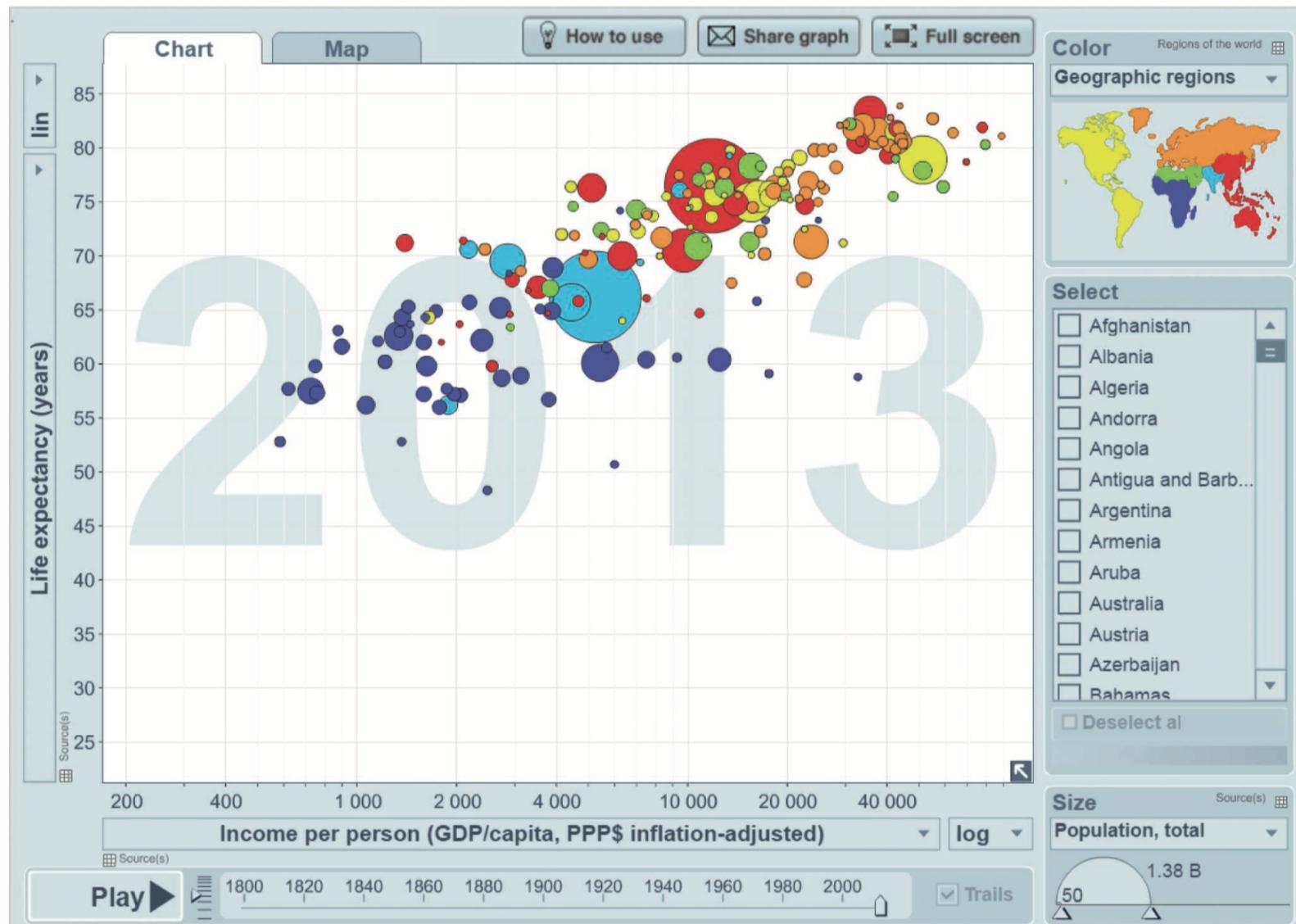
The Role of Information Reporting in Managerial Decision Making



A Taxonomy of Charts and Graphs



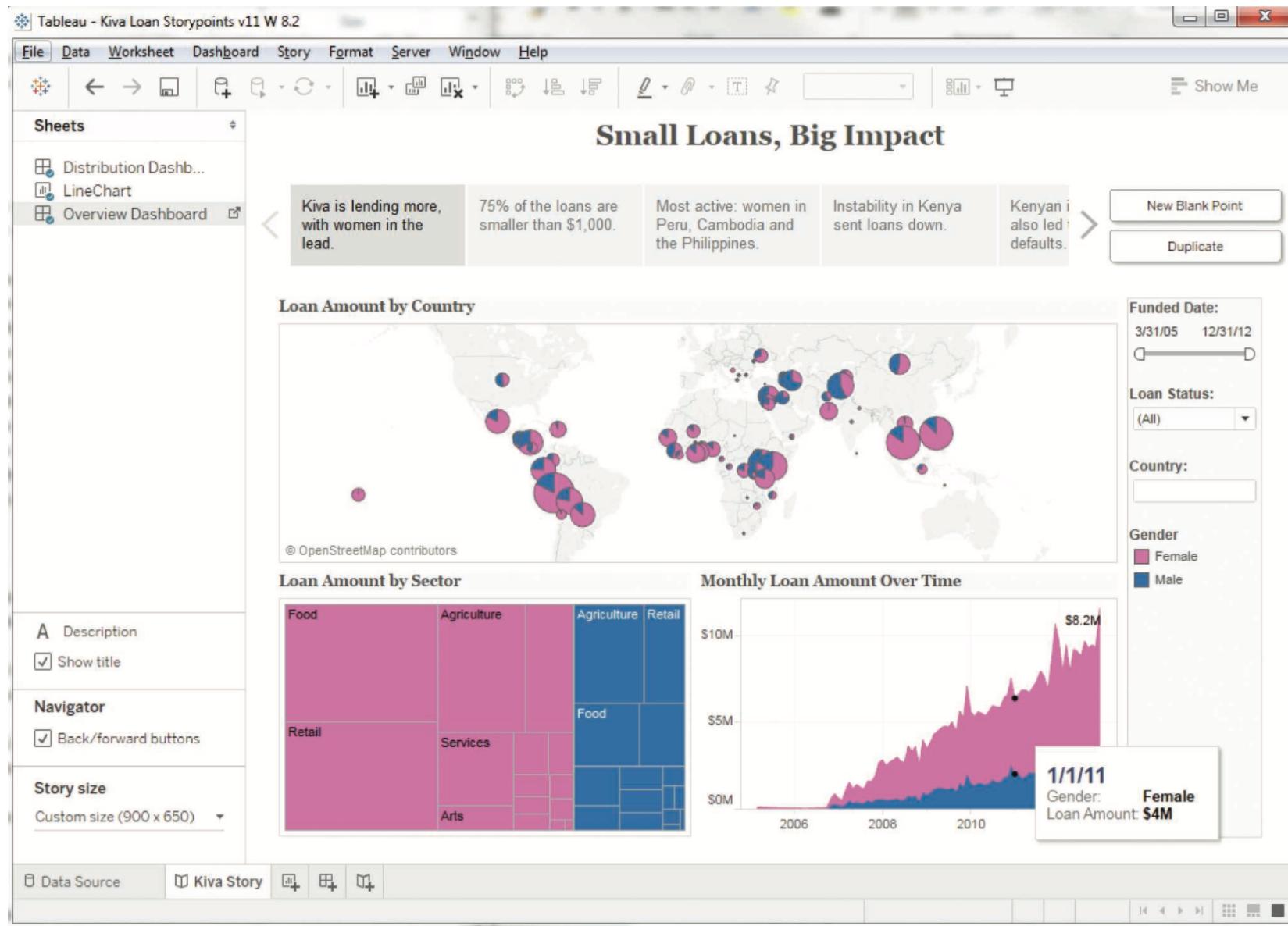
A Gapminder Chart That Shows the Wealth and Health of Nations



Magic Quadrant for Business Intelligence and Analytics Platforms



A Storyline Visualization in Tableau Software



An Overview of SAS Visual Analytics Architecture



A Screenshot from SAS Visual Analytics

The screenshot displays the SAS Visual Analytics interface, showing several data exploration windows and a central dashboard.

Left Panel (Data Explorer): Shows the data source "INSTITUTE_TOY_DEMO" with various data items listed under categories like Product Make, Product Style, Sales Rep, etc. A search bar is also present.

Central Dashboard: Features a map titled "Product Sale, Product Cost of Sale by Facility Region" showing North America with colored bubbles representing data points. Below the map are two numerical values: 3796968 and 211544, with a unit of "(millions)" indicated.

