HW1

January 14, 2023

[1]:
```
import numpy as np
import pandas as pd
from pandas import Series, DataFrame
```

[2]:
```
heart = pd.read_csv("/Users/user/Desktop/Yonsei/Junior/3-2/Introduction to Data␣
↪Analysis and Regression/heart.csv",
                    index_col=0)
```

[3]:
```
heart.head()
```

[3]:

	Age	Sex	ChestPain	RestBP	Chol	Fbs	RestECG	MaxHR	ExAng	Oldpeak	\
1	63	1	typical	145	233	1	2	150	0	2.3	
2	67	1	asymptomatic	160	286	0	2	108	1	1.5	
3	67	1	asymptomatic	120	229	0	2	129	1	2.6	
4	37	1	nonanginal	130	250	0	0	187	0	3.5	
5	41	0	nontypical	130	204	0	2	172	0	1.4	

	Slope	Ca	Thal	AHD
1	3	0.0	fixed	No
2	2	3.0	normal	Yes
3	2	2.0	reversable	Yes
4	3	0.0	normal	No
5	1	0.0	normal	No

[4]:
```
heart.Chol.head()
```

[4]:
```
1    233
2    286
3    229
4    250
5    204
Name: Chol, dtype: int64
```

[5]:
```
heart.MaxHR.head()
```

[5]:
```
1    150
2    108
```

```
3    129
4    187
5    172
Name: MaxHR, dtype: int64
```

[6]:
```
heart1 = pd.concat([heart.Chol, heart.MaxHR], axis=1)
```

[7]:
```
heart1.head()
```

[7]:
```
   Chol  MaxHR
1   233    150
2   286    108
3   229    129
4   250    187
5   204    172
```

[8]:
```
heart.Chol.corr(heart.MaxHR)
```

[8]:
```
-0.003431831518025789
```

[9]:
```
heart1.corr()
```

[9]:
```
            Chol     MaxHR
Chol    1.000000 -0.003432
MaxHR  -0.003432  1.000000
```

[10]:
```
heart1.describe()
```

[10]:
```
              Chol       MaxHR
count   303.000000  303.000000
mean    246.693069  149.607261
std      51.776918   22.875003
min     126.000000   71.000000
25%     211.000000  133.500000
50%     241.000000  153.000000
75%     275.000000  166.000000
max     564.000000  202.000000
```

[11]:
```
Cholminusmean = heart.Chol - heart.Chol.mean()
```

[12]:
```
MaxHRminusmean = heart.MaxHR - heart.MaxHR.mean()
```

[13]:
```
xy = Cholminusmean * MaxHRminusmean
```

[14]:
```
Sxy = xy.sum()
Sxy
```

[14]:
```
-1227.5247524752485
```

[15]:
```
xx = Cholminusmean ** 2
```

[16]:
```
Sxx = xx.sum()
Sxx
```

[16]:
```
809616.4554455446
```

[17]:
```
beta1 = Sxy / Sxx
beta1
```

[17]:
```
-0.0015161805867689813
```

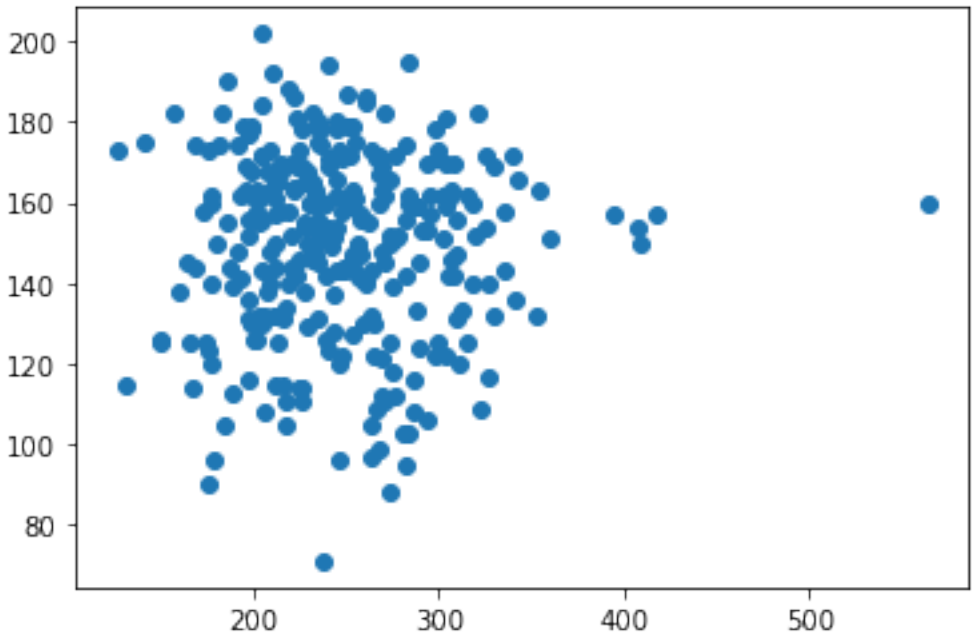
[18]:
```
beta0 = heart.MaxHR.mean() - beta1 * heart.Chol.mean()
beta0
```

[18]:
```
149.98129196864625
```

[19]:
```
import matplotlib
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

[20]:
```
plt.scatter('Chol', 'MaxHR', data=heart)
```

[20]:
```
<matplotlib.collections.PathCollection at 0x7fed19ac6fa0>
```



[21]:
```
heart.Chol.min()
```

[21]: 126

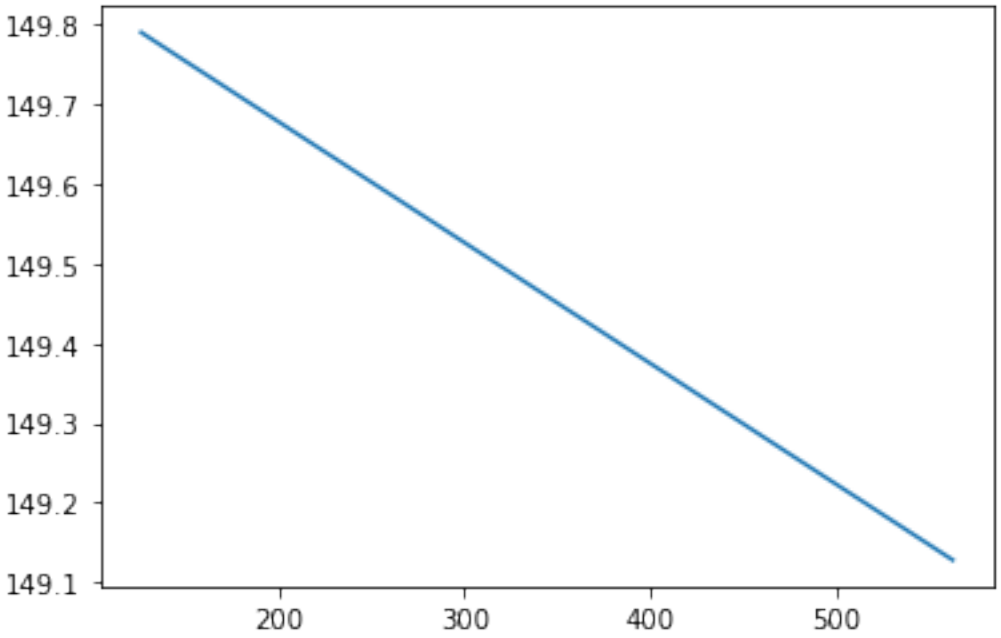
[22]:
```
heart.Chol.max()
```

[22]: 564

[24]:
```
x = np.arange(heart.Chol.min(), heart.Chol.max())
```

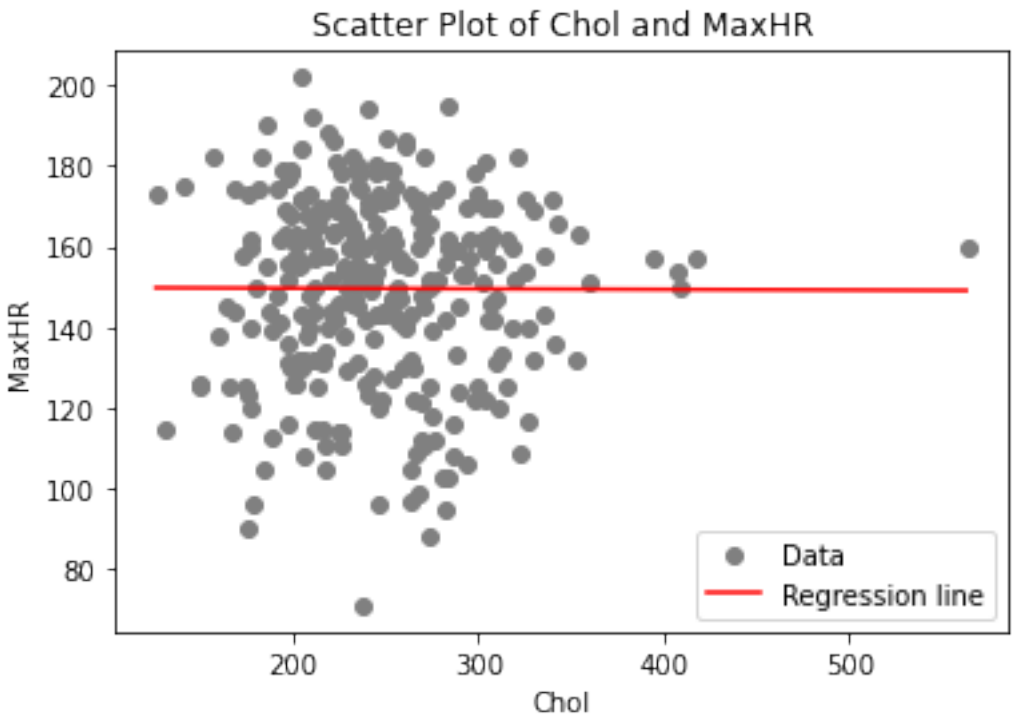
[25]:
```
plt.plot(x, beta0 + beta1 * x)
```

[25]: [<matplotlib.lines.Line2D at 0x7fed28549610>]



[26]:
```
plt.scatter('Chol', 'MaxHR', data=heart, color='grey', label='Data')
plt.plot(x, beta0 + beta1 * x, color='red', label = 'Regression line')
plt.title('Scatter Plot of Chol and MaxHR', fontsize=12)
plt.xlabel('Chol', fontsize=10)
plt.ylabel('MaxHR', fontsize=10)
plt.legend(loc='lower right')
```

[26]: <matplotlib.legend.Legend at 0x7fed19bf7dc0>


Scatter Plot of Chol and MaxHR
MaxHR
Chol
200
180
160
140
120
100
80
200
300
400
500
Data
Regression line

[ ]: