ICT233
Data Programming

Seminar 3

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Course Structure

13-Jan-26 to 31-Mar-26: 6 lectures (3 hrs) & 6 labs (2 hrs)

S/N	Topic	Date & Time	Venue
1	Introduction to Data Programming	7pm to 10pm, Tue, 13-Jan-26	HQ BLK C-SR.C.4.16
2	Lab	7pm to 9pm, Tue, 20-Jan-26	ICT233_JAN26_T01 -> Virtual Class -> Zoom
3	Data Management	7pm to 10pm, Tue, 27-Jan-26	HQ BLK C-SR.C.4.16
4	Lab	7pm to 9pm, Tue, 3-Feb-26	ICT233_JAN26_T01 -> Virtual Class -> Zoom
5	Data Types and Structure	7pm to 10pm, Tue, 10-Feb-26	HQ BLK C-SR.C.4.16
6	**Lab (Rescheduled due to CNY)**	**10am to 12pm, Sat, 21-Feb-26**	**ICT233_JAN26_T01 -> Virtual Class -> Zoom**
7	Data Manipulation	7pm to 10pm, Tue, 24-Feb-26	HQ BLK C-SR.C.4.16
8	Lab	7pm to 9pm, Tue, 3-Mar-26	ICT233_JAN26_T01 -> Virtual Class -> Zoom
9	Data Munging	7pm to 10pm, Tue, 10-Mar-26	HQ BLK C-SR.C.4.16
10	Lab	7pm to 9pm, Tue, 17-Mar-26	ICT233_JAN26_T01 -> Virtual Class -> Zoom
11	Data Scraping	7pm to 10pm, Tue, 24-Mar-26	HQ BLK C-SR.C.4.16
12	Lab	7pm to 9pm, Tue, 31-Mar-26	ICT233_JAN26_T01 -> Virtual Class -> Zoom

3 pre-class quizzes (PCQ), 1 quiz, 1 Tutor-Marked Assignment (TMA) and 1 ECA:
(Please always refer to CANVAS for the latest update!)

Assessment	Description	Weight Allocation	Deadline
Quiz	PCQ 1	6%	06 Jan 2026 - 13 Jan 2026, 2355hrs
	PCQ 2		27 Jan 2026 - 3 Feb 2026, 2355hrs
	PCQ 3		24 Feb 2026 - 3 Mar 2026, 2355hrs
	Quiz		28 March 2026 (0900hrs) to 30 March 2026 (2355 hrs)
Assignment	TMA	24%	Thursday, 12 March 2026, 2355 hours
Examination	ECA	70%	Start of ECA: Thursday, 02 April 2026, 12 noon End of ECA: Sunday, 05 April 2026, 12 noon End of ECA Grace Period: Monday, 06 April 2026, 12 am
TOTAL		**100%**	

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Learning Outcomes

By the end of this course, you should be able to:

Knowledge & Understanding (Theory Component)

- Develop analytic mindset to understand and interpret datasets
- Analyze HTTP and design parsing methods for information retrieval
- Apply Object-Relational Mapping (ORM) to manage information between objects and databases
- Compose and utilize query languages for information retrieval from databases

Key Skills (Practical Component)

- Perform ETL (Extraction, Transformation, Loading) and calculations using Python and Pandas
- Develop programs to perform CRUD operations on database information
- Formulate communication methods for exchanging information over the WWW
- Conduct effective data visualization

Data Types and Structure

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Learning Outcomes

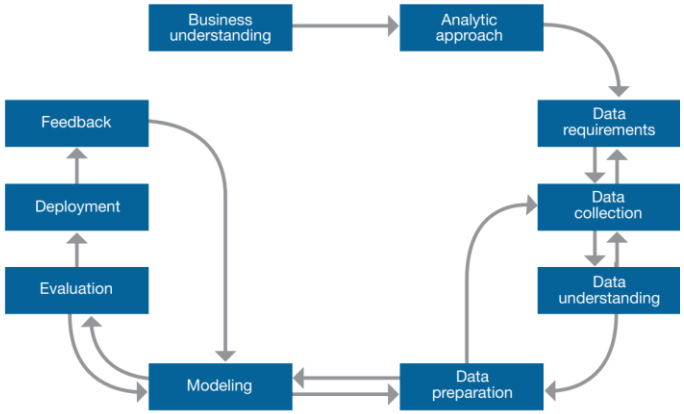
At the end of this unit, you are expected to be able to:

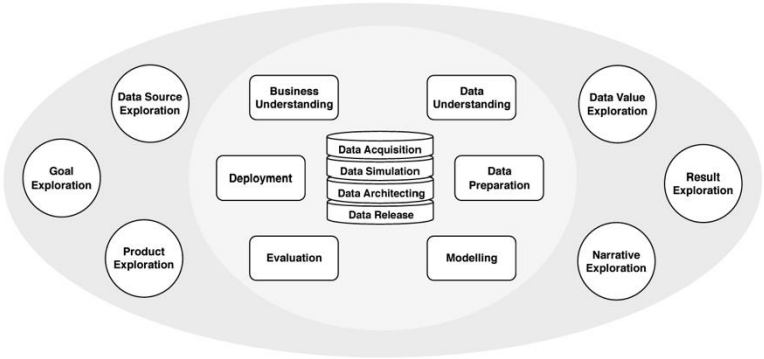
- Appreciate the features and usage possibility of Pandas library as a data analytics package
- Understand the basic usage of Python Pandas library - loading files, counting data, determine item structure and types in the data
- Learn the basic manipulation of data using Pandas - row and column selection, itemised or vector operation on Pandas DataFrame
- Conduct operations of Pandas DataFrame - subsetting, slicing and indexing DataFrame
- Presenting and visualising data in Pandas DataFrame using charting and plotting libraries such as Matplotlib and Seaborn

Pandas Dataframe Basics

➢ Data preparation, Cleansing, Pre-processing, Wrangling

- CRISP-DM model - https://en.wikipedia.org/wiki/Cross-industry_standard_process_for_data_mining
- Foundational Methodology for Data Science - IBM Analytics White Paper 2015 (https://tdwi.org/~/media/64511A895D86457E964174EDC5C4C7B1.PDF)
- CRISP-DM Twenty Years Later: From Data Mining Processes to Data Science Trajectories (https://research-information.bris.ac.uk/ws/portalfiles/portal/220614618/TKDE_Data_Science_Trajectories_PF.pdf)





CRISP-DM model Foundational Methodology for Data Science Data Science Trajectories (DST) framework

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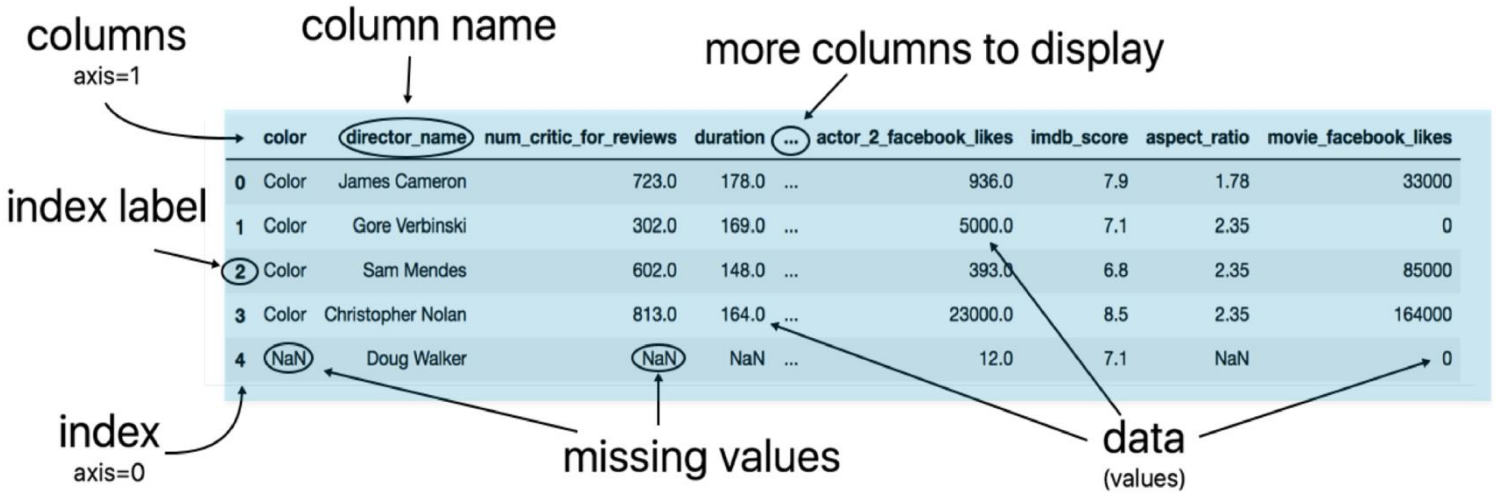
Pandas Dataframe Basics

➢ Introduction

- Pandas – Open-source Python libraries with "spreadsheet" like functions (https://pandas.pydata.org/docs/reference/frame.html)
- New Data Types
  - Series – i.e. single column
  - DataFrame – i.e. a collection of Series



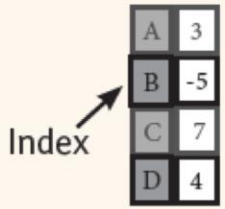
	color	director_name	num_critic_for_reviews	duration	...	actor_2_facebook_likes	imdb_score	aspect_ratio	movie_facebook_likes
0	Color	James Cameron	723.0	178.0	...	936.0	7.9	1.78	33000
1	Color	Gore Verbinski	302.0	169.0	...	5000.0	7.1	2.35	0
2	Color	Sam Mendes	602.0	148.0	...	393.0	6.8	2.35	85000
3	Color	Christopher Nolan	813.0	164.0	...	23000.0	8.5	2.35	164000
4	NaN	Doug Walker	NaN	NaN	...	12.0	7.1	NaN	0

Pandas Dataframe Basics

Pandas Data Structures

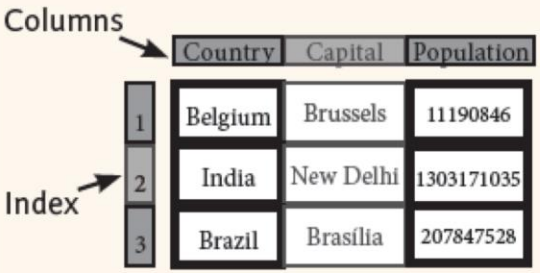
Series

A one-dimensional labeled array capable of holding any data type




```
>>> s = pd.Series([3, -5, 7, 4], index=['a', 'b', 'c', 'd'])
```

DataFrame



A two-dimensional labeled data structure with columns of potentially different types

```
>>> data = {'Country': ['Belgium', 'India', 'Brazil'],
            'Capital': ['Brussels', 'New Delhi', 'Brasília'],
            'Population': [11190846, 1303171035, 207847528]}

>>> df = pd.DataFrame(data,
                      columns=['Country', 'Capital', 'Population'])
```

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Pandas Dataframe Basics

➢ Introduction

Loading and examining the data

```
import pandas as pd
df =pd.read_csv('gapminder.tsv', sep='\t’)
print (df.head())
print (df.tail())
```

```
     country    continent year  lifeExp     pop    gdpPercap
0  Afghanistan      Asia  1952   28.801   8425333  779.445314
1  Afghanistan      Asia  1957   30.332   9240934  820.853030
2  Afghanistan      Asia  1962   31.997  10267083  853.100710
3  Afghanistan      Asia  1967   34.020  11537966  836.197138
4  Afghanistan      Asia  1972   36.088  13079460  739.981106

      country    continent year  lifeExp     pop    gdpPercap
3307  Zimbabwe    Africa  1987   62.351   9216418  706.157306
3308  Zimbabwe    Africa  1992   60.377  10704340  693.420786
3309  Zimbabwe    Africa  1997   46.809  11404948  792.449960
3310  Zimbabwe    Africa  2002   39.989  11926563  672.038623
3311  Zimbabwe    Africa  2007   43.487  12311143  469.709298
```

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

```
out:
(3312, 6)
```

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Pandas Dataframe Basics

➢ Introduction

Loading and examining the data

- df.dtypes
- df.describe()
- df.info()

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

```
out:
RangeIndex: 3312 entries, 0 to 3311
Data columns (total 6 columns):
country      3312 non-null object
continent    3011 non-null object
year         3312 non-null int64
lifeExp      3312 non-null float64
pop          3312 non-null int64
gdpPercap    3312 non-null float64
dtypes: float64(2), int64(2), object(2)
memory usage: 155.3+ KB
None
```

```
>>> df = pd.DataFrame(
...     {
...         "float": [1.0],
...         "int": [1],
...         "datetime": [pd.Timestamp("20180310")],
...         "string": ["foo"],
...     }
... )
>>> df.dtypes
float              float64
int                  int64
datetime    datetime64[us]
string                str
dtype: object
```

```
>>> df = pd.DataFrame(
...     {
...         "categorical": pd.Categorical(["d", "e", "f"]),
...         "numeric": [1, 2, 3],
...         "object": ["a", "b", "c"],
...     }
... )
>>> df.describe()
       numeric
count      3.0
mean       2.0
std        1.0
min        1.0
25%        1.5
50%        2.0
75%        2.5
max        3.0
```

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Pandas Dataframe Basics

- **Introduction**

Pandas Data Types

- Pandas Types Versus Python Types

Pandas Type	Python Type	Description
`object`	`string`	Most common data type
`int64`	`int`	Whole numbers
`float64`	`float`	Numbers with decimals
`date-time64`	`date-time`	`datetime` is found in the Python standard library (i.e., it is not loaded by default and needs to be imported)

Pandas Dataframe Basics

➢ Introduction

Sub-setting Columns

- By Name

```
subset_df = df['country']
```

or multiple columns

```
subset_df = df[['country', 'pop']]
```

```
df[['country', 'pop']]
```

	country	pop
0	Afghanistan	8425333
1	Afghanistan	9240934
2	Afghanistan	10267083
3	Afghanistan	11537966
4	Afghanistan	13079460

Sub-setting Rows

- By Index, Name - df.loc[:, [columns]] to subset the column(s).

```
print (df.iloc[0]) # returns the first row
print (df.iloc[1]) # returns the second row
print (df.iloc[[1, 3, 5]]) # \
    returns the second, fourth and sixth row
print (df.iloc[-1]) # returns the last row
print (df.iloc[:]) # returns every row
print (df.iloc[4:]) # returns from 5th row onwards
print (df.iloc[:5] # returns first 5 row
```

```
df.loc[[0, 4, 5],['lifeExp']]
```

	lifeExp
0	28.801
4	36.088
5	38.438

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Pandas Dataframe Basics

- **Introduction**

Sub-setting Rows

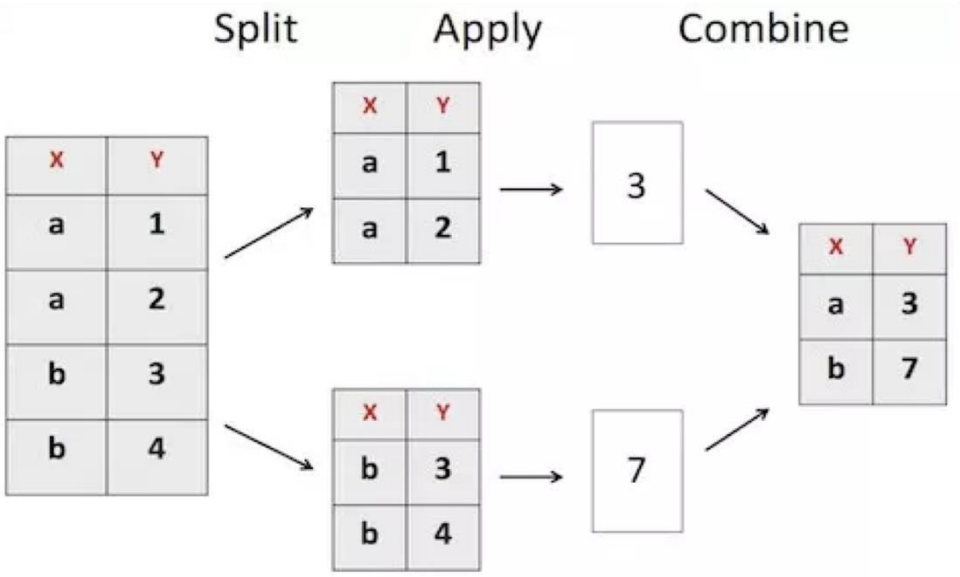
- By Index, Name - df.loc[:, [columns]] to subset the column(s).

Subset method	Description
`loc`	Subset based on index label (row name)
`iloc`	Subset based on row index (row number)
`ix` (no longer works in `Pandas v0.20`)	Subset based on index label or row index

Pandas Dataframe Basics

- **Introduction**

Grouped and Aggregated Calculations



df.groupby('x').sum()

i.e. select sum(y) as total_y from tb group by x

Pandas Dataframe Basics

- **Introduction**

Grouped and Aggregated Calculations (using Gapminder dataset)

- For each year, what is the life expectancy average for all countries, or the total population for all countries?

```
df.groupby('year')['lifeExp'].mean().head()
```

```
year
1950    62.002568
1951    65.904167
1952    49.206867
1953    66.674563
1954    67.459817
Name: lifeExp, dtype: float64
```

Pandas Dataframe Basics

- **Introduction**

Grouped and Aggregated Calculations (using Gapminder dataset)

- For each year, what is the life expectancy average for all countries, by continent?

```
df.groupby(['year','continent'])['lifeExp', 'gdpPercap'].mean()
```

		lifeExp	gdpPercap
year	continent		
1950	Africa	41.361500	1422.081643
	Americas	57.976800	5331.664417
	Asia	53.675000	1363.645814
	Europe	65.755916	6804.996873
	FSU	59.950000	3638.203164
	NA	64.991000	7447.839876
	Oceania	69.290000	11449.376300
1951	Americas	68.220000	13702.425750
	Asia	58.045000	2020.011385
	Europe	66.164444	6822.317167

Pandas Dataframe Basics

➢ Introduction

Grouped and Aggregated Calculations (using Gapminder dataset)

- For each year, what is the life expectancy average for all countries, by continent?

- Flatten the dataframe, using reset_index method

```
df.groupby(['year','continent'])['lifeExp', 'gdpPercap'].mean().reset_index()
```

	year	continent	lifeExp	gdpPercap
0	1950	Africa	41.361500	1422.081643
1	1950	Americas	57.976800	5331.664417
2	1950	Asia	53.675000	1363.645814
3	1950	Europe	65.755916	6804.996873
4	1950	FSU	59.950000	3638.203164
5	1950	NA	64.991000	7447.839876
6	1950	Oceania	69.290000	11449.376300
7	1951	Americas	68.220000	13702.425750
8	1951	Asia	58.045000	2020.011385
9	1951	Europe	66.164444	6822.317167

Pandas Dataframe Basics

- **Introduction**

Grouped and Aggregated Calculations (using Gapminder dataset)

- Grouped Frequency Counts

```
df.groupby(['continent'])['country'].nunique()
```

```
continent
Africa      51
Americas    25
Asia        41
Europe      35
FSU          6
NA          26
Oceania      3
Name: country, dtype: int64
```

```
df.groupby(['continent','year'])['country'].nunique()
```

```
continent  year
Africa     1950     2
           1952    51
           1957    51
           1962    51
           1967    51
           1972    51
           1977    51
           1982    51
           1987    51
           1992    50
           1997    51
           2002    51
           2007    51
Americas   1950     5
           1951     1
           1952    23
           1953     1
```

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Pandas Data Structure

➢ Dataframe Operations

Creating a Pandas Series

```
s1 = pd.Series([2, 3, 5])
s2 = pd.Series([2, 'apple'])
print(s1)
print(s2)

out:
0    2
1    3
2    5
dtype: int64
0        2
1    apple
dtype: object
```

```
scientists = pd.DataFrame({
    'Name': ['Rosaline','William'],
    'Occupation': ['Chemist', 'Statistician'],
    'Born': ['1920-07-25','1876-06-13'],
    'Died':['1958-04-16','1937-10-16'],
    'Age': [37,61]
    })

print(scientists)
```