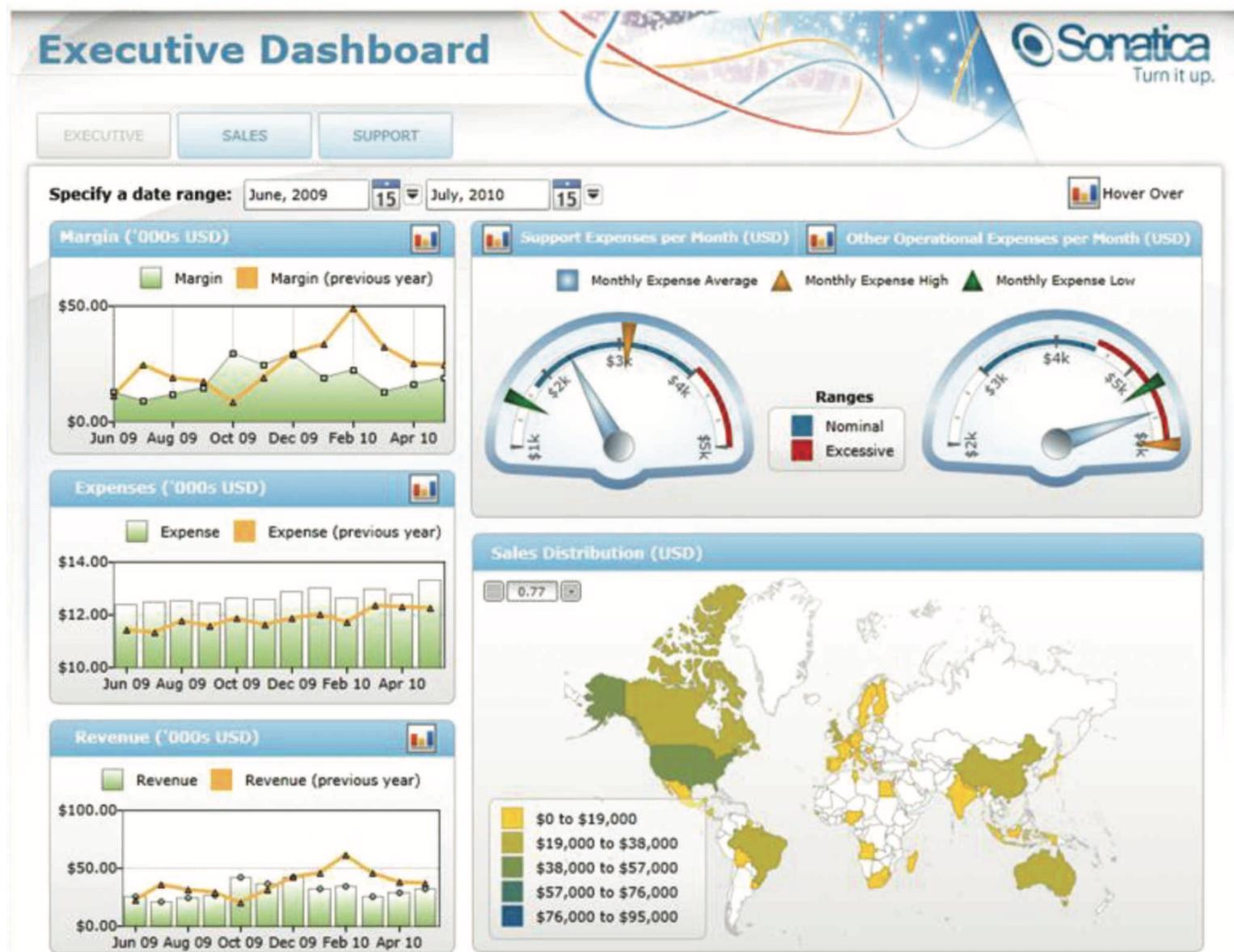
Top Right Panel (Correlation): Displays a correlation matrix titled "Correlation of selected measures". A tooltip for the correlation between "Customer Satisfaction" and "Sales Rep Rating" shows a value of 0.9821 and a relationship of "Strong".

Bottom Right Panel (Revenue & Cost): Contains a bar chart titled "Product Sale, Product Cost of Sale by Product Line". The Y-axis ranges from 0 to 8 million. The legend indicates "Product Cost of Sale" (green) and "Product Sale" (blue).

Bottom Left Panel (Sales Forecast): Shows a line chart titled "Forecast of Product Sale, Product Material Cost by Transaction Month". The X-axis spans from April 2007 to August 2012. The Y-axis ranges from 0 to 400,000. The chart displays three series: "Product Material Cost" (green), "Product Sale (95% confidence)" (blue), and "Product Sale" (dark blue).

Right Side (Facility Overview): A sidebar titled "INSTITUTE_TOY_DEMO" lists facility-related measures like Facility Age, Facility Employees, and Unit Actual Yield Rate. A checkbox for "United States" is checked. A section titled "Visualization" allows dropping data items to filter the view.

A Sample Executive Dashboard



igraph

[Products](#) ▾[News](#)[On github](#)

igraph – The network analysis package

igraph is a collection of network analysis tools with the emphasis on **efficiency, portability** and ease of use. igraph is **open source** and free.
igraph can be programmed in **R, Python** and **C/C++**.

[igraph R package](#)[python-igraph](#)[igraph C library](#)[R/igraph 1.0.0](#)[Repositories at Github](#)[R/igraph 0.7.1](#)[C/igraph 0.7.1](#)[R/igraph 0.7.0](#)[python-igraph 0.7.0](#)[C/igraph 0.7.0](#)[R/igraph 0.6.5](#)

Recent news

[R/igraph 1.0.0](#)

June 24, 2015

[Release Notes](#)

This is a new major release, with a lot of UI changes. We tried to make it easier to use, with short and easy to remember, consistent function names. Unfortunately

<http://igraph.org/redirect.html>

Gephi



[Download](#) [Blog](#) [Wiki](#) [Forum](#) [Support](#) [Bug tracker](#)

[Home](#) [Features](#) [Learn](#) [Develop](#) [Plugins](#) [Services](#) [Consortium](#)

The Open Graph Viz Platform

Gephi is the leading visualization and exploration software for all kinds of graphs and networks. Gephi is open-source and free.

Runs on Windows, Mac OS X and Linux.

[Learn More on Gephi Platform »](#)

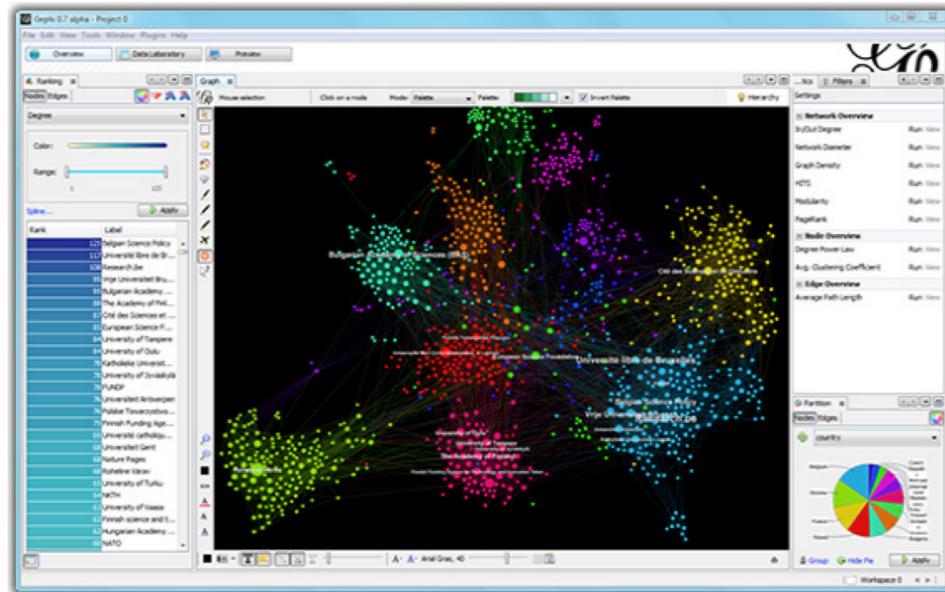


Download FREE
Gephi 0.9.1

[Release Notes](#) | [System Requirements](#)

► [Features](#)
► [Quick start](#)

► [Screenshots](#)
► [Videos](#)



Support us! We are **non-profit**. Help us to **innovate** and **empower** the community by donating only 8€:

[Donate](#)



APPLICATIONS

- ✓ **Exploratory Data Analysis:** intuition-oriented analysis by networks manipulations in real time.
- ✓ **Link Analysis:** revealing the underlying structures of associations between objects.
- ✓ **Social Network Analysis:** easy creation of social

Like Photoshop™ for graphs.

— the Community

LATEST NEWS

► [Gephi updates with 0.9.1 version](#)

PAPERS

[Gephi: An Open Source Software for Exploring and Manipulating Networks](#)

Matthias Boenigk and Sébastien Heymann
Software Engineering Institute
University of Pittsburgh, Pittsburgh, PA, USA
Foundation Navis de Sciences et Techniques

Mathieu Journe
Software Engineering Institute
University of Pittsburgh, Pittsburgh, PA, USA
Foundation Navis de Sciences et Techniques

Abstract
Gephi is an open source Java-based software for exploring and manipulating network graphs. It has a UI that makes it simple to define large complex network graphs and to analyze them. Gephi is designed to be used by people who have little or no knowledge about network analysis and manipulation. It is also designed to be used by people who have some knowledge about network analysis and manipulation. Gephi is a tool for analyzing and manipulating network graphs in the context of interactive exploration and

<https://gephi.org/>

**Discovering,
Analyzing,
Visualizing and
Presenting Data
with Python
in Google Colab**

Google Colab

Hello, Colaboratory - Colaboratory x

Secure | https://colab.research.google.com/notebooks/welcome.ipynb

Hello, Colaboratory

File Edit View Insert Runtime Tools Help

SHARE

CO

+ CODE + TEXT ↑ CELL ↓ CELL COPY TO DRIVE CONNECT EDITING

Table of contents Code snippets Files X

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

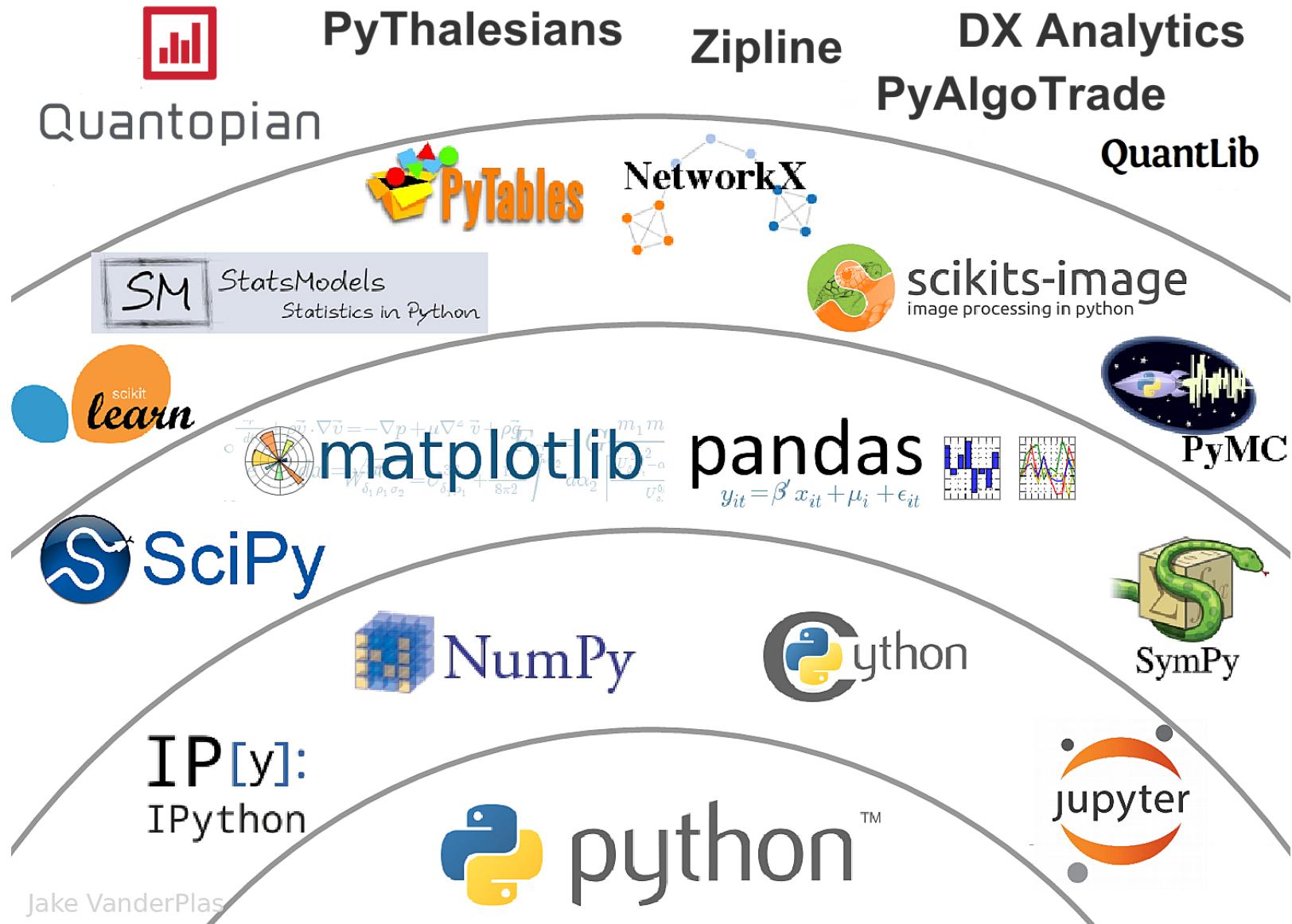
Looking for Colab notebooks to learn from? Check out [Seedbank](#), a place to discover interactive machine learning examples.

▼ TensorFlow execution

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

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

The Quant Finance PyData Stack



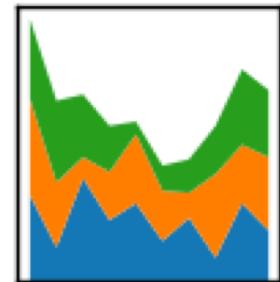
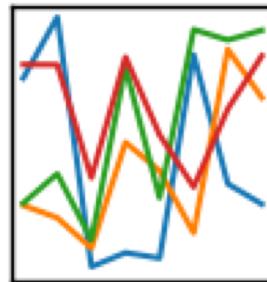
Python matplotlib



Python Pandas

pandas

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



Iris flower data set

setosa



versicolor



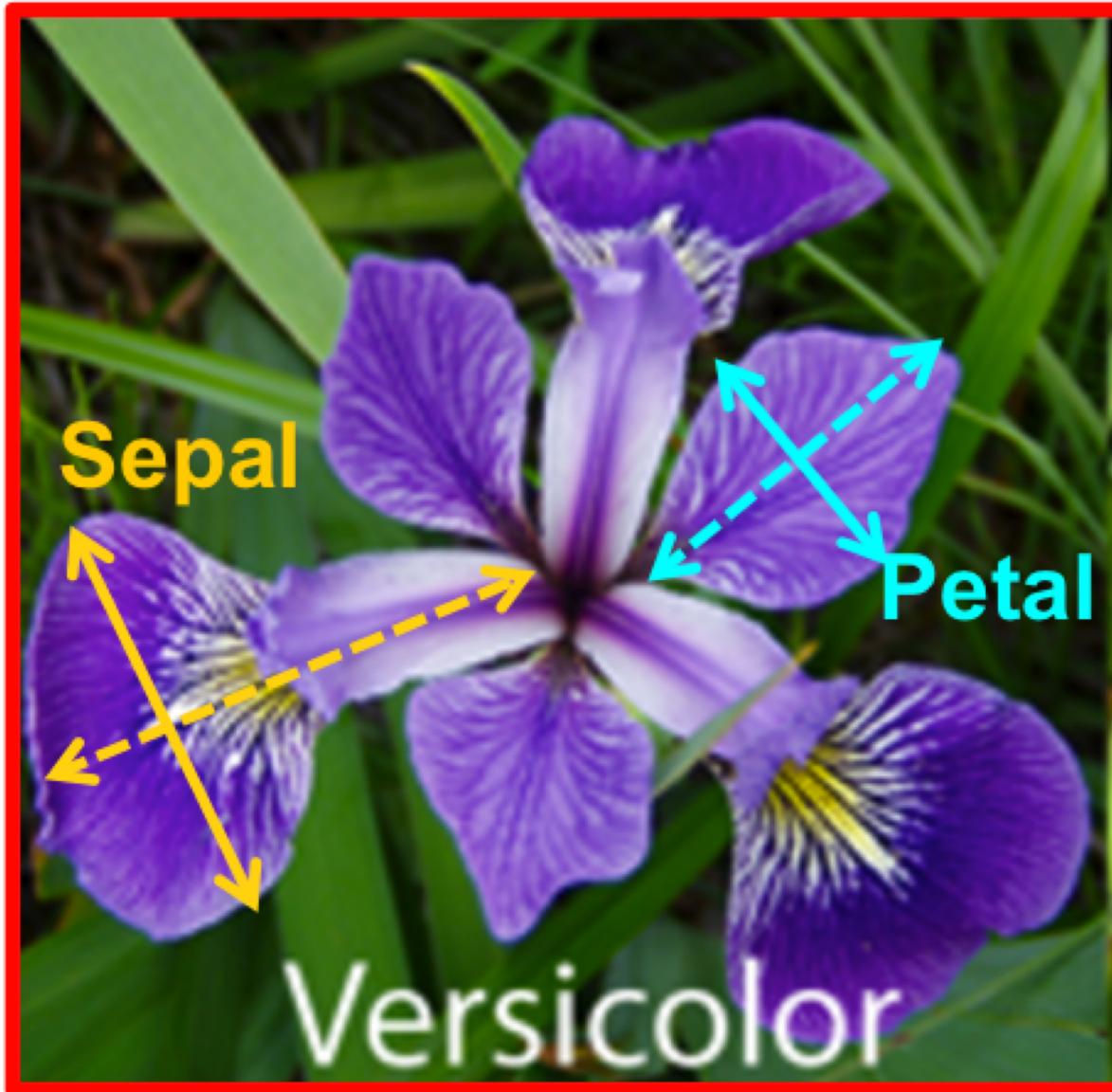
virginica



Source: https://en.wikipedia.org/wiki/Iris_flower_data_set

Source: <http://suruchifialoke.com/2016-10-13-machine-learning-tutorial-iris-classification/>

