Cheat Sheet for Exploratory Data Analysis in Python

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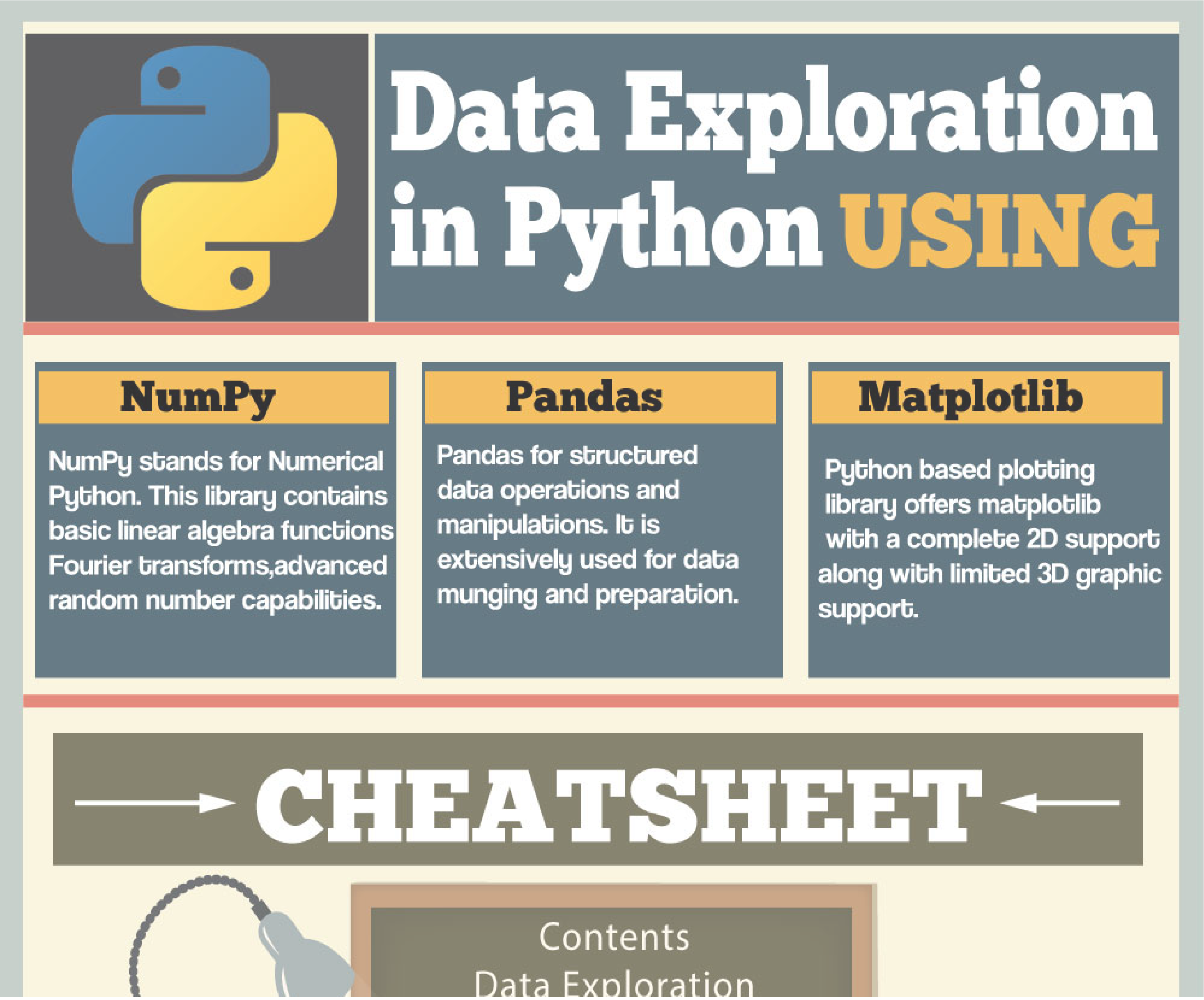
Introduction

The secret behind creating powerful predictive models is to understand the data really well. Thereby, it is suggested to maneuver the essential steps of data exploration (https://www.analyticsvidhya.com/blog/2015/02/data-exploration-preparation-model/) to build a healthy model.

