

# 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](#) 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](#) 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

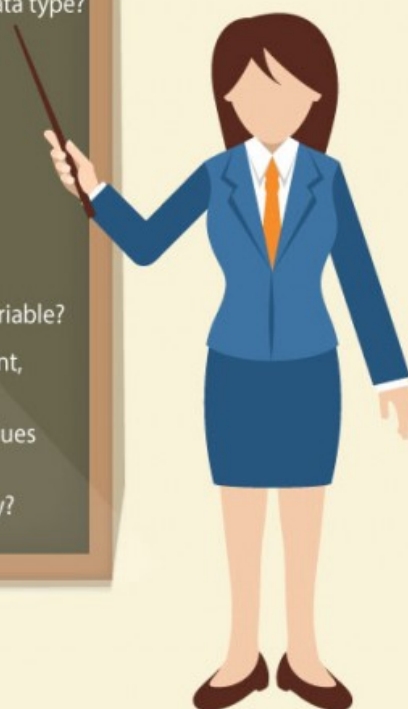
Python based plotting library offers matplotlib with a complete 2D support along with limited 3D graphic support.

## CHEATSHEET



### Contents Data Exploration

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?
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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)?



loading...

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
#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' delimiter 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



```
string_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

Original 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")
```

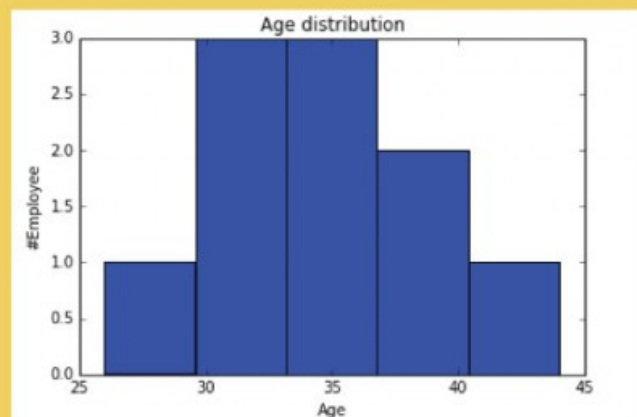
```
#Plots in matplotlib reside within a figure
object, use plt.figure to create new figure
fig=plt.figure()
```

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

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

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

### OutPut



## Scatter plot

### Code

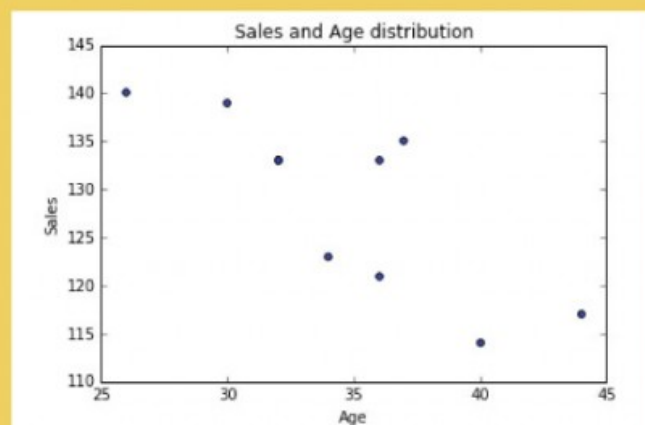
```
#Plots in matplotlib reside within a figure
object, use plt.figure to create new figure
fig=plt.figure()
```

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

```
#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

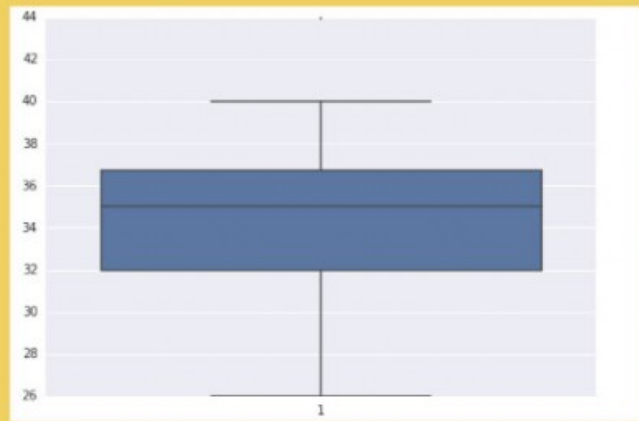


## Box-plot:

## 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

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

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

## 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
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
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>



You can easily copy / paste these code and keep them handy by downloading the PDF version of this infographic here: [Data Exploration in Python.pdf](#)

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