Iris Classification



iris.data

<https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data>

5.1,3.5,1.4,0.2,Iris-setosa
4.9,3.0,1.4,0.2,Iris-setosa
4.7,3.2,1.3,0.2,Iris-setosa
4.6,3.1,1.5,0.2,Iris-setosa
5.0,3.6,1.4,0.2,Iris-setosa
5.4,3.9,1.7,0.4,Iris-setosa
4.6,3.4,1.4,0.3,Iris-setosa
5.0,3.4,1.5,0.2,Iris-setosa
4.4,2.9,1.4,0.2,Iris-setosa
4.9,3.1,1.5,0.1,Iris-setosa
5.4,3.7,1.5,0.2,Iris-setosa
4.8,3.4,1.6,0.2,Iris-setosa
4.8,3.0,1.4,0.1,Iris-setosa
4.3,3.0,1.1,0.1,Iris-setosa
5.8,4.0,1.2,0.2,Iris-setosa
5.7,4.4,1.5,0.4,Iris-setosa
5.4,3.9,1.3,0.4,Iris-setosa
5.1,3.5,1.4,0.3,Iris-setosa
5.7,3.8,1.7,0.3,Iris-setosa
5.1,3.8,1.5,0.3,Iris-setosa
5.4,3.4,1.7,0.2,Iris-setosa
5.1,3.7,1.5,0.4,Iris-setosa
4.6,3.6,1.0,0.2,Iris-setosa
5.1,3.3,1.7,0.5,Iris-setosa
4.8,3.4,1.9,0.2,Iris-setosa
5.0,3.0,1.6,0.2,Iris-setosa
5.0,3.4,1.6,0.4,Iris-setosa

setosa



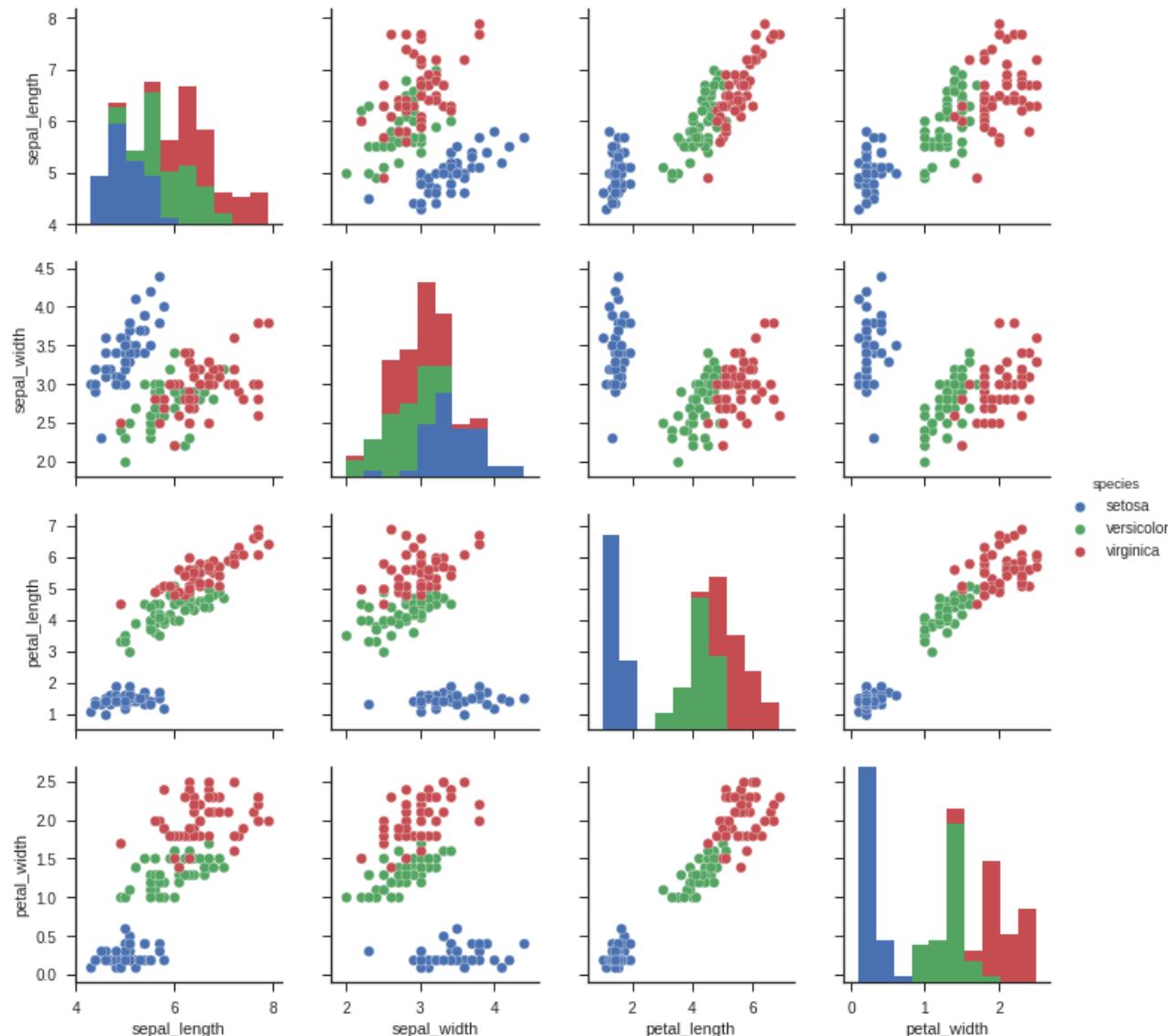
virginica



versicolor



Iris Data Visualization



Connect Google Colab in Google Drive

The screenshot shows the Google Drive interface. On the left, there's a sidebar with various options: My Drive (highlighted with a red dashed box), Computers, Shared with me, Recent, Starred, Trash, Backups, Storage (0 bytes of 15 GB used), and Upgrade Storage. Below the sidebar is a 'Get Backup and Sync for Mac' button. The main area is titled 'My Drive' and contains a 'Search Drive' bar and a 'Quick Access' section with links for New folder..., Upload files..., Upload folder..., Google Docs, Google Sheets, Google Slides, and More (also highlighted with a red dashed box). To the right is a list of connected apps: Google Forms, Google Drawings, Google My Maps, Google Sites, and a 'Connect more apps' button (also highlighted with a red dashed box).

Google Colab

My Drive - Google Drive https://drive.google.com/drive/u/2/my-drive

Drive Search Drive ? Settings New My Drive Computers Shared with me Recent Starred Trash Backups Storage 0 bytes of 15 GB used UPGRADE STORAGE Get Backup and Sync for Mac Access anywhere Share easily Every file in Drive becomes Give others access to any file or

Connect apps to Drive

All ZIP Extractor Extract ZIP files to Google Drive Extraction complete. View extracted files Share Extract another Test.zip ZIP Extractor 307,585 users

LUMIN PDF The fast and simple PDF Viewer Lumin PDF - Beautiful PDF Editor 289,310 users

colab

cloudconvert CloudConvert 373,161 users

Sejda Merge PDF - Split PDF - Sejda.com ★★★★★ (1106)

Edit, Send & Sign PDFs DocHub DocHub - Edit and Sign PDF Docu... 2,131,600 users

Google Forms Google Forms 4,803,614 users G

Name ↑

Google Colab

My Drive - Google Drive +

https://drive.google.com/drive/u/2/my-drive

Drive

Search Drive

New

All

colab

Connect apps to Drive

Colaboratory
offered by https://colab.research.google.com

A data analysis tool that combines code, output, and descriptive text into one collaborative document.

+ CONNECT

Productivity

★★★★★ (195)

Name ↑

My Drive

Computers

Shared with me

Recent

Starred

Trash

Backups

Storage

0 bytes of 15 GB used

UPGRADE STORAGE

Get Backup and Sync for Mac

Access anywhere

Share easily

43

Connect Colaboratory to Google Drive

My Drive - Google Drive x +

https://drive.google.com/drive/u/2/my-drive

Drive Search Drive ? Settings New Help

My Drive Computers Shared with me Recent Starred Trash Backups Storage

0 bytes of 15 GB used UPGRADE STORAGE

Get Backup and Sync for Mac Access anywhere Share easily

Connect apps to Drive

All colab

Colaboratory was connected to Google Drive.

Make Colaboratory the default app for files it can open

OK

RATE IT Productivity ★★★★★ (195)

Name ↑

The screenshot shows the Google Drive interface with a modal window titled 'Connect apps to Drive'. The modal displays a success message: 'Colaboratory was connected to Google Drive.' It includes a checked checkbox for 'Make Colaboratory the default app for files it can open' and a large blue 'OK' button at the bottom right. The 'OK' button is highlighted with a red dashed border. The background shows the main Google Drive dashboard with various sections like My Drive, Computers, and Shared with me.

Google Colab

My Drive - Google Drive x +

https://drive.google.com/drive/u/2/my-drive

Drive Search Drive ? ? ⚙️ grid bell A

New

My Drive

Quick Access

My Drive

Computer

New folder...