Here is a cheat sheet to help you with various codes and steps while performing exploratory data analysis in Python. We have also released a pdf version of the sheet (http://discuss.analyticsvidhya.com/t/download-pdf-version-of-cheat-sheet-on-data-exploration-in-python/1403) this time so that you can easily copy / paste these codes.



Data Exploration in Python USING

NumPy

NumPy stands for Numerical Python. This library contains basic linear algebra functions Fourier transforms,advanced random number capabilities.

Pandas

Pandas for structured data operations and manipulations. It is extensively used for data munging and preparation.

Matplotlib

Python based plotting library offers matplotlib with a complete 2D support along with limited 3D graphic support.

CHEATSHEET

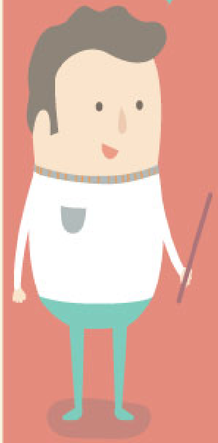
Contents

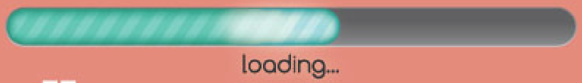
Data Exploration

Data Exploration

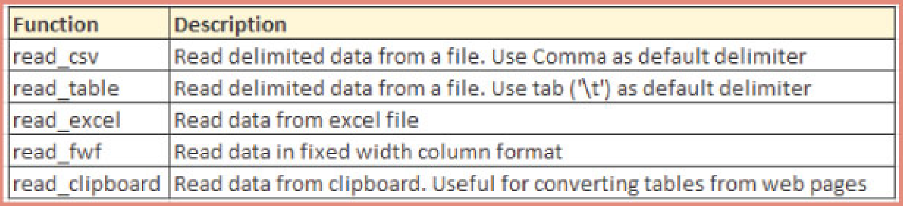
1. How to load data file(s)?
2. How to convert a variable to different data type?
3. How to transpose a table?
4. How to sort Data?
5. How to create plots (Histogram, Scatter, Box Plot)?
6. How to generate frequency tables?
7. How to do sampling of Data set?
8. How to remove duplicate values of a variable?
9. How to group variables to calculate count, average, sum?
10. How to recognize and treat missing values and outliers?
11. How to merge / join data set effectively?

How to load data file(s)?





Here are some common functions used to read data



Function	Description
read_csv	Read delimited data from a file. Use Comma as default delimiter
read_table	Read delimited data from a file. Use tab ('\t') as default delimiter
read_excel	Read data from excel file
read_fwf	Read data in fixed width column format
read_clipboard	Read data from clipboard. Useful for converting tables from web pages

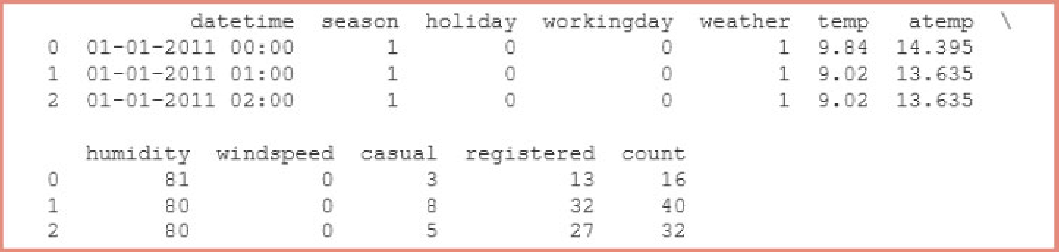
Loading data from CSV file(s):

CODE

```
import pandas as pd
#Import Library Pandas
df=pd.read_csv("E:/train.csv") #I am working in Windows environment
```

```
df = pd.read_csv("E:/train.csv")  #I am working in Windows environment
#Reading the dataset in a dataframe using Pandas
print df.head(3)  #Print first three observations
```

Output



```
           datetime  season  holiday  workingday  weather  temp   atemp  \
0  01-01-2011 00:00       1        0           0        1  9.84  14.395
1  01-01-2011 01:00       1        0           0        1  9.02  13.635
2  01-01-2011 02:00       1        0           0        1  9.02  13.635

   humidity  windspeed  casual  registered  count
0        81          0       3          13     16
1        80          0       8          32     40
2        80          0       5          27     32
```

Loading data from excel file(s):

CODE

```
df=pd.read_excel("E:/EMP.xlsx", "Data") # Load Data sheet of excel file EMP
```

Loading data from txt file(s):

CODE

```
# Load Data from text file having tab '\t' delimeter print df
df=pd.read_csv("E:/Test.txt",sep='\t')
```

How to convert a variable to different data type?

- Convert numeric variables to string variables and vice versa

```
srting_outcome = str(numeric_input) #Converts numeric_input to string_outcome
integer_outcome = int(string_input) #Converts string_input to integer_outcome
float_outcome = float(string_input) #Converts string_input to integer_outcome
```

- Convert character date to Date

```
from datetime import datetime
char_date = 'Apr 1 2015 1:20 PM' #creating example character date
date_obj = datetime.strptime(char_date, '% b % d % Y % I : % M % p')
print date_obj
```

How to transpose a Data set?

- Data set used

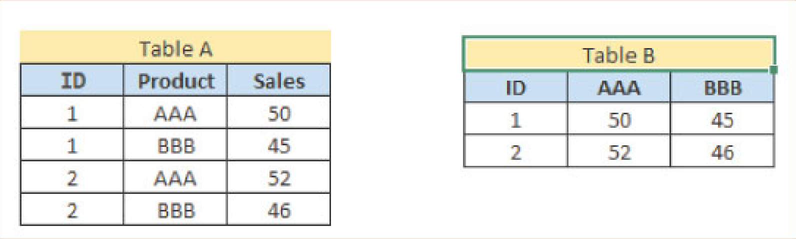


Table A

ID	Product	Sales
1	AAA	50
1	BBB	45
2	AAA	52
2	BBB	46

Table B

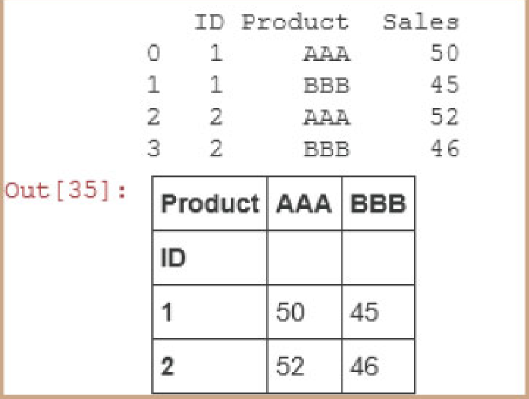
ID	AAA	BBB
1	50	45
2	52	46

Code

#Transposing dataframe by a variable

```
df=pd.read_excel("E:/transpose.xlsx", "Sheet1") # Load Data sheet of excel file EMP
print df
result= df.pivot(index= 'ID', columns='Product', values='Sales')
result
```

Output



```
   ID Product  Sales
0   1     AAA     50
1   1     BBB     45
2   2     AAA     52
3   2     BBB     46
```

Out[35]:

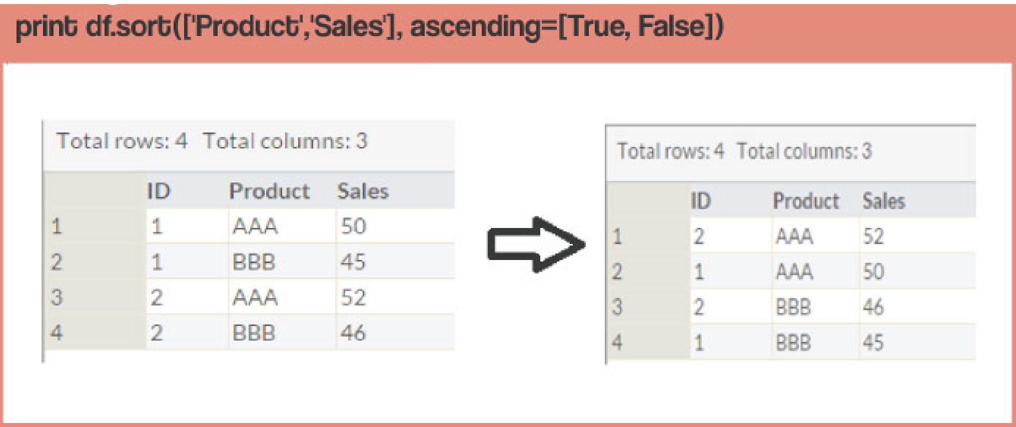
Product	AAA	BBB
ID		
1	50	45
2	52	46

How to sort DataFrame?

CODE

```
#Sorting Dataframe
df=pd.read_excel("E:/transpose.xlsx", "Sheet1")
#Add by variable name(s) to sort
```

```
print df.sort(['Product','Sales'], ascending=[True, False])
```



Total rows: 4 Total columns: 3

	ID	Product	Sales
1	1	AAA	50
2	1	BBB	45
3	2	AAA	52
4	2	BBB	46

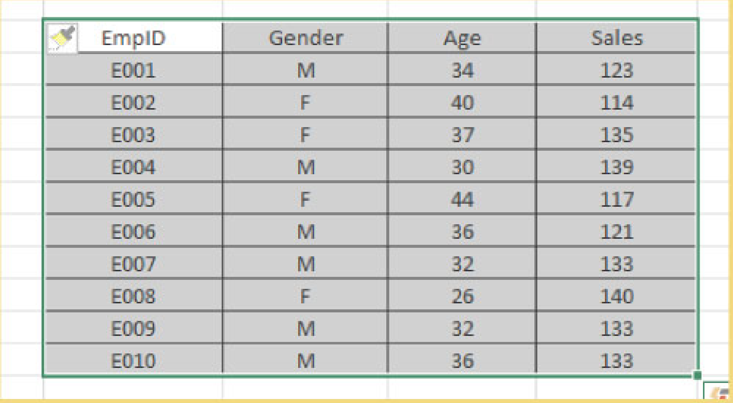
Total rows: 4 Total columns: 3

	ID	Product	Sales
1	2	AAA	52
2	1	AAA	50
3	2	BBB	46
4	1	BBB	45

Orginal Table

Sorted Table

How to create plots (Histogram, Scatter, Box Plot)?



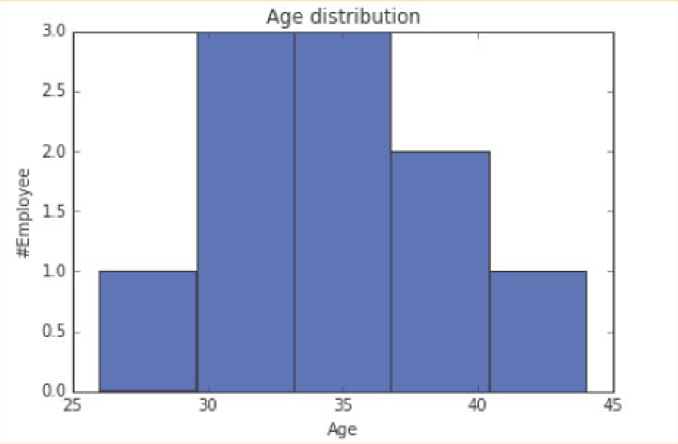
EmpID	Gender	Age	Sales
E001	M	34	123
E002	F	40	114
E003	F	37	135
E004	M	30	139
E005	F	44	117
E006	M	36	121
E007	M	32	133
E008	F	26	140
E009	M	32	133
E010	M	36	133

Histogram

Code

```
#Plot Histogram

import matplotlib.pyplot as plt
import pandas as pd

df=pd.read_excel("E:/First.xlsx", "Sheet1")

#Plots in matplotlib reside within a figure
  object, use plt.figure to create new figure
fig=plt.figure()

#Create one or more subplots using
  add_subplot, because you can't
  create blank figure
ax = fig.add_subplot(1,1,1)

#Variable
```

OutPut



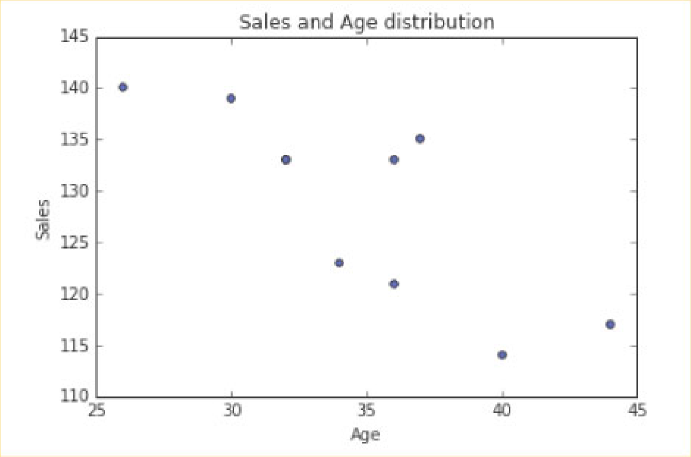
```
ax.hist(df['Age'],bins = 5)

#Labels and Tit
plt.title('Age distribution')
plt.xlabel('Age')
plt.ylabel('#Employee')
plt.show()
```

Scatter plot

Code

```
#Plots in matplotlib reside within a figure
  object, use plt.figure to create new figure
fig=plt.figure()

#Create one or more subplots using
  add_subplot, because you can't
  create blank figure
ax = fig.add_subplot(1,1,1)

#Variable
ax.scatter(df['Age'],df['Sales'])

#Labels and Tit
plt.title('Sales and Age distribution')
plt.xlabel('Age')
plt.ylabel('Sales')
plt.show()
```

OutPut

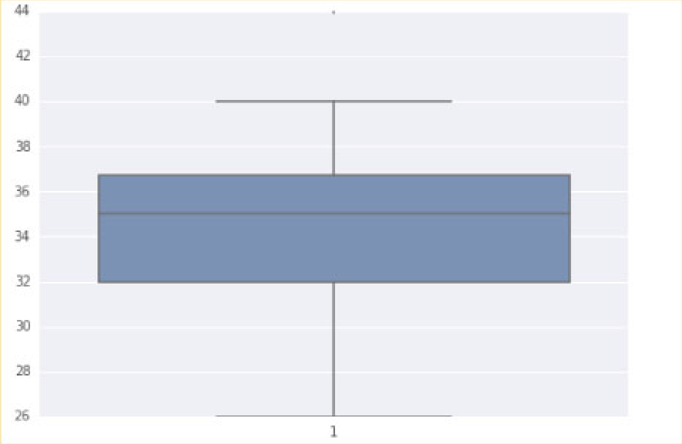


Box-plot:

Code

```
import seaborn as sns
sns.boxplot(df['Age'])
sns.despine()
```

OutPut

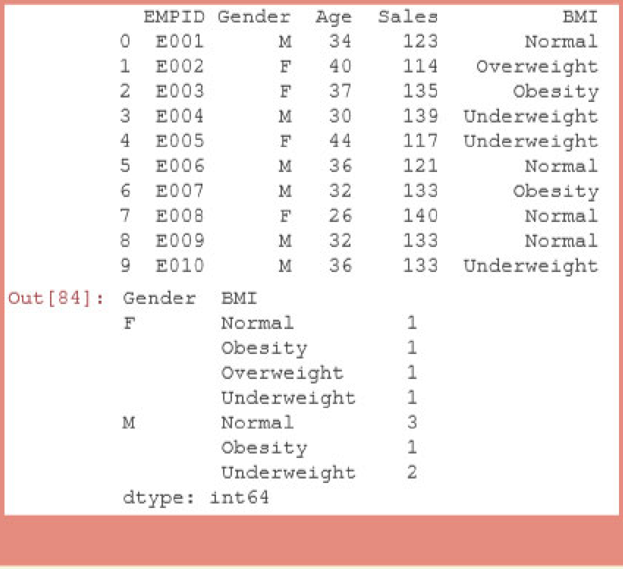


How to generate frequency tables with pandas?

Code

```
import pandas as pd
df=pd.read_excel("E:/First.xlsx", "Sheet1")
print df
test= df.groupby(['Gender','BMI'])
test.size()
```

OutPut



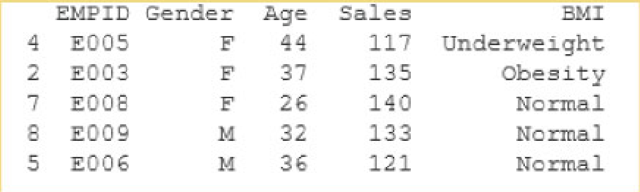
```
  EMPID Gender  Age  Sales          BMI
0  E001      M   34    123       Normal
1  E002      F   40    114   Overweight
2  E003      F   37    135      Obesity
3  E004      M   30    139  Underweight
4  E005      F   44    117  Underweight
5  E006      M   36    121       Normal
6  E007      M   32    133      Obesity
7  E008      F   26    140       Normal
8  E009      M   32    133       Normal
9  E010      M   36    133  Underweight
Out[84]: Gender  BMI
         F       Normal         1
                 Obesity        1
                 Overweight     1
                 Underweight    1
         M       Normal         3
                 Obesity        1
                 Underweight    2
         dtype: int64
```

How to do sample Data set in Python?

Code

```
#Create Sample dataframe
import numpy as np
import pandas as pd
from random import sample

# create random index
rindex = np.array(sample(xrange(len(df)), 5))

# get 5 random rows from df
dfr = df.ix[rindex]
print dfr
```

OutPut



```
  EMPID Gender  Age  Sales          BMI
4  E005      F   44    117  Underweight
2  E003      F   37    135      Obesity
7  E008      F   26    140       Normal
8  E009      M   32    133       Normal
5  E006      M   36    121       Normal
```

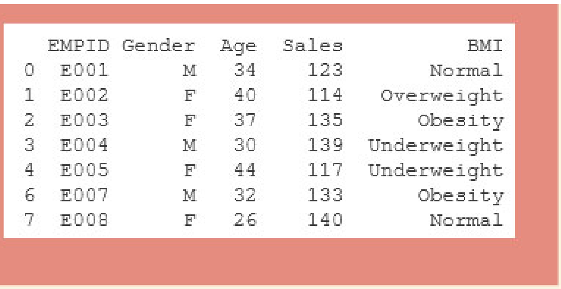
How to remove duplicate values of a variable?

Code

Output

#Remove Duplicate Values based on values of variables "Gender" and "BMI"

```
rem_dup=df.drop_duplicates(['Gender', 'BMI'])
print rem_dup
```

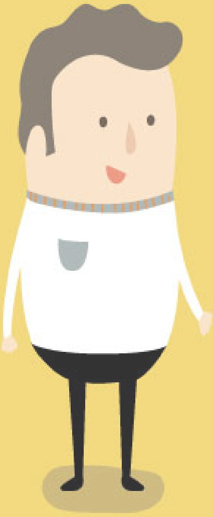


```
  EMPID Gender  Age  Sales          BMI
0  E001      M   34    123       Normal
1  E002      F   40    114   Overweight
2  E003      F   37    135      Obesity
3  E004      M   30    139  Underweight
4  E005      F   44    117  Underweight
6  E007      M   32    133      Obesity
7  E008      F   26    140       Normal
```

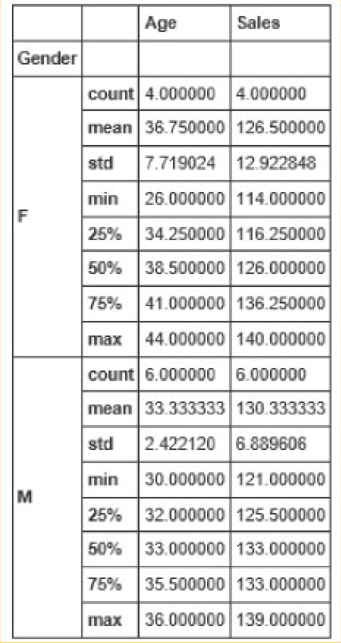
How to group variables in Python to calculate count, average, sum?

Code

```
test= df.groupby(['Gender'])
test.describe()
```



Output



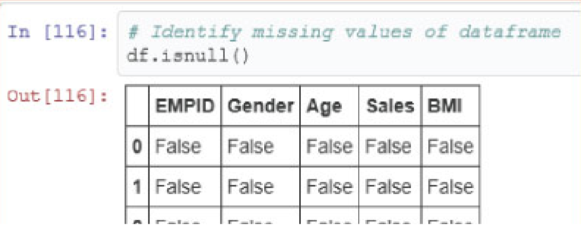
		Age	Sales
Gender			
F	count	4.000000	4.000000
	mean	36.750000	126.500000
	std	7.719024	12.922848
	min	26.000000	114.000000
	25%	34.250000	116.250000
	50%	38.500000	126.000000
	75%	41.000000	136.250000
	max	44.000000	140.000000
M	count	6.000000	6.000000
	mean	33.333333	130.333333
	std	2.422120	6.889606
	min	30.000000	121.000000
	25%	32.000000	125.500000
	50%	33.000000	133.000000
	75%	35.500000	133.000000
	max	36.000000	139.000000

How to recognize and Treat missing values and outliers?

Code

```
# Identify missing values of dataframe
df.isnull()
```

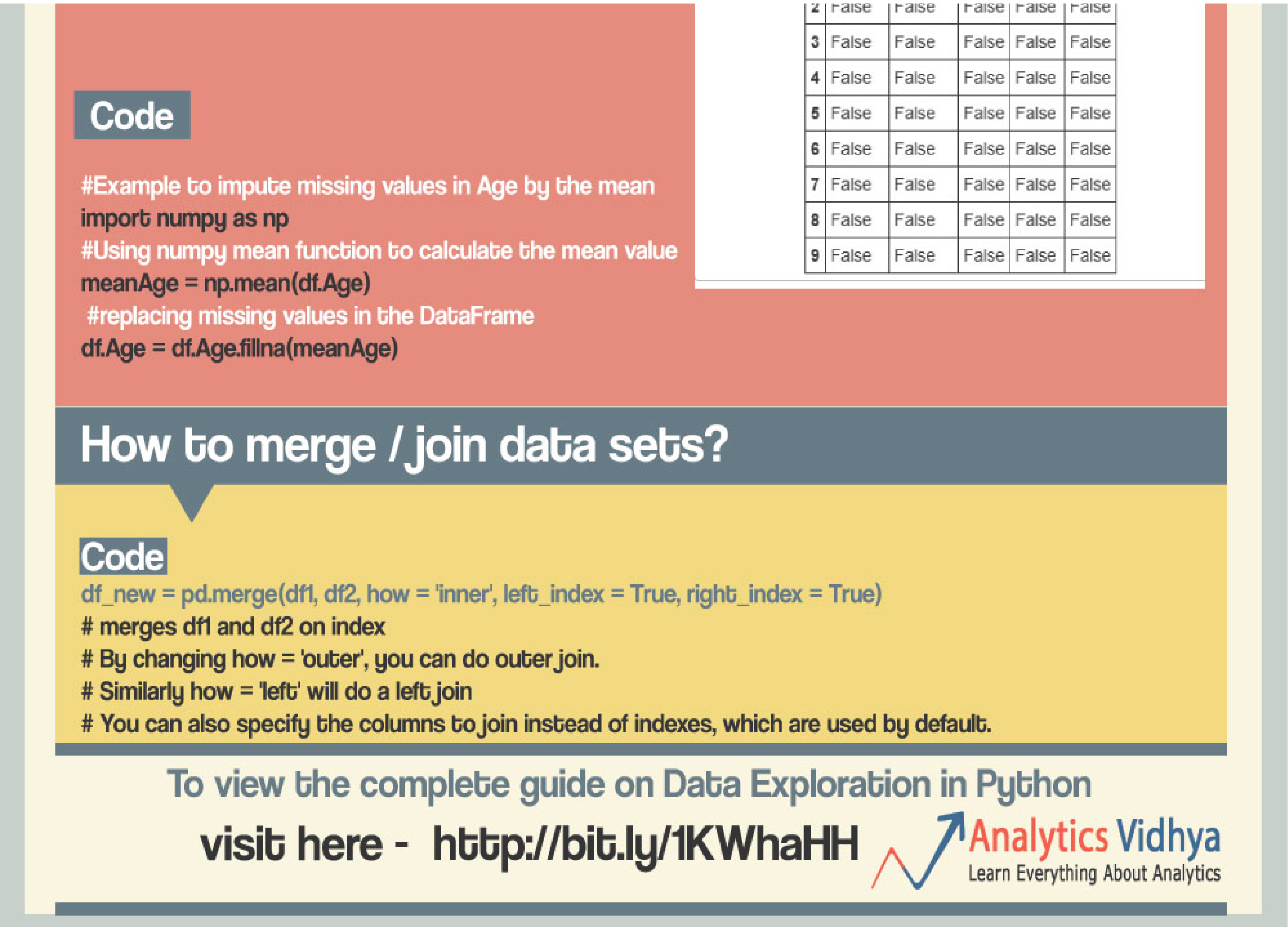
Output



```
In [116]: # Identify missing values of dataframe
          df.isnull()
```

Out[116]:

	EMPID	Gender	Age	Sales	BMI
0	False	False	False	False	False
1	False	False	False	False	False



2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
5	False	False	False	False	False
6	False	False	False	False	False
7	False	False	False	False	False
8	False	False	False	False	False
9	False	False	False	False	False

Code

```
#Example to impute missing values in Age by the mean
import numpy as np
#Using numpy mean function to calculate the mean value
meanAge = np.mean(df.Age)
 #replacing missing values in the DataFrame
df.Age = df.Age.fillna(meanAge)
```

How to merge / join data sets?

Code

```
df_new = pd.merge(df1, df2, how = 'inner', left_index = True, right_index = True)
# merges df1 and df2 on index
# By changing how = 'outer', you can do outer join.
# Similarly how = 'left' will do a left join
# You can also specify the columns to join instead of indexes, which are used by default.
```

To view the complete guide on Data Exploration in Python

visit here - http://bit.ly/1KWhaHH

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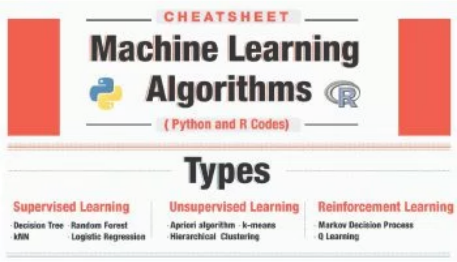

(https://www.analyticsvidhya.com/blog/2015/09/full-cheatsheet-machine-learning-algorithms/) Cheatsheet - Python & R codes for common Machine Learning Algorithms (https://www.analyticsvidhya.com/blog/2015/09/full-cheatsheet-machine-learning-algorithms/)

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2 COMMENTS

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JUNE 10, 2015 AT 4:19 AM (HTTPS://WWW.ANALYTICSVIDHYA.COM/BLOG/2015/06/INFOGRAPHIC-CHEAT-SHEET-DATA-EXPLORATION-PYTHON/#COMMENT-88192)

very much useful. plz provide its equivalent in R also.

Rajesh says: REPLY (HTTPS://WWW.ANALYTICSVIDHYA.COM/BLOG/2015/06/INFOGRAPHIC-CHEAT-SHEET-DATA-EXPLORATION-PYTHON/?REPLYTOCOM=97170#RESPOND)

OCTOBER 12, 2015 AT 9:59 AM (HTTPS://WWW.ANALYTICSVIDHYA.COM/BLOG/2015/06/INFOGRAPHIC-CHEAT-SHEET-DATA-EXPLORATION-PYTHON/#COMMENT-97170)

Thanks . Sounds good . There are few additional features in Pandas compared to R.

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