	Age	Born	Died	Name	Occupation
0	37	1920-07-25	1958-04-16	Rosaline	Chemist
1	61	1876-06-13	1937-10-16	William	Statistician

Pandas Data Structure

- **Dataframe Operations**

Creating a Pandas Series – additional parameters

```
scientists = pd.DataFrame(
   data = {'Occupation': ['Chemist',\
        'Statistician','Biologists'],
        'Born': ['1920-07-25','1876-06-13','1916-01-23'],
        'Died':['1958-04-16','1937-10-16','1998-01-30'],
        'Age': [37,61,82]},
    index = ['Rosaline','William','John'],
    columns = [ 'Occupation','Age','Born','Died']
    )
print(scientists)
```

```
           Occupation  Age        Born        Died
Rosaline       Chemist   37  1920-07-25  1958-04-16
William   Statistician   61  1876-06-13  1937-10-16
John        Biologists   82  1916-01-23  1998-01-30
```

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Pandas Data Structure

➢ Dataframe Operations

Pandas Series – Examining it

```
first_row = scientists.loc['William Gosset']

print(type(first_row))
```

```
<class 'pandas.core.series.Series'>
```

```
print(first_row)
```

```
Occupation    Statistician
Born            1876-06-13
Died            1937-10-16
Age                     61
Name: William Gosset, dtype: object
```

```
print(first_row.values)
```

```
['Statistician' '1876-06-13' '1937-10-16' 61]
```

```
print(first_row.index)
```

```
Index(['Occupation', 'Born', 'Died', 'Age'], dtype='object')
```

```
print(first_row.keys)
```

```
<bound method Series.keys of Occupation    Statistician
Born            1876-06-13
Died            1937-10-16
Age                     61
Name: William Gosset, dtype: object>
```

```
print(first_row.index[0])
```

```
Occupation
```

Pandas Data Structure

- **Dataframe Operations**

Pandas Series – Methods

```
ages = scientists['Age']
print(ages.mean())
print(ages.min())
print(ages.max())
print(ages.std())
print(ages.describe())
```

Boolean Subsetting: Series

```
ages = scientists['Age']
```

```
print(ages[ages > ages.mean()])
```

```
William Gosset    61
Name: Age, dtype: int64
```

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Pandas Data Structure

➢ Dataframe Operations

Querying and filter Series

```
df.query('year == 2000')
```

	country	continent	year	lifeExp	pop	gdpPercap
122	Australia	NA	2000	79.99	19164620	29241.514500
178	Austria	Europe	2000	78.35	8113413	32008.504660
244	Belarus	FSU	2000	69.00	10366719	5936.237819
301	Belgium	Europe	2000	77.91	10263618	29940.204700
445	Bulgaria	Europe	2000	71.59	7818495	6907.013722
550	Canada	NA	2000	79.42	31278097	32448.607640

```
df[(df.year > 2000) & (df.country == 'Australia')]
```

	country	continent	year	lifeExp	pop	gdpPercap
123	Australia	NA	2001	80.350	19357594	30043.24277
124	Australia	NA	2002	80.370	19546792	30687.75473
125	Australia	NA	2003	80.780	19731984	31634.24243
126	Australia	NA	2004	81.150	19913144	32098.50615
127	Australia	NA	2007	81.235	20434176	34435.36744

```
df.query('year < 1972')
```

	country	continent	year	lifeExp	pop	gdpPercap
0	Afghanistan	Asia	1952	28.801	8425333	779.445314
1	Afghanistan	Asia	1957	30.332	9240934	820.853030
2	Afghanistan	Asia	1962	31.997	10267083	853.100710
3	Afghanistan	Asia	1967	34.020	11537966	836.197138
12	Albania	Europe	1952	55.230	1282697	1601.056136
13	Albania	Europe	1957	59.280	1476505	1942.284244
14	Albania	Europe	1962	64.820	1728137	2312.888958
15	Albania	Europe	1967	66.220	1984060	2760.196931

Pandas Data Structure

- **Dataframe Operations**

Updating Series & Dataframes

- Changing datatypes

- Creating new columns

```
print(df['time'].dtype)

out:
object

print(df['time'])

out:
0    1920-07-25
1    1876-06-13
2    1820-05-12
3    1867-11-07
4    1907-05-27
5    1813-03-15
6    1912-06-23
7    1777-04-30
```

```
df['new_time']= pd.to_datetime(df['time'], format='%y-%m-%d')
```

If we look at the data type for `new_time`

```
print(df['new_time'].dtype)

        out:
datetime64[ns]
```

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Pandas Data Structure

➢ Dataframe Operations

Exporting DataFrames

```
df.to_csv('mydata.csv')

df.to_csv('mydata.tsv', sep='\t')
```

Export Method	Description
`to_clipboard`	Save data into the system clipboard for pasting
`to_dense`	Convert data into a regular "dense" `DataFrame`
`to_dict`	Convert data into a Python
`dict to_gbq`	Convert data into a Google BigQuery table
`to_hdf`	Save data into a hierarchal data format (HDF)
`to_msgpack`	Save data into a portable JSON-like binary
`to_html`	Convert data into a HTML table
`to_json`	Convert data into a JSON string

Pandas Plotting

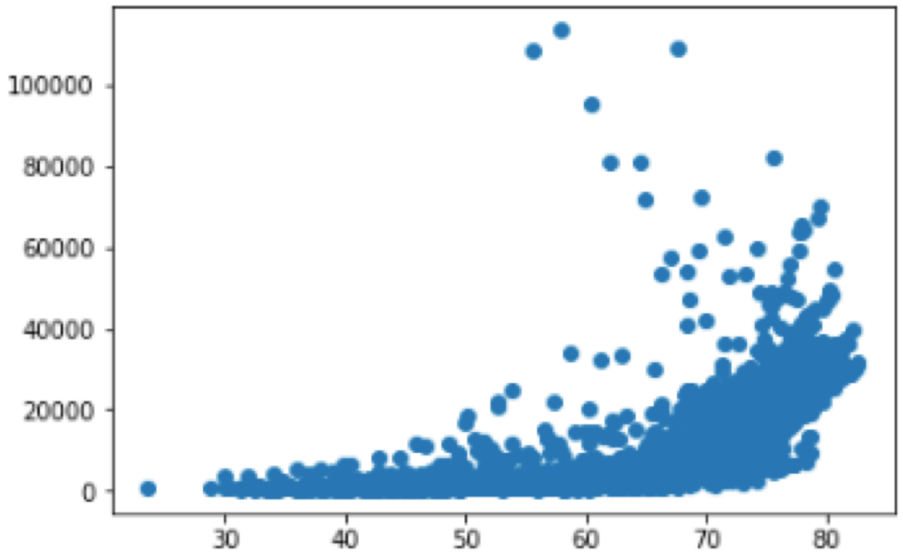
- **Introduction to Plotting**

Matplotlib – Python's fundamental plotting library (https://matplotlib.org/)

```
%matplotlib inline
import matplotlib.pyplot as plt

plt.plot(df['lifeExp'],df['gdpPercap'], 'o' )
```

```
[<matplotlib.lines.Line2D at 0x7f20223df898>]
```



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Pandas Plotting

- **Introduction to Plotting**

Matplotlib – Multiple Plots

```
# Need to include this line so that the plots show up in
# Jupyter Notebook
%matplotlib inline

#import the necessary libraries and dataset

import matplotlib.pyplot as plt
import seaborn as sns
anscombe = sns.load_dataset('anscombe')


d_1 = anscombe[anscombe['dataset']=='I']
d_2 = anscombe[anscombe['dataset']=='II']
d_3 = anscombe[anscombe['dataset']=='III']
d_4 = anscombe[anscombe['dataset']=='IV']
```

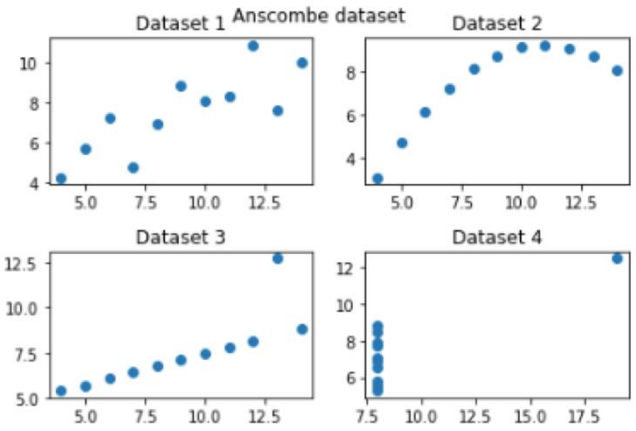
Pandas Plotting

➢ Introduction to Plotting

Matplotlib – Multiple Plots

```
# Create the figure where all the subplots will go
fig = plt.figure()

# Define axes1 as the first subplot, which will be the 1st
# plot in the 2 x 2 figure space
axes1 = fig.add_subplot(2,2,1)
# On axes1, we plot the x and y values from dataset d_1
axes1.plot(d_1['x'],d_1['y'], 'o' )
# Set the title for axes1
axes1.set_title('Dataset 1')

# Define axes1 as the first subplot, which will be the 2nd
# plot in the 2 x 2 figure space
axes2 = fig.add_subplot(2,2,2)
# On axes2, we plot the x and y values from dataset d_2
axes2.plot(d_2['x'],d_2['y'], 'o' )
# Set the title for axes2
axes2.set_title('Dataset 2')

# Define axes1 as the first subplot, which will be the 3rd
# plot in the 2 x 2 figure space
axes3 = fig.add_subplot(2,2,3)
# On axes3, we plot the x and y values from dataset d_3
axes3.plot(d_3['x'],d_3['y'], 'o' )
# Set the title for axes3
axes3.set_title('Dataset 3')

# Define axes1 as the first subplot, which will be the 4th
# plot in the 2 x 2 figure space
axes4 = fig.add_subplot(2,2,4)
# On axes4, we plot the x and y values from dataset d_4
axes4.plot(d_4['x'],d_4['y'], 'o' )
# Set the title for axes4
axes4.set_title('Dataset 4')
```

```
# Define the title for entire figure
fig.suptitle("Anscombe dataset")
# We use this function to make sure that all the subplots are spread out
fig.tight_layout()
```



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Pandas Plotting

➢ Statistical Graphics for Different Types of Data

Univariate

```
tips = sns.load_dataset('tips')
display(tips.head())
```

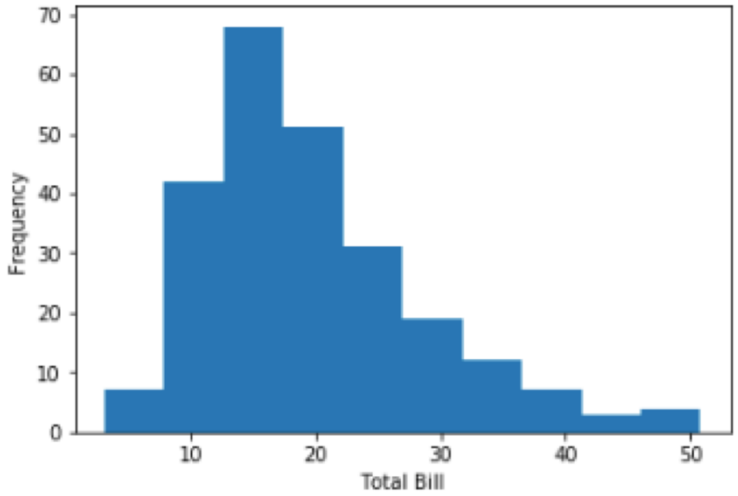
	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

```
%matplotlib inline

import matplotlib.pyplot as plt

fig = plt.figure()
axes1 = fig.add_subplot(1,1,1)
axes1.hist(tips['total_bill'],bins=10)
axes1.set_xlabel('Total Bill')
axes1.set_ylabel('Frequency')
```

```
Text(0, 0.5, 'Frequency')
```



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Pandas Plotting

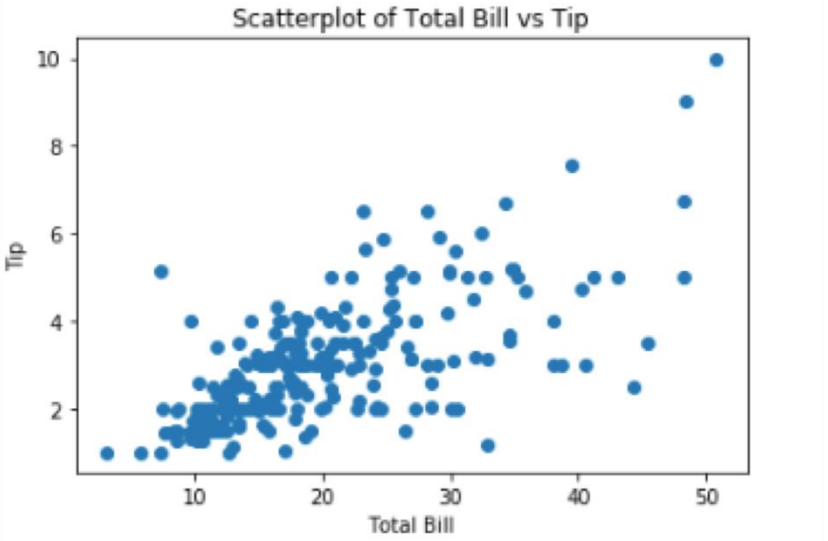
- **Statistical Graphics for Different Types of Data**

Bivariate

```
%matplotlib inline
import matplotlib.pyplot as plt

fig = plt.figure()
axes1 = fig.add_subplot(1,1,1)
axes1.scatter(tips['total_bill'],tips['tip'])
axes1.set_title('Scatterplot of Total Bill vs Tip')
axes1.set_xlabel('Total Bill')
axes1.set_ylabel('Tip')
```

```
Text(0, 0.5, 'Tip')
```



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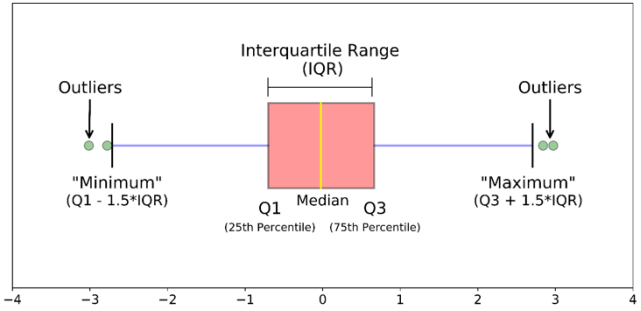
Pandas Plotting

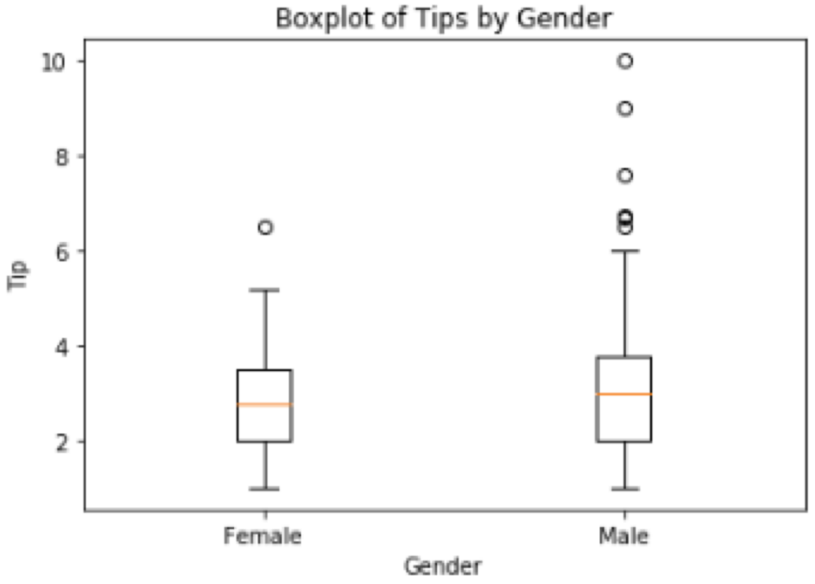


- **Statistical Graphics for Different Types of Data**

Discrete variable against variable (eg Gender vs Tips given)

```
%matplotlib inline
import matplotlib.pyplot as plt

fig = plt.figure()
axes1 = fig.add_subplot(1,1,1)
axes1.boxplot(
# first argument of boxplot is the data
    # we put each piece of data into a list here
    [tips[tips['sex'] == 'Female']['tip'],
    tips[tips['sex'] == 'Male']['tip']],
   # we pass an optional labels parameter here
    labels=['Female', 'Male']
    )

axes1.set_title('Boxplot of Tips by Gender')
axes1.set_xlabel('Gender')
axes1.set_ylabel('Tip')
```

```
Text(0, 0.5, 'Tip')
```

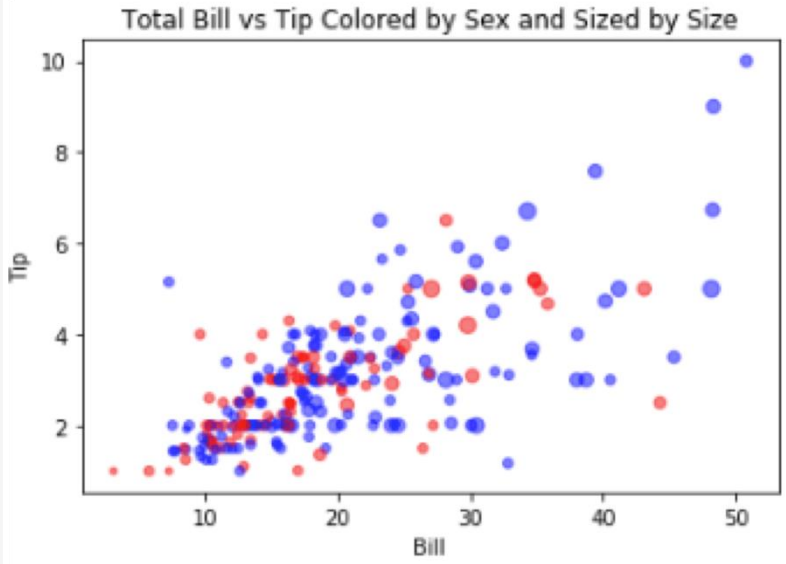


Pandas Plotting

- **Statistical Graphics for Different Types of Data**

Multivariate - Scatterplot

```
# define a method to set color variable based on sex
def recode_sex(sex):
    if sex == 'Female':
        # red for female
        return 'r'
    else:
        # blue for male
        return 'b'

# create a new column, sex_color, by applying the method
# on the existing column, sex
tips['sex_color'] = tips['sex'].apply(recode_sex)

scatter_plot = plt.figure()
axes2 = scatter_plot.add_subplot(1,1,1)
axes2.scatter(
    x = tips['total_bill'],
    y = tips['tip'],

    # set the size of the bots based on party size
    # we multiply the values by 10 to make the points bigger
    # and to emphasize the difference
    s = tips['size']*10,

    # set the color for the sex
    c = tips['sex_color'],
    # set the alpha value so that the points will be transparent
    # this helps with overlapping points
    alpha=0.5)

axes2.set_title('Total Bill vs Tip Colored by Sex and Sized by Size')
axes2.set_ylabel('Tip')
axes2.set_xlabel('Bill')
scatter_plot.show()
```



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Learning Outcomes

At the end of this unit, you are expected to be able to:

- Appreciate the features and usage possibility of Pandas library as a data analytics package
- Understand the basic usage of Python Pandas library - loading files, counting data, determine item structure and types in the data
- Learn the basic manipulation of data using Pandas - row and column selection, itemised or vector operation on Pandas DataFrame
- Conduct operations of Pandas DataFrame - subsetting, slicing and indexing DataFrame
- Presenting and visualising data in Pandas DataFrame using charting and plotting libraries such as Matplotlib and Seaborn

Thank you!

Q&A