```
import numpy as np
import pandas as pd
from sklearn.neighbors import KNeighborsClassifier
from scipy.stats import zscore
from sklearn.preprocessing import Imputer
from sklearn.metrics import accuracy_score
import seaborn as sns
import os
%matplotlib inline
```

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.m
```

```
data = pd.read_csv('/content/drive/My Drive/Colab Notebooks/Project18aug/data.csv')
```

```
data
```

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	City1	City2	Average Fare	Distance	Average weekly passengers	market leading airline	market share	Average fare	Low price airline
0	CAK	ATL	114.47	528	424.56	FL	70.19	111.03	FL
1	CAK	MCO	122.47	860	276.84	FL	75.10	123.09	DL
2	ALB	ATL	214.42	852	215.76	DL	78.89	223.98	CO
3	ALB	BWI	69.40	288	606.84	WN	96.97	68.86	WN
4	ALB	ORD	158.13	723	313.04	UA	39.79	161.36	WN
5	ALB	FLL	135.17	1204	199.02	WN	40.68	137.97	DL
6	ALB	LAS	152.85	2237	237.17	WN	59.94	148.59	WN
7	ALB	LAX	190.73	2467	191.95	DL	17.89	205.06	US
8	ALB	MCO	129.35	1073	550.54	WN	76.84	127.69	WN
9	ALB	TPA	134.17	1130	202.93	US	35.40	132.91	DL
10	ABQ	ATL	212.49	1269	198.80	DL	68.39	226.79	AA
11	ABQ	BWI	173.56	1670	312.39	WN	49.16	180.49	AA
12	ABQ	ORD	170.67	1121	364.78	AA	45.94	174.62	WN
13	ABQ	DFW	120.24	580	839.78	WN	71.91	117.20	WN
14	ABQ	DEN	168.69	349	308.26	UA	59.55	181.34	F9
15	ABQ	IAH	154.40	767	372.93	WN	50.48	152.03	WN
16	ABQ	LAS	114.24	487	620.86	WN	93.92	113.82	WN
17	ABQ	LAX	132.29	677	655.00	WN	89.46	130.44	WN
18	ABQ	MSP	181.99	981	187.28	NW	65.00	182.27	CO
19	ABQ	LGA	233.05	1825	344.45	AA	31.33	233.26	DL
20	ABQ	OAK	162.21	889	388.15	WN	88.63	164.27	HP
				1552	190.65	WN	72.29	151.81	WN
22	ABQ	PHX	71.57	328	1252.39	WN	77.65	70.99	WN
23	ABQ	PDX	163.63	1111	222.93	WN	57.24	167.46	HP
24	ABQ	SAN	134.42	628	346.30	WN	82.92	136.70	HP
25	ABQ	SEA	165.69	1180	284.34	WN	47.82	164.81	HP
26	ABQ	TUS	77.82	321	191.19	WN	86.29	73.50	WN
27	ABQ	IAD	227.93	1650	301.84	AA	46.59	213.13	AA
28	AMA	DFW	74.82	324	615.10	WN	82.04	71.51	WN
29	AMA	IAH	120.50	545	229.78	WN	58.79	119.76	CO
...	...	...	...	...	...	...	...	...	...

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970	SLC	SEA	110.64	689	892.39	DL	60.93	111.80	WN
971	SLC	GEG	98.36	546	204.56	DL	62.27	97.48	DL
972	SLC	IAD	263.37	1851	305.97	DL	68.95	268.78	DL
973	SAT	SAN	165.13	1129	248.80	WN	57.92	165.01	AA
974	SAT	SEA	177.77	1774	229.89	AA	26.71	169.59	AA
975	SAT	IAD	215.04	1381	345.10	DL	48.59	191.34	DL
976	SAN	SFO	122.02	447	937.93	UA	95.92	122.11	AA
977	SAN	SJC	82.34	417	2176.19	WN	71.53	83.52	AA
978	SAN	SEA	148.62	1050	1303.15	AS	73.50	149.91	AS
979	SAN	TPA	177.91	2087	273.47	DL	27.10	172.14	WN
980	SAN	TUS	74.62	367	469.67	WN	94.07	73.10	WN
981	SAN	IAD	330.21	2276	582.17	UA	42.55	440.35	AA
982	SFO	SNA	134.18	372	703.36	UA	66.35	140.50	AA
983	SFO	SEA	116.78	678	1545.54	UA	52.32	122.59	AS
984	SFO	TPA	237.26	2392	193.26	DL	21.54	265.35	CO
985	SFO	IAD	401.23	2442	955.65	UA	64.45	490.03	TZ
986	SJC	SNA	77.11	342	1970.76	WN	49.97	77.54	AA
987	SJC	SEA	105.84	697	1390.65	AS	75.35	106.30	WN
988	SJC	TUS	144.22	721	204.56	AS	56.16	143.53	AS
989	SJC	IAD	322.83	2424	229.02	UA	37.01	408.10	TZ
990	SNA	SEA	156.01	978	1191.84	AS	86.77	157.43	DL
991	SEA	GEG	70.61	224	1423.15	AS	68.40	72.60	WN
992	SEA	TPA	162.46	2520	312.93	DL	33.03	147.60	AA
993	SEA	TUS	121.47	1216	359.23	AS	73.25	126.38	AS
995	STK	TPA	136.16	1104	184.34	US	33.37	135.82	DL

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```
rket leading airline","Low price airline"], axis = 1, inpla
```

```
data
```

	Average Fare	Distance	Average weekly passengers	market share	Average fare	marke
0	114.47	528	424.56	70.19	111.03	
1	122.47	860	276.84	75.10	123.09	
2	214.42	852	215.76	78.89	223.98	
3	69.40	288	606.84	96.97	68.86	
4	158.13	723	313.04	39.79	161.36	
5	135.17	1204	199.02	40.68	137.97	
6	152.85	2237	237.17	59.94	148.59	
7	190.73	2467	191.95	17.89	205.06	
8	129.35	1073	550.54	76.84	127.69	
9	134.17	1130	202.93	35.40	132.91	
10	212.49	1269	198.80	68.39	226.79	
11	173.56	1670	312.39	49.16	180.49	
12	170.67	1121	364.78	45.94	174.62	
13	120.24	580	839.78	71.91	117.20	
14	168.69	349	308.26	59.55	181.34	
15	154.40	767	372.93	50.48	152.03	
16	114.24	487	620.86	93.92	113.82	
17	132.29	677	655.00	89.46	130.44	
18	181.99	981	187.28	65.00	182.27	
19	233.05	1825	344.45	31.33	233.26	
20	162.21	889	388.15	88.63	164.27	
			190.65	72.29	151.81	
			1252.39	77.65	70.99	
23	163.63	1111	222.93	57.24	167.46	
24	134.42	628	346.30	82.92	136.70	
25	165.69	1180	284.34	47.82	164.81	
26	77.82	321	191.19	86.29	73.50	
27	227.93	1650	301.84	46.59	213.13	
28	74.82	324	615.10	82.04	71.51	
29	120.50	545	229.78	58.79	119.76	
...	...	...	...	...	...	
970	110.64	689	892.39	60.93	111.80	

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971	98.36	546	204.56	62.27	97.48
972	263.37	1851	305.97	68.95	268.78
973	165.13	1129	248.80	57.92	165.01
974	177.77	1774	229.89	26.71	169.59
975	215.04	1381	345.10	48.59	191.34
976	122.02	447	937.93	95.92	122.11
977	82.34	417	2176.19	71.53	83.52
978	148.62	1050	1303.15	73.50	149.91
979	177.91	2087	273.47	27.10	172.14
980	74.62	367	469.67	94.07	73.10
981	330.21	2276	582.17	42.55	440.35
982	134.18	372	703.36	66.35	140.50
983	116.78	678	1545.54	52.32	122.59
984	237.26	2392	193.26	21.54	265.35
985	401.23	2442	955.65	64.45	490.03
986	77.11	342	1970.76	49.97	77.54
987	105.84	697	1390.65	75.35	106.30
988	144.22	721	204.56	56.16	143.53
989	322.83	2424	229.02	37.01	408.10
990	156.01	978	1191.84	86.77	157.43
991	70.61	224	1423.15	68.40	72.60
992	162.46	2520	312.93	33.03	147.60
993	131.47	1216	359.23	73.25	126.38
			787.50	46.51	329.20

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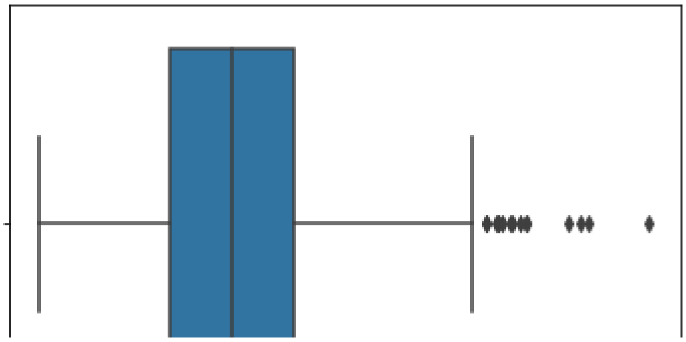
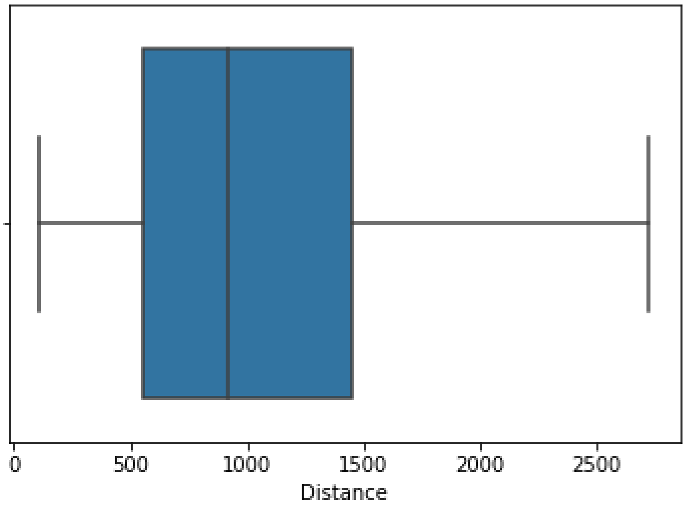
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fba06c694a8>
```



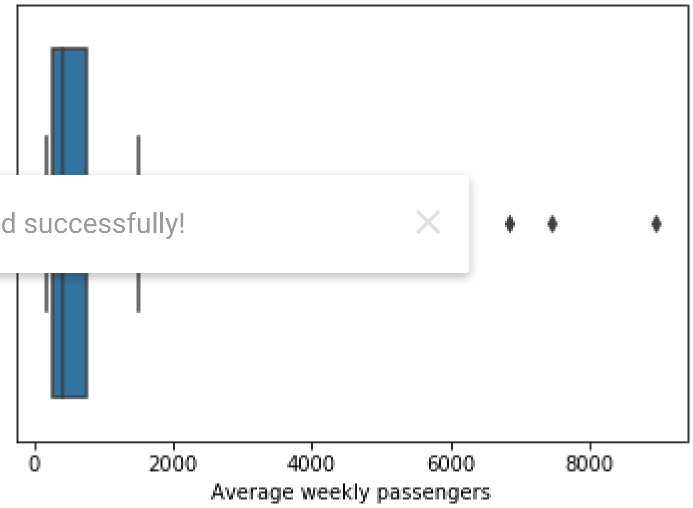
```
sns.boxplot(x=data['Distance'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fba03f49588>
```



```
sns.boxplot(x=data['Average weekly passengers'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fba03f17668>
```



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```
sns.boxplot(x=data['market share '])
sns.boxplot(x=data['market share .1'])
```

```
sns.boxplot(x=data['Average fare '])
```

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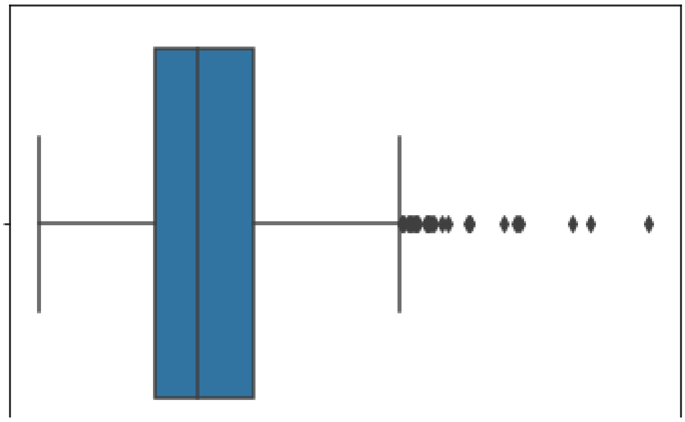
```
sns.boxplot(x=data['price '])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fba03d7ab70>
```



```
Q1 = np.percentile(data, 25, interpolation = 'midpoint')


Q3 = np.percentile(data, 75, interpolation = 'midpoint')


IQR = Q3 - Q1


print(IQR)
```

```
200.38
```

```
def remove_outlier(df_in, col_name):
    q1 = df_in[col_name].quantile(0.25)
    q3 = df_in[col_name].quantile(0.75)
    iqr = q3-q1 #Interquartile range
    fence_low  = q1-1.5*iqr
    fence_high = q3+1.5*iqr
    df_out = df_in.loc[(df_in[col_name] > fence_low) & (df_in[col_name] < fence_high)]
    return df_out
```

```
from scipy import stats
import numpy as np


z = np.abs(stats.zscore(data))
```

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```
data_o = data[(z < 3).all(axis=1)]
print(data_o)
```

```
     Average Fare  Distance  ...  market share .1   price
0          114.47       528  ...            70.19  111.03
1          122.47       860  ...            17.23  118.94
2          214.42       852  ...             2.77  167.12
3           69.40       288  ...            96.97   68.86
4          158.13       723  ...            15.34  145.42
5          135.17      1204  ...            17.09  127.69
6          152.85      2237  ...            59.94  148.59
7          190.73      2467  ...            16.59  174.00
8          129.35      1073  ...            76.84  127.69
9          134.17      1130  ...            26.40  124.78
10         212.49      1269  ...            11.91  200.93
11         173.56      1670  ...            14.37  161.39
12         170.67      1121  ...            33.87  163.22
13         120.24       580  ...            71.91  117.20
14         168.69       349  ...            39.95  149.41
15         154.40       767  ...            50.48  152.03
16         114.24       487  ...            93.92  113.82
17         132.29       677  ...            89.46  130.44
18         181.99       981  ...             2.37  109.14
19         233.05      1825  ...            19.50  222.08
20         162.21       889  ...             7.19  144.51
21         161.74      1552  ...            72.29  151.81
22          71.57       328  ...            77.65   70.99
23         163.63      1111  ...            20.77  155.82
24         134.42       628  ...            13.05  119.03
25         165.69      1180  ...            25.07  159.64
26          77.82       321  ...            86.29   73.50
27         227.93      1650  ...            46.59  213.13
28          74.82       324  ...            82.04   71.51
29         120.50       545  ...            37.55  118.05
..            ...       ...  ...              ...     ...
967        142.71       599  ...            33.83  133.85
968        143.99       585  ...            17.23  114.46
969        102.95       588  ...            89.93  101.01
970        110.64       689  ...            36.44  105.36
971         98.36       546  ...            62.27   97.48
972        263.37      1851  ...            68.95  268.78
973        165.13      1129  ...            12.45  160.60
974        177.77      1774  ...            26.71  169.59
975        215.04      1381  ...            48.59  191.34
976        122.02       447  ...             1.35  102.68
                              ..            26.94   79.37
                              ..            73.50  149.91
979        177.91      2087  ...            15.38  165.25
980         74.62       367  ...            94.07   73.10
982        134.18       372  ...            30.82  119.80
983        116.78       678  ...            45.62  109.45
984        237.26      2392  ...            16.02  200.96
986         77.11       342  ...            48.91   76.66
987        105.84       697  ...            22.04  103.02
988        144.22       721  ...            56.16  143.53
990        156.01       978  ...             2.19  100.08
```

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```
data.describe().transpose()
```

	count	mean	std	min	25%	50%	75%
Average Fare	1000.0	163.37542	55.365470	50.52	125.9750	161.345	197.3925
Distance	1000.0	1056.97300	643.203251	108.00	553.5000	919.000	1452.5000
Average weekly passengers	1000.0	672.27914	766.519254	181.41	257.1975	404.780	769.9125
market share	1000.0	60.12859	19.367779	17.68	46.5100	59.240	73.5100

```
#Treat “Average Fare” – 3rdColumn as your Dependent Variable and Rest of the columns as Indepen
X = data_o.drop('Average fare ', axis=1)
y = data_o[['Average fare ']]
```

```
data_o.corr(method ='pearson')
```

	Average Fare	Distance	Average weekly passengers	market share	Average fare	market share .1
Average Fare	1.000000	0.552015	-0.222121	-0.228129	0.981103	-0.476023
Distance	0.552015	1.000000	-0.164635	-0.533325	0.526077	-0.365148
Average weekly passengers	-0.222121	-0.164635	1.000000	0.032822	-0.190827	0.078109
market share	-0.228129	-0.533325	0.032822	1.000000	-0.214354	0.298800
Average fare	0.981103	0.526077	-0.190827	-0.214354	1.000000	-0.499622
market share .1	-0.476023	-0.365148	0.078109	0.298800	-0.499622	1.000000

```
#Drop the independent variables which has less than 0.1 correlation with the dependent variable
data_o.drop(["Average weekly passengers", "market share "], axis = 1, inplace = True)
```

```
/usr/local/lib/python3.6/dist-packages/pandas/core/frame.py:3940: SettingWithCopyWarn
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/ind
  ersus-a-copy)
```

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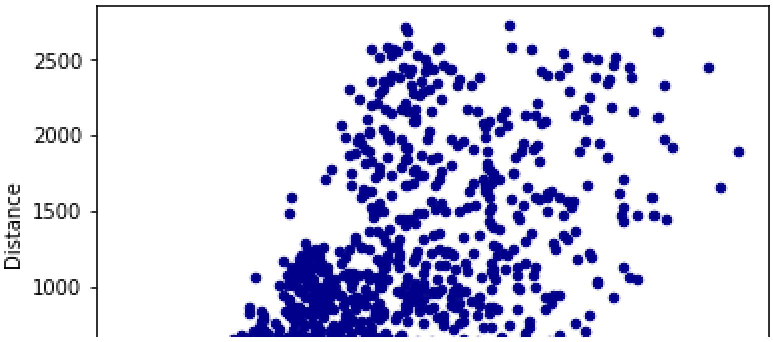
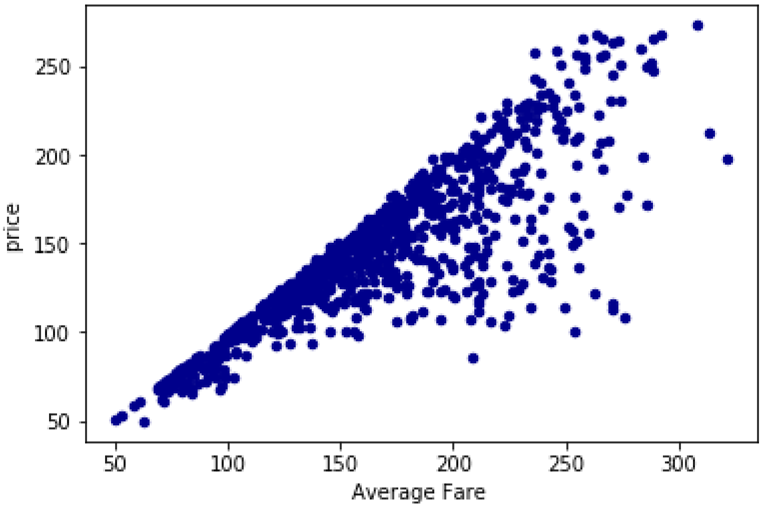
```
#Create Scatter Plot of Independent Variable vs Dependent Variable
ax1 = data_o.plot.scatter(x='Average Fare ',y='Distance', c='DarkBlue')
```



```
#Create scatter Plot of Independent Variable vs Dependent Variable
  ax2 = data_o.plot.scatter(x='Average Fare ',y='price ', c='DarkBlue')
```



```
import numpy as np
import matplotlib.pyplot as plt  # To visualize
import pandas as pd  # To read data
from sklearn.linear_model import LinearRegression

from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.30, random_state=1)


linear_regressor = LinearRegression()  # create object for the class
linear_regressor.fit(X_train, y_train)  # perform linear regression
                                                   # make predictions


for idx, col_name in enumerate(X_train.columns):
    print("The coefficient for {} is {}".format(col_name, linear_regressor.coef_[0][idx]))
```

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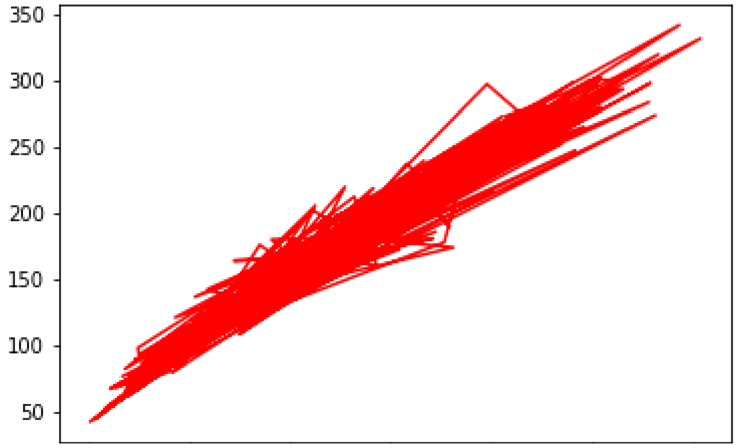
```
The coefficient for Average Fare  is 1.1366197326863348
The coefficient for Distance is -0.0015485614045845728
The coefficient for Average weekly passengers is 0.002851461693504956
The coefficient for market share  is 0.01289859557008012
The coefficient for market share .1 is -0.07570730908031131
The coefficient for price  is -0.0814430646852034
```

```
plt.plot(y, Y_pred, color='red')
plt.show()
```



```
r_sq = linear_regressor.score(X, y)
print('coefficient of determination:', r_sq)
```

```
coefficient of determination: 0.9661081824734021
```

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error, r2_score
```

```
intercept = linear_regressor.intercept_[0]

print("The intercept for our model is {}".format(intercept))
```

```
The intercept for our model is -6.234372769859277
```

```
linear_regressor.score(X_test, y_test)
```

```
0.9600795812532257
```

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