Upload files...

Upload folder...

Google Docs

Google Sheets

Google Slides

More

Backup

Storage

0 bytes of 15 GB used

UPGRADE STORAGE

Get Backup and Sync for Mac

Name ↑

Store safely

Sync seamlessly

Access anywhere

Share easily

Google Forms

Google Drawings

Google My Maps

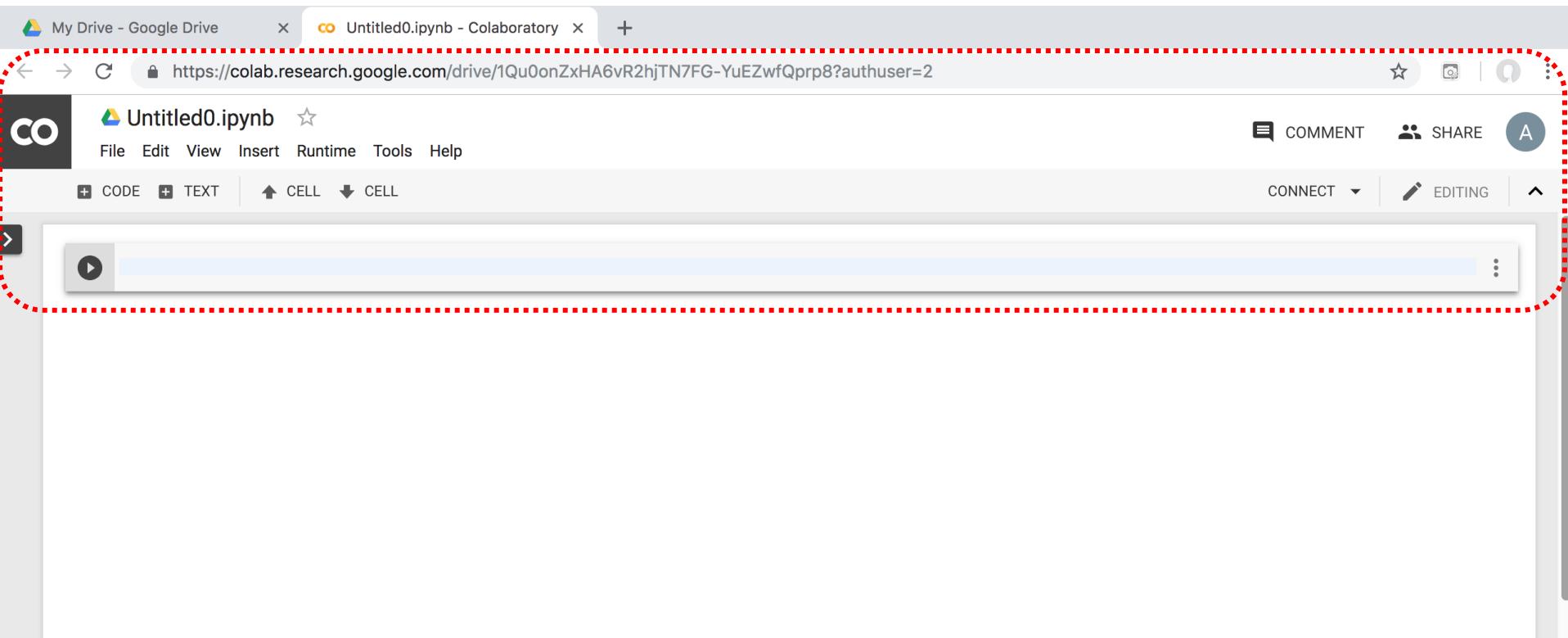
Google Sites

Colaboratory

Connect more apps

The screenshot shows the Google Drive interface. A red dashed box highlights the 'New' button in the top left. A secondary red dashed box highlights the 'More' option in the 'Quick Access' dropdown menu. A third red dashed box highlights the 'Colaboratory' option in the expanded 'More' menu. The main workspace shows basic storage information and links to Google's suite of productivity tools.

Google Colab



Google Colab

The screenshot shows the Google Colab interface. At the top, there's a navigation bar with tabs for "My Drive - Google Drive" and "Untitled0.ipynb - Colaboratory". Below the navigation bar is a toolbar with icons for file operations like "New", "Upload", and "Run". The main area is titled "Untitled0.ipynb" and contains two tabs: "CODE" and "TEXT". A play button icon is visible on the left. On the right side, there are buttons for "COMMENT", "SHARE", "CONNECT", and "EDITING". The "Runtime" menu is open, showing various options for running cells. The option "Change runtime type" is highlighted with a red dashed box. The "Manage sessions" option at the bottom of the menu is also highlighted with a red dashed box.

Untitled0.ipynb

File Edit View Insert **Runtime** Tools Help

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 runtime... ⌘/Ctrl+M .

Restart and run all...

Reset all runtimes...

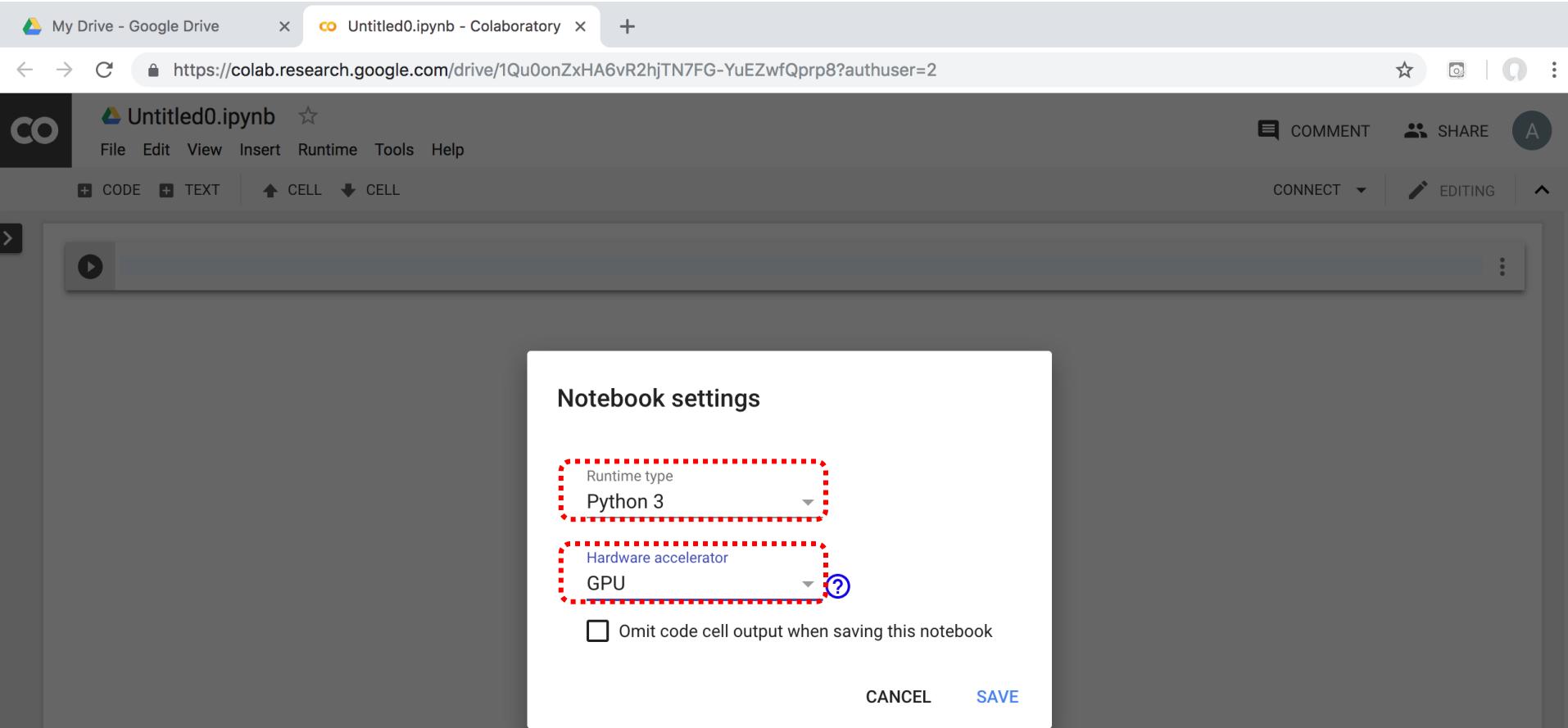
Change runtime type

Manage sessions

Run Jupyter Notebook

Python3 GPU

Google Colab



Google Colab Python Hello World

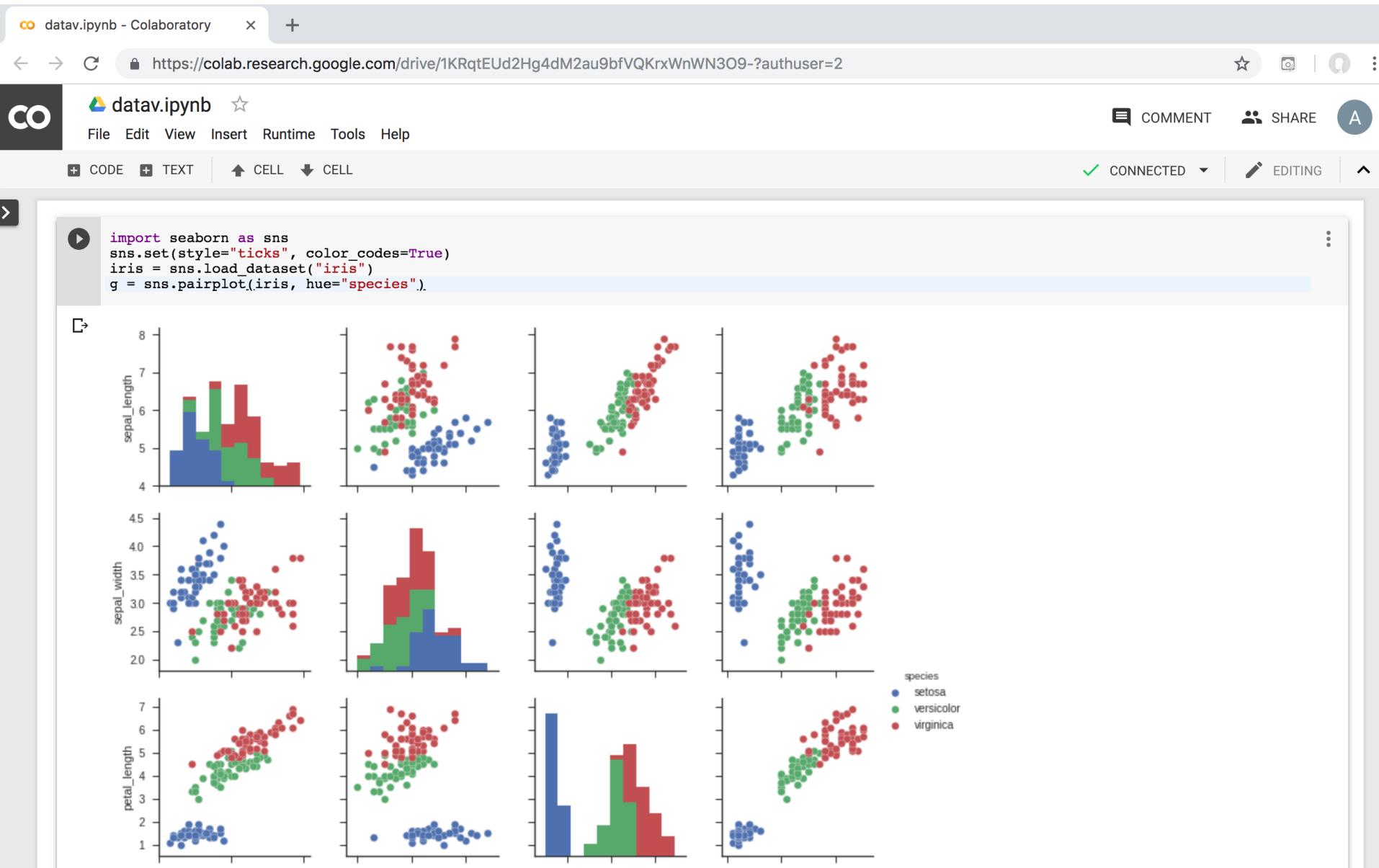
print('Hello World')

A screenshot of a Google Colab notebook titled "Untitled0.ipynb". The notebook interface includes a toolbar with file operations like File, Edit, View, Insert, Runtime, Tools, Help, and a sidebar with CO, COMMENT, SHARE, and A buttons. Below the toolbar is a code editor cell containing the Python command `print('Hello World')`. The output of this cell is displayed below it, showing the text "Hello World". The status bar at the bottom indicates the notebook is connected.

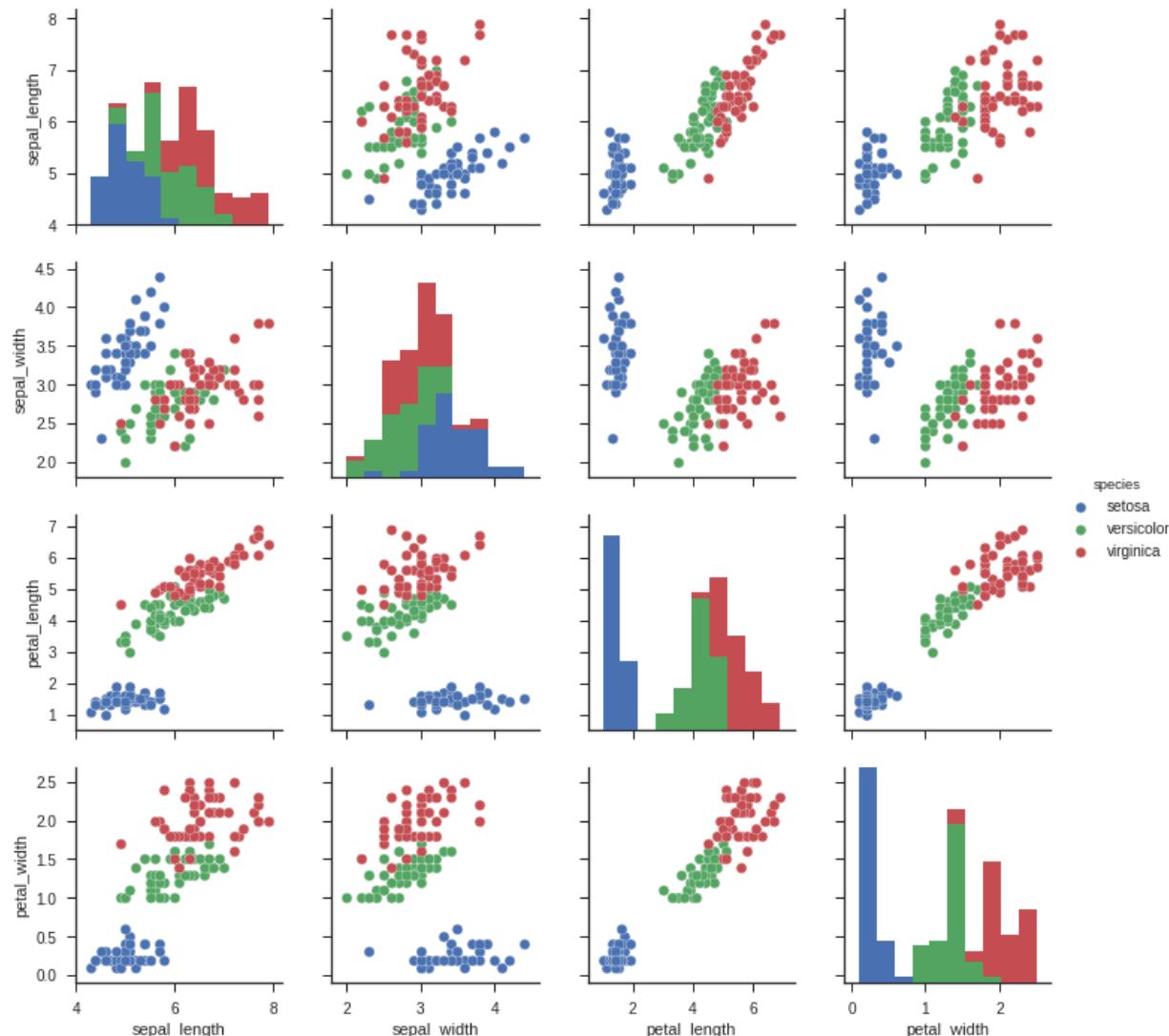
```
print('Hello World')
```

Hello World

Data Visualization in Google Colab



```
import seaborn as sns  
sns.set(style="ticks", color_codes=True)  
iris = sns.load_dataset("iris")  
g = sns.pairplot(iris, hue="species")
```



```
import numpy as np
import pandas as pd
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
from pandas.plotting import scatter_matrix

# Load dataset
url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
names = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'class']
df = pd.read_csv(url, names=names)

print(df.head(10))
print(df.tail(10))
print(df.describe())
print(df.info())
print(df.shape)
print(df.groupby('class').size())

plt.rcParams["figure.figsize"] = (10,8)
df.plot(kind='box', subplots=True, layout=(2,2), sharex=False, sharey=False)
plt.show()

df.hist()
plt.show()

scatter_matrix(df)
plt.show()

sns.pairplot(df, hue="class", size=2)
```

```
import numpy as np
import pandas as pd
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
from pandas.plotting import scatter_matrix
```

```
# Import Libraries
import numpy as np
import pandas as pd
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
from pandas.plotting import scatter_matrix
print('imported')
```

imported

```
url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
names = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'class']
df = pd.read_csv(url, names=names)
print(df.head(10))
```

```
# Load dataset
url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
names = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'class']
df = pd.read_csv(url, names=names)
print(df.head(10)).
```

	sepal-length	sepal-width	petal-length	petal-width	class
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa
5	5.4	3.9	1.7	0.4	Iris-setosa
6	4.6	3.4	1.4	0.3	Iris-setosa
7	5.0	3.4	1.5	0.2	Iris-setosa
8	4.4	2.9	1.4	0.2	Iris-setosa
9	4.9	3.1	1.5	0.1	Iris-setosa

df.tail(10)

```
print(df.tail(10))
```

	sepal-length	sepal-width	petal-length	petal-width	class
140	6.7	3.1	5.6	2.4	Iris-virginica
141	6.9	3.1	5.1	2.3	Iris-virginica
142	5.8	2.7	5.1	1.9	Iris-virginica
143	6.8	3.2	5.9	2.3	Iris-virginica
144	6.7	3.3	5.7	2.5	Iris-virginica
145	6.7	3.0	5.2	2.3	Iris-virginica
146	6.3	2.5	5.0	1.9	Iris-virginica
147	6.5	3.0	5.2	2.0	Iris-virginica
148	6.2	3.4	5.4	2.3	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica

df.describe()

```
print(df.describe())
```

	sepal-length	sepal-width	petal-length	petal-width
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.054000	3.758667	1.198667
std	0.828066	0.433594	1.764420	0.763161
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

```
print(df.info())
print(df.shape)
```

```
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
sepal-length      150 non-null float64
sepal-width       150 non-null float64
petal-length      150 non-null float64
petal-width       150 non-null float64
class             150 non-null object
dtypes: float64(4), object(1)
memory usage: 5.9+ KB
None
```

```
print(df.shape)
```

```
(150, 5)
```

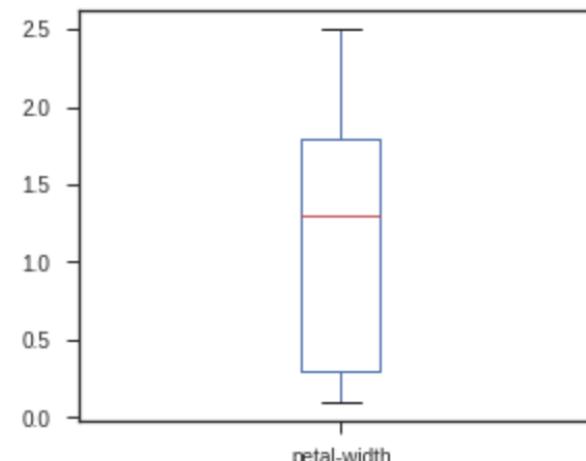
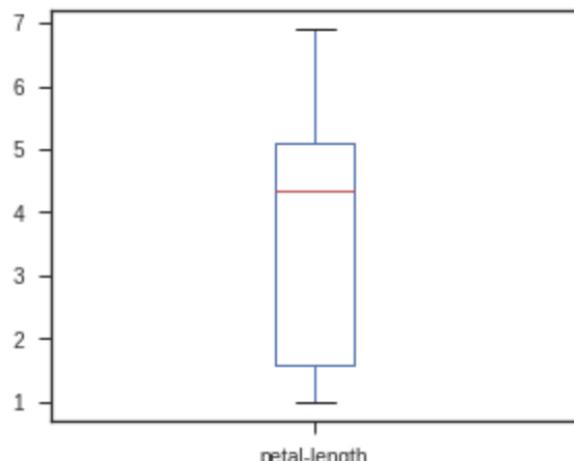
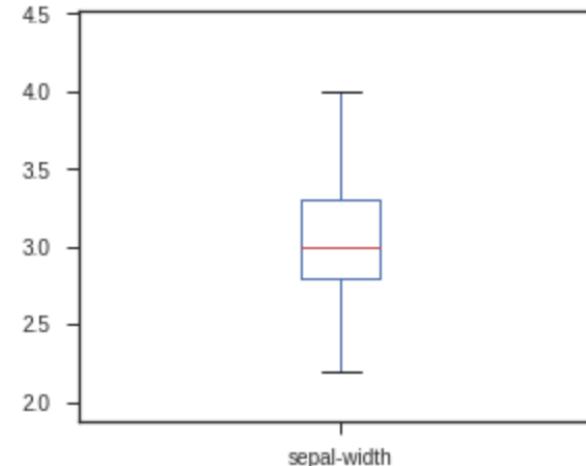
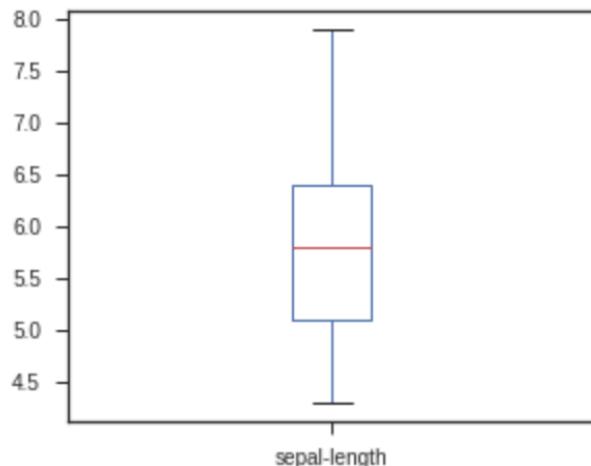
```
df.groupby('class').size()
```

```
print(df.groupby('class').size())
```

```
class
Iris-setosa      50
Iris-versicolor 50
Iris-virginica  50
dtype: int64
```

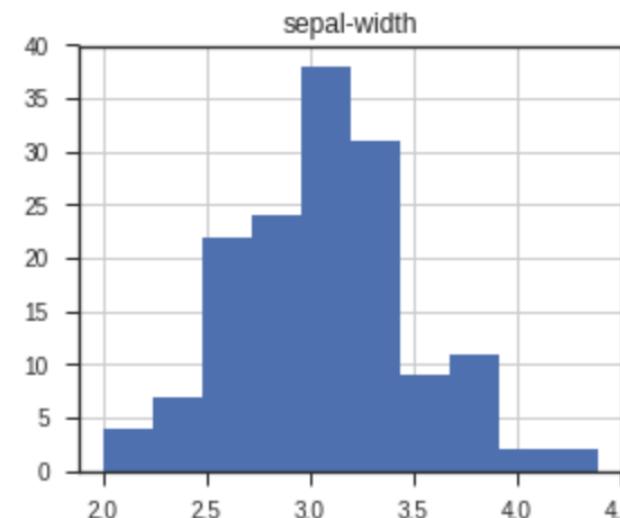
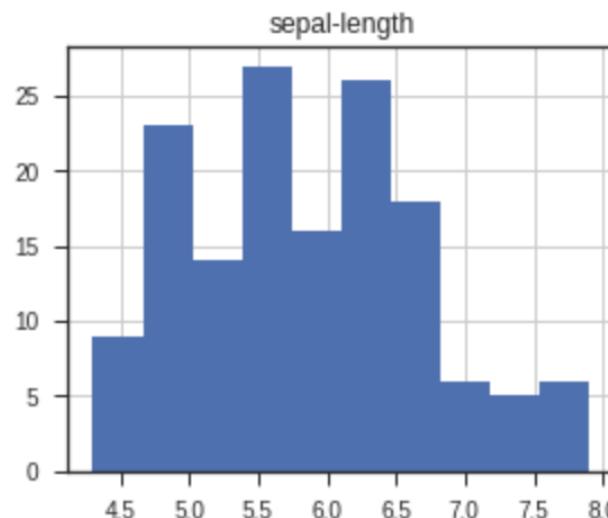
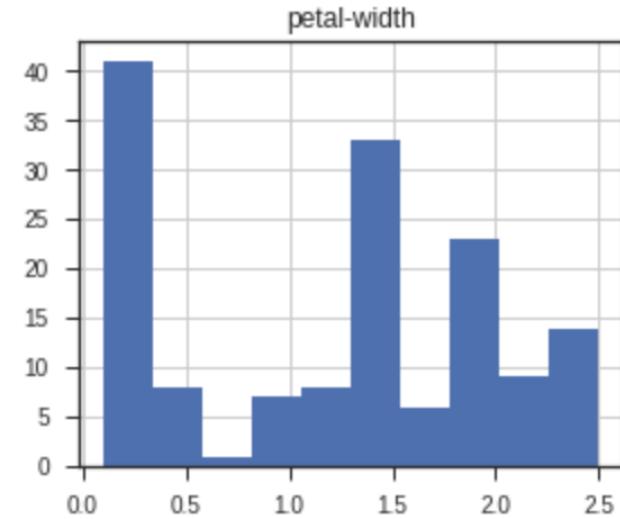
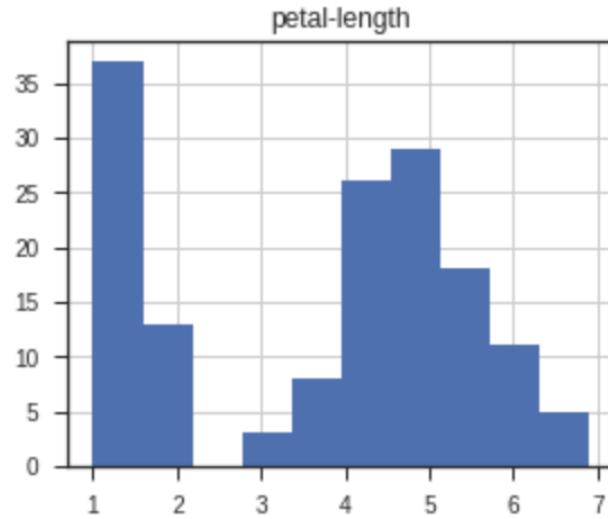
```
plt.rcParams["figure.figsize"] = (10,8)
df.plot(kind='box', subplots=True, layout=(2,2), sharex=False, sharey=False)
plt.show()
```

```
plt.rcParams["figure.figsize"] = (10,8)
df.plot(kind='box', subplots=True, layout=(2,2), sharex=False, sharey=False)
plt.show()
```



df.hist() plt.show()

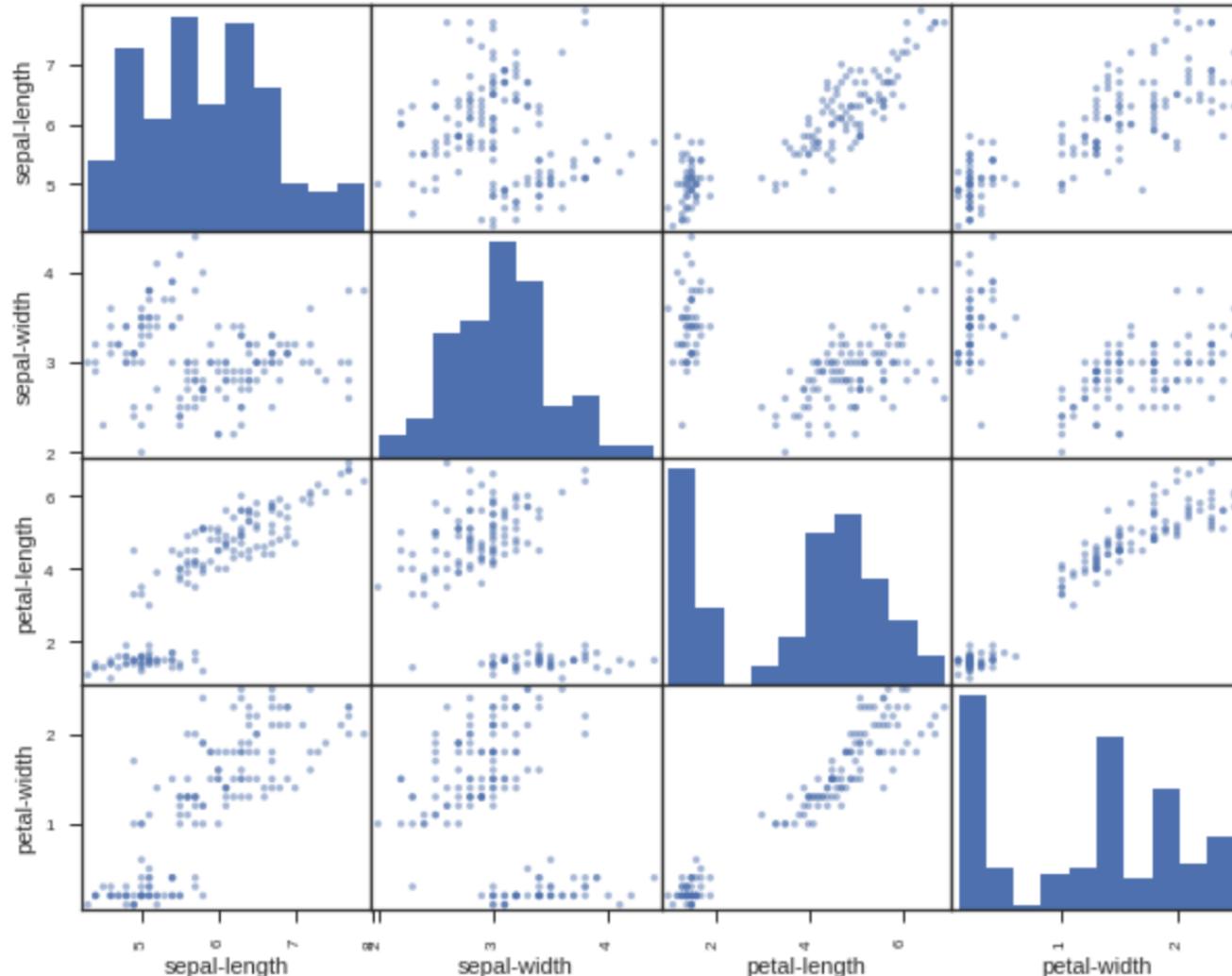
```
df.hist()  
plt.show(.)
```



```
scatter_matrix(df)
```

```
plt.show()
```

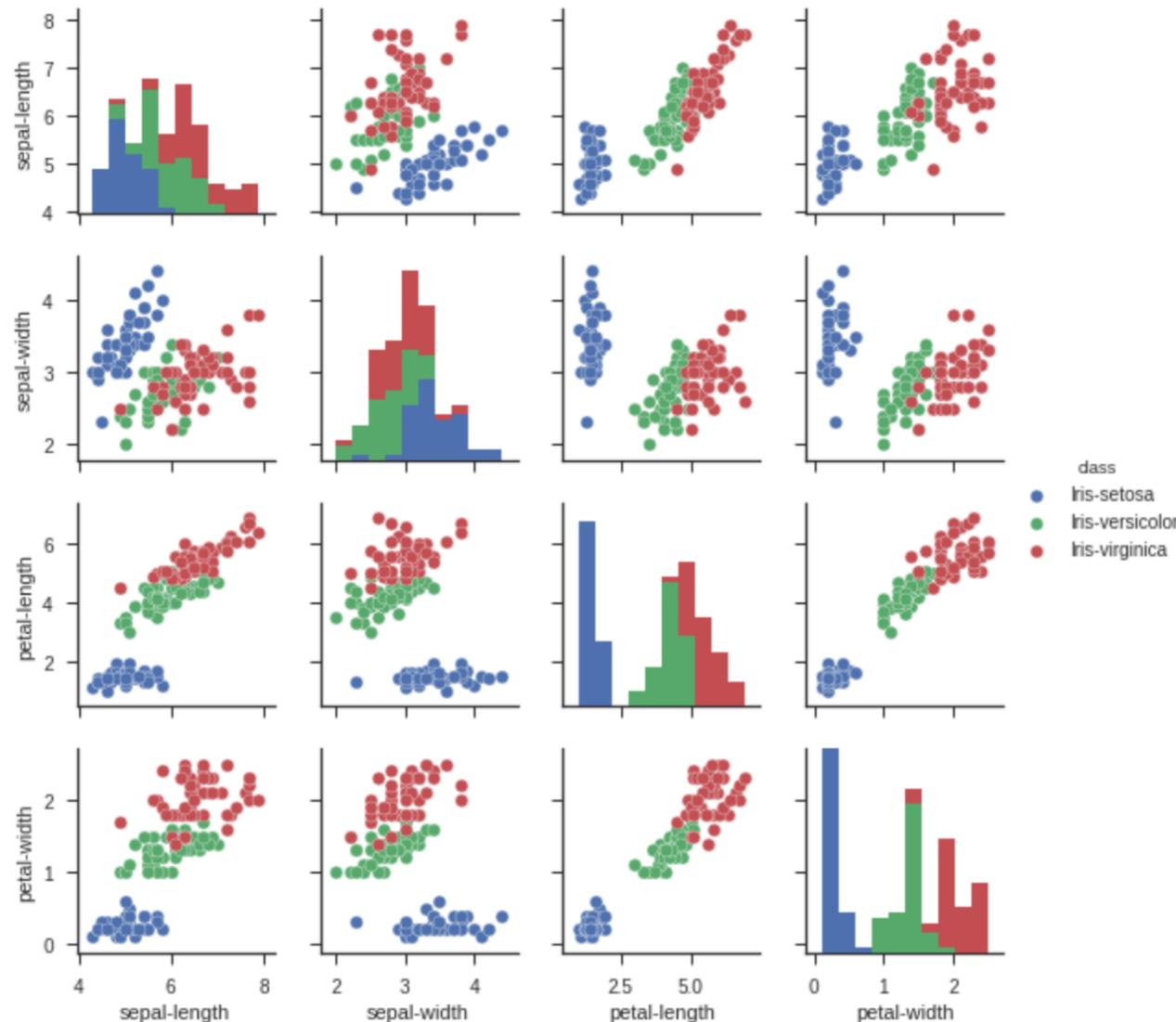
```
scatter_matrix(df)  
plt.show()
```



```
sns.pairplot(df, hue="class", size=2)
```

```
sns.pairplot(df, hue="class", size=2)
```

```
<seaborn.axisgrid.PairGrid at 0x7f1d21267390>
```



Summary

- Descriptive Analytics I
- Nature of Data
- Statistical Modeling
- Visualization

References

- Ramesh Sharda, Dursun Delen, and Efraim Turban (2017), Business Intelligence, Analytics, and Data Science: A Managerial Perspective, 4th Edition, Pearson.
- EMC Education Services (2015), Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley