```
import pandas as pd
import seaborn as sb
import numpy as np
import matplotlib as plt
from sklearn.model selection import train test split as tts
from sklearn.linear model import LogisticRegression
from sklearn import metrics
heart = pd.read csv("Heart dataset.csv")
heart
     Unnamed: 0
                  Age Sex
                                ChestPain
                                            RestBP
                                                     Chol Fbs
                                                                 RestECG
MaxHR \
               1
                   63
                          1
                                  typical
                                               145
                                                      233
                                                                       2
0
                                                             1
150
1
               2
                          1
                             asymptomatic
                                               160
                                                      286
                                                                       2
                   67
108
2
               3
                                               120
                                                      229
                                                             0
                                                                       2
                   67
                          1
                             asymptomatic
129
3
               4
                                               130
                                                      250
                                                                       0
                   37
                          1
                               nonanginal
                                                             0
187
               5
                   41
                          0
                               nontypical
                                               130
                                                      204
                                                             0
                                                                       2
172
. .
. . .
             299
                                  typical
                                                      264
298
                   45
                          1
                                               110
                                                             0
                                                                       0
132
299
             300
                   68
                          1
                             asymptomatic
                                               144
                                                      193
                                                             1
                                                                       0
141
300
             301
                                               130
                                                      131
                                                                       0
                   57
                          1
                             asymptomatic
115
301
             302
                   57
                          0
                               nontypical
                                               130
                                                      236
                                                             0
                                                                       2
174
302
             303
                   38
                          1
                               nonanginal
                                               138
                                                      175
                                                             0
                                                                       0
173
     ExAng
             Oldpeak
                      Slope
                               Ca
                                          Thal
                                                AHD
0
                 2.3
                           3
                              0.0
                                         fixed
                                                 No
         0
                 1.5
                           2
1
         1
                              3.0
                                        normal
                                                Yes
2
         1
                 2.6
                           2
                              2.0
                                    reversable
                                                Yes
3
                 3.5
         0
                           3
                              0.0
                                        normal
                                                  No
4
         0
                 1.4
                           1
                              0.0
                                        normal
                                                  No
                 . . .
298
         0
                 1.2
                           2
                              0.0
                                    reversable
                                                Yes
                           2
299
         0
                 3.4
                              2.0
                                    reversable
                                                Yes
300
         1
                              1.0
                 1.2
                           2
                                    reversable
                                                Yes
301
         0
                 0.0
                           2
                              1.0
                                        normal
                                                Yes
302
         0
                 0.0
                              NaN
                                        normal
                                                  No
```

```
[303 rows x 15 columns]
heart = heart.drop(columns=['Unnamed: 0'])
heart
                                                   RestECG
     Age Sex
                   ChestPain
                              RestBP
                                       Chol Fbs
                                                            MaxHR ExAng
      63
          1
                                  145
                                        233
                                                         2
                                                              150
                                                                        0
                     typical
                                               1
      67
            1
               asymptomatic
                                  160
                                        286
                                               0
                                                         2
                                                              108
                                                                        1
      67
               asymptomatic
                                  120
                                        229
                                                         2
                                                              129
         1
                                                                        1
      37
            1
                  nonanginal
                                  130
                                        250
                                               0
                                                         0
                                                              187
                                                                        0
                                        204
      41
            0
                  nontypical
                                  130
                                               0
                                                         2
                                                              172
                                                                        0
                                  . . .
298
      45
            1
                     typical
                                  110
                                        264
                                               0
                                                              132
                                                                        0
299
      68
            1
              asymptomatic
                                  144
                                        193
                                               1
                                                              141
                                                                        0
300
      57
                asymptomatic
                                  130
                                        131
                                                              115
                                                                        1
            1
301
                  nontypical
                                  130
                                        236
                                               0
                                                         2
                                                              174
                                                                        0
      57
            0
                  nonanginal
302
      38
          1
                                  138
                                        175
                                               0
                                                              173
                                                                        0
     0ldpeak
              Slope
                                  Thal
                                        AHD
                       Ca
                                fixed
0
         2.3
                      0.0
                                         No
                   3
                   2
1
         1.5
                      3.0
                                normal
                                        Yes
2
                   2
         2.6
                      2.0
                           reversable
                                        Yes
3
         3.5
                   3
                      0.0
                                normal
                                         No
4
                   1
         1.4
                      0.0
                                normal
                                         No
298
         1.2
                   2
                      0.0
                           reversable
                                        Yes
                   2
299
         3.4
                      2.0
                           reversable
                                        Yes
300
         1.2
                   2
                      1.0
                           reversable
                                        Yes
                   2
301
         0.0
                      1.0
                                normal
                                        Yes
302
         0.0
                   1
                      NaN
                                normal
                                         No
[303 rows x 14 columns]
heart['AHD'] = np.where(heart["AHD"] == "Yes", 1, 0)
heart
     Age Sex
                   ChestPain
                              RestBP Chol Fbs RestECG
                                                            MaxHR ExAng
```

Θ	63	1	t	ypica	al	145	233	1	2	150	0	
1	67	1	asympt	omat:	ic	160	286	Θ	2	108	1	
2	67	1	asympt	omat:	ic	120	229	0	2	129	1	
3	37	1	nona	ngina	al	130	250	0	0	187	Θ	
4	41	0	nont	ypic	al	130	204	0	2	172	0	
298	45	1	t	ypica	al	110	264	0	0	132	0	
299	68	1	asympt	omat	ic	144	193	1	0	141	0	
300	57	1	asympt	omat:	ic	130	131	0	0	115	1	
301	57	0	nont	ypica	al	130	236	0	2	174	0	
302	38	1	nona	ngina	al	138	175	0	0	173	0	
hear 'asyı	1 2 3 1 1 3 1 0 rows t['Che mptoma t['Che typica	.3 .5 .6 .5 .4 .2 .4 .2 .0 .0 x 14 stPa	2 2 3 1 2 2 2 2 1 column in'] =	hear <mark>1</mark>]) hear	revers revers revers revers no	ormal ormal sable sable ormal ormal		lace(['ty	•			
	Age	Sex	ChestP	ain	RestBF	P Cho	l Fbs	RestECO	G MaxH	ŀR Ex	Ang	
Oldpe	eak \ 63	1		0	145	5 23	3 1	2	2 15	50	0	
2.3	67	1		1	160) 28	6 0	2	2 10	98	1	

1.5 2	67	1	1	120	229	0	2	129	1
2.6	37	1	2	130	250	0	0	187	0
3.5 4 1.4	41	0	3	130	204	0	2	172	0
298	45	1	0	110	264	0	0	132	Θ
1.2 299	68	1	1	144	193	1	0	141	Θ
3.4 300	57	1	1	130	131	0	0	115	1
1.2 301	57	0	3	130	236	Θ	2	174	Θ
0.0 302	38	1	2	138	175	0	0	173	Θ
0.0		_	_			-	-		_
0 1 2 3 4	Slope 3 2 2 3 1	Ca 0.0 3.0 2.0 0.0 0.0	Thal fixed normal reversable normal normal	AHD 0 1 1 0 0					
298 299 300 301 302	2 2 2 2 1	0.0 2.0 1.0 1.0 NaN	reversable reversable reversable normal normal	1 1 1 0					
[303	rows >	(14 c	columns]						
'reve	ersable		heart['Thal' 0, 1, 2])].rep	lace(['fixed	l', 'norm	al',	
hear			hoc+Dain Do	c+DD	Chal	Ehc	Doc+ECC	MayUD	EvAna
Oldpe	eak \		ChestPain Re				RestECG	MaxHR	ExAng
0 2.3	63	1	0	145	233	1	2	150	0
1 1.5	67	1	1	160	286	Θ	2	108	1
2 2.6	67	1	1	120	229	0	2	129	1
3.5	37	1	2	130	250	0	0	187	Θ

4	41		0		3	130	204	0	2	172	0
1.4											
		•	• •	•	• •						
298 1.2	45		1		0	110	264	0	0	132	0
299	68		1		1	144	193	1	0	141	0
3.4	F 7		1		1	120	101	0	0	115	1
300 1.2	57		1		1	130	131	0	0	115	1
301	57		0		3	130	236	0	2	174	0
0.0 302	38		1		2	138	175	0	0	173	0
0.0											
0 1 2 3 4 298 299 300 301 302	Slop	De 3 2 2 3 1	Ca 0.0 3.0 2.0 0.0 0.0 2.0 1.0 1.0 NaN	Thal 0.0 1.0 2.0 1.0 2.0 2.0 2.0 2.0 2.0 1.0	AHD 0 1 0 0 1 1 1 0 0 0						
[303	rows	5 X	14 c	olumns]						
hear	t.dty	/pes	5								

Age int64 Sex int64 ChestPain int64 RestBP int64 Chol int64 Fbs int64 RestECG int64 MaxHR int64 ExAng int64 **Oldpeak** float64 Slope int64 Ca float64 Thal float64 AHD int64 dtype: object

```
heart.isnull().sum()
Age
             0
             0
Sex
ChestPain
             0
             0
RestBP
Chol
             0
Fbs
             0
RestECG
             0
             0
MaxHR
             0
ExAng
             0
Oldpeak
Slope
             0
             4
Ca
             2
Thal
AHD
dtype: int64
heart.mean()
              54.438944
Age
Sex
               0.679868
ChestPain
               1.537954
RestBP
             131.689769
Chol
             246.693069
Fbs
               0.148515
RestECG
               0.990099
             149.607261
MaxHR
ExAng
               0.326733
Oldpeak
               1.039604
Slope
               1.600660
Ca
               0.672241
Thal
               1.328904
               0.458746
AHD
dtype: float64
ca=heart["Ca"].mean()
                                       #mean of individual column ca
0.6722408026755853
heart["Ca"].fillna(ca, inplace = True) # h) replace missing data
heart
     Age Sex ChestPain RestBP Chol
                                         Fbs
                                              RestECG MaxHR
                                                               ExAng
Oldpeak \
0
      63 1
                       0
                              145
                                    233
                                           1
                                                    2
                                                          150
                                                                   0
2.3
                                                    2
                              160
                                    286
                                                          108
1
      67
            1
                       1
                                                                   1
1.5
2
      67
            1
                       1
                              120
                                    229
                                                    2
                                                          129
                                                                   1
                                           0
```

2.6										
3	37	1	2	130	250	0	0	187	0	
3.5	41	0	2	120	204	0	2	170	0	
4 1.4	41	0	3	130	204	0	2	172	0	
	•••	• • •	• • •	• • •	•••	•••	• • • •	• • • •	• • •	
298	45	1	0	110	264	0	0	132	0	
1.2										
299	68	1	1	144	193	1	0	141	0	
3.4	5 7	1	1	120	101	0	0	115	1	
300 1.2	57	1	1	130	131	0	0	115	1	
301	57	0	3	130	236	0	2	174	0	
0.0	31	Ū	3	150	250	U	2	1/7	J	
302	38	1	2	138	175	0	0	173	0	
0.0										
0	Slope 3	0.00000	0.0	AHD 0						
1	2			1						
1 2 3 4	2			1						
3 1	3 1			0 0						
298	2			1						
299	2			1						
300	2			1						
301 302	2 1			1 0						
302	1	0.07224	1 1.0	U						
[303	rows	x 14 colu	mns]							
th=he	eart["	Thal"].me	an()			#mean	n of indi	vidual	column	са
1.328	890365	44850499								
hear data hear	_	l"].filln	a(th, in	place	= True)	# h) re	place m	issing	
	Age	Sex Ches	tPain R	estBP	Chol	Fbs	RestECG	MaxHR	ExAng	
Oldpe	eak \								_	
0	63	1	0	145	233	1	2	150	0	
2.3	67	1	1	160	206	0	2	100	1	
1 1.5	67	1	1	160	286	0	2	108	1	
2	67	1	1	120	229	0	2	129	1	
2.6	3,	-	_	120	223	0		123	_	

3	37	1	2	130	250	0	0	187	0
3 3.5	47	0	2	120	204	0	2	170	0
4 1.4	41	0	3	130	204	0	2	172	0
298 1.2	45	1	0	110	264	0	0	132	0
299	68	1	1	144	193	1	0	141	0
3.4	57	1	1	130	131	0	0	115	1
1.2 301	57	Θ	3	130	236	0	2	174	0
0.0 302 0.0	38	1	2	138	175	0	0	173	0
0 1 2 3 4	Slope 3 2 2 3 1	Ca 0.000000 3.000000 2.000000 0.000000 0.000000	Thal 0.0 1.0 2.0 1.0 1.0 2.0	AHD 0 1 1 0 0					
299 300 301 302	2 2 2 1	2.000000 1.000000 1.000000 0.672241	2.0 2.0 1.0 1.0	1 1 1 0					
		(14 columr	is]						
Age Sex	tPain BP ECG R g eak e	0 0 0 0 0 0 0 0 0							

AHD dtype: int64 heart.duplicated().sum() heart.describe() Sex ChestPain RestBP Chol Age Fbs count 303.000000 303.000000 303.000000 303.000000 303.000000 303.000000 54.438944 0.679868 1.537954 131.689769 246.693069 mean 0.148515 std 9.038662 0.467299 0.856053 17.599748 51.776918 0.356198 min 29.000000 0.000000 0.000000 94.000000 126.000000 0.000000 25% 48.000000 0.000000 1.000000 120.000000 211.000000 0.000000 50% 56.000000 1.000000 1.000000 130.000000 241.000000 0.000000 275.000000 75% 61.000000 1.000000 2.000000 140.000000 0.000000 1.000000 3.000000 200.000000 564.000000 max 77.000000 1.000000 RestECG MaxHR ExAng Oldpeak Slope Ca \ 303.000000 303.000000 303.000000 count 303.000000 303.000000 303.000000 0.990099 149.607261 0.326733 1.039604 1.600660 mean 0.672241 0.994971 22.875003 0.469794 1.161075 0.616226 std 0.931209 min 0.000000 71.000000 0.000000 0.000000 1.000000 0.000000 25% 0.000000 133.500000 0.000000 0.000000 1.000000 0.000000 153.000000 50% 1.000000 0.000000 0.800000 2.000000 0.000000 75% 2.000000 166.000000 1.000000 1.600000 2.000000 1.000000 202.000000 1.000000 6.200000 2.000000 3.000000 max 3.000000 Thal AHD

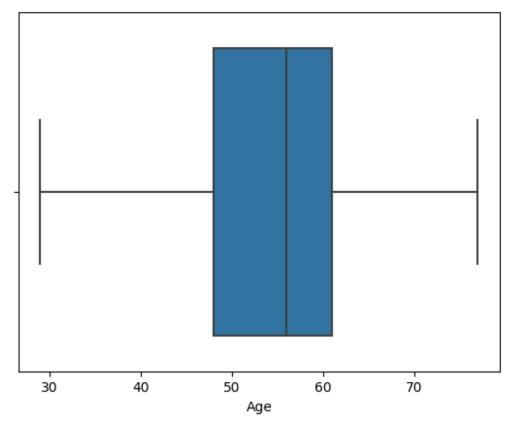
303.000000

1.328904

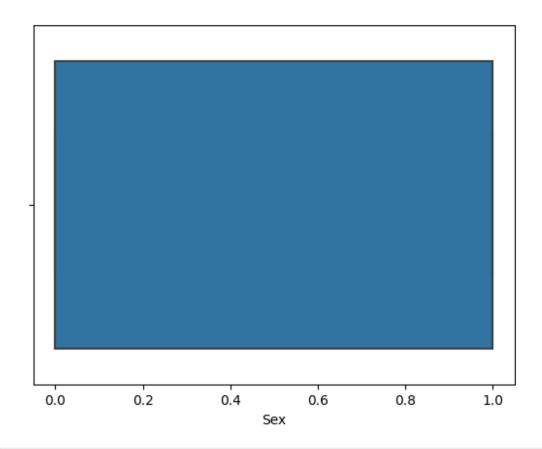
count mean 303.000000

0.458746

```
std
         0.582409
                     0.499120
         0.000000
                     0.000000
min
25%
         1.000000
                     0.000000
                     0.000000
50%
         1.000000
         2.000000
                     1.000000
75%
         2.000000
                     1.000000
max
heart.shape
(303, 14)
sb.boxplot(data=heart, x="Age")
<Axes: xlabel='Age'>
```

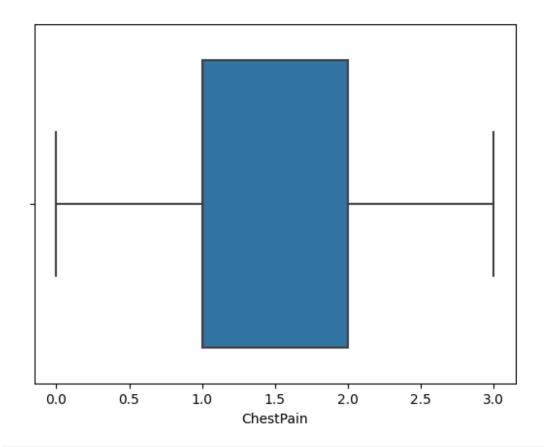


```
sb.boxplot(data=heart, x="Sex")
<Axes: xlabel='Sex'>
```



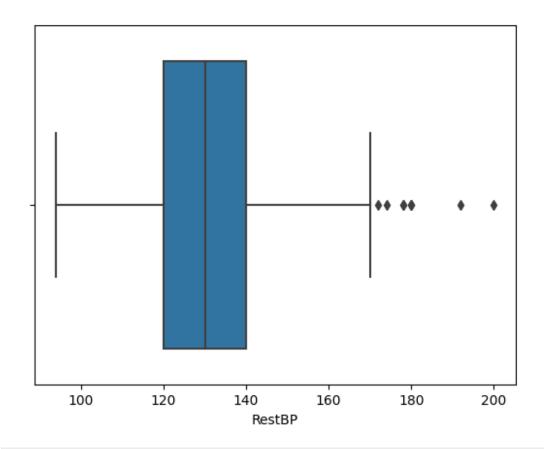
sb.boxplot(data=heart, x="ChestPain")

<Axes: xlabel='ChestPain'>



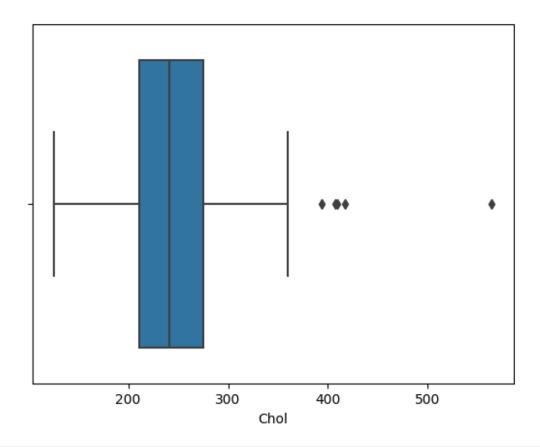
sb.boxplot(data=heart, x="RestBP")

<Axes: xlabel='RestBP'>



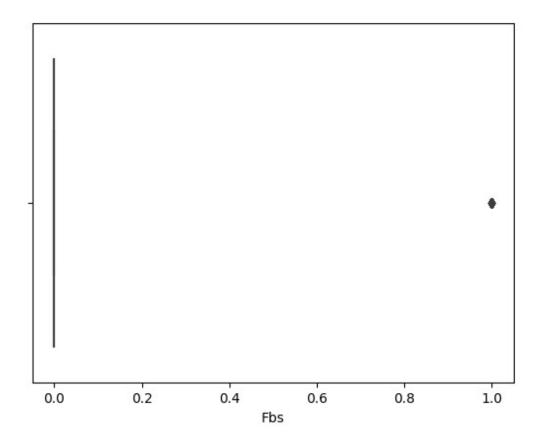
sb.boxplot(data=heart, x="Chol")

<Axes: xlabel='Chol'>



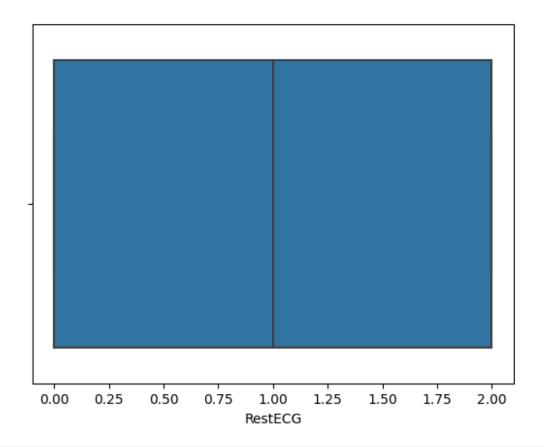
sb.boxplot(data=heart, x="Fbs")

<Axes: xlabel='Fbs'>



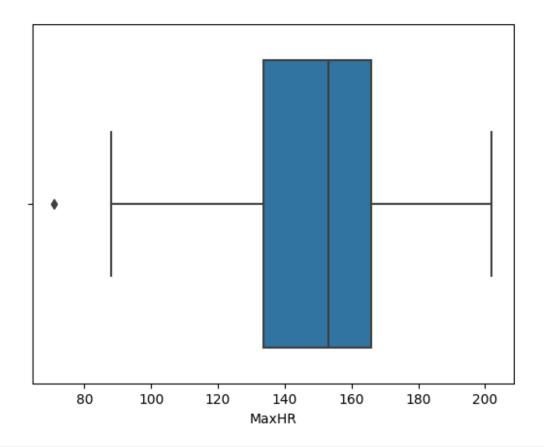
sb.boxplot(data=heart, x="RestECG")

<Axes: xlabel='RestECG'>



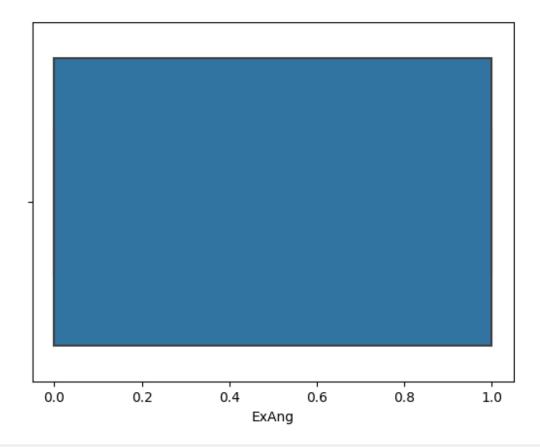
sb.boxplot(data=heart, x="MaxHR")

<Axes: xlabel='MaxHR'>



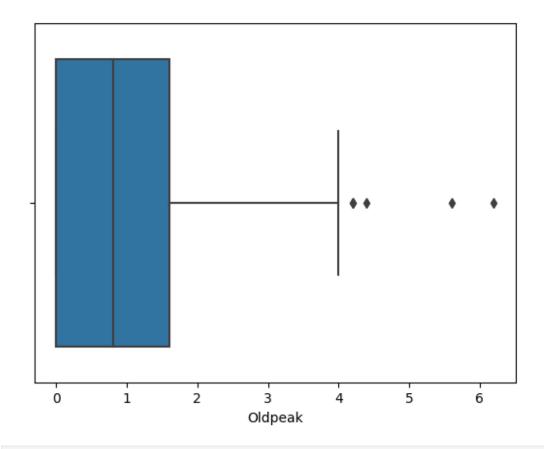
sb.boxplot(data=heart, x="ExAng")

<Axes: xlabel='ExAng'>



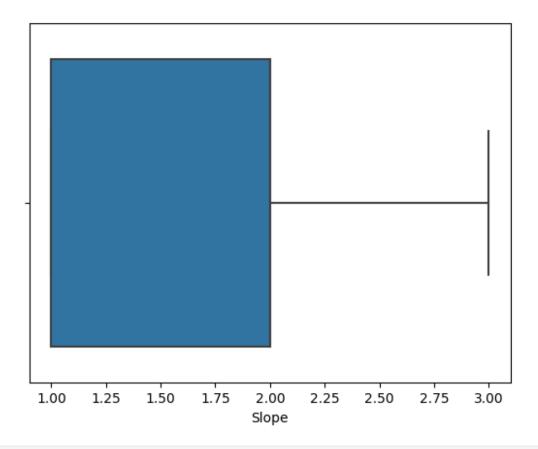
sb.boxplot(data=heart, x="0ldpeak")

<Axes: xlabel='0ldpeak'>



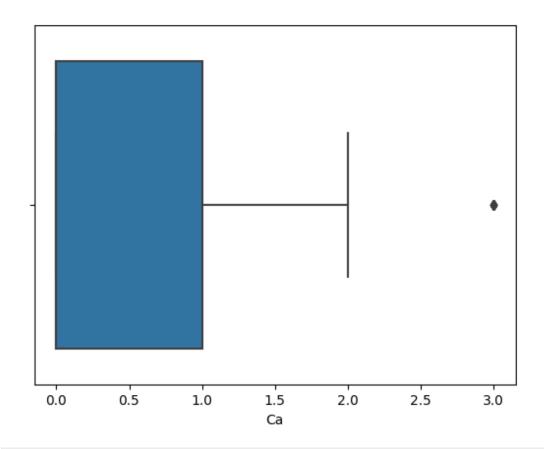
sb.boxplot(data=heart, x="Slope")

<Axes: xlabel='Slope'>



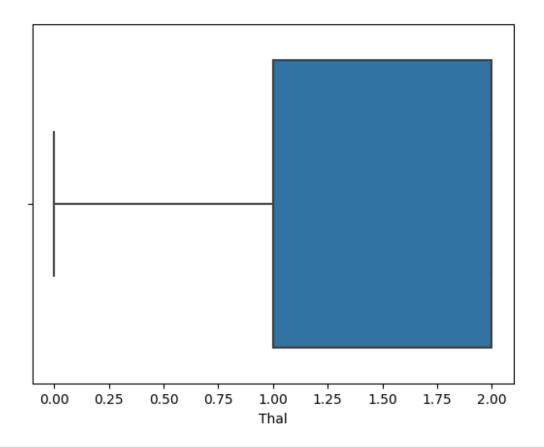
sb.boxplot(data=heart, x="Ca")

<Axes: xlabel='Ca'>



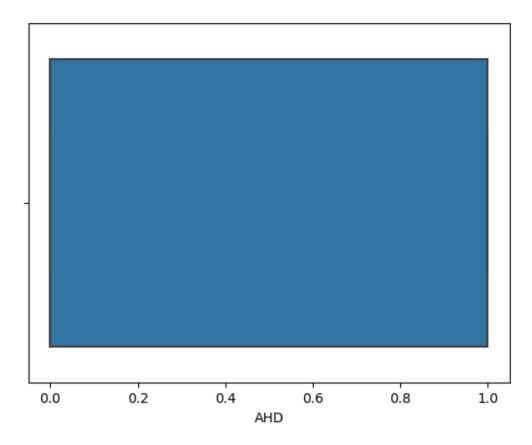
sb.boxplot(data=heart, x="Thal")

<Axes: xlabel='Thal'>



sb.boxplot(data=heart, x="AHD")

<Axes: xlabel='AHD'>

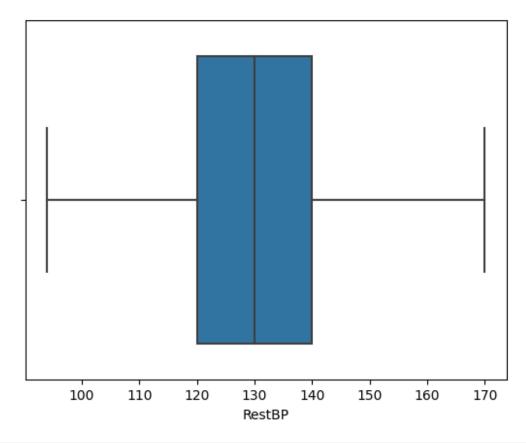


```
for x in ['RestBP']:
    q75,q25 = np.percentile(heart.loc[:,x],[75,25])
    intr_qr = q75-q25

max = q75+(1.5*intr_qr)
    min = q25-(1.5*intr_qr)

heart.loc[heart[x] < min,x] = np.nan
    heart.loc[heart[x] > max,x] = np.nan
sb.boxplot(data=heart, x="RestBP")

<Axes: xlabel='RestBP'>
```



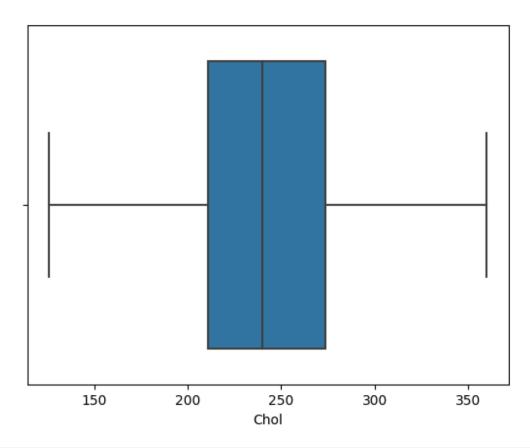
```
for x in ['Chol']:
    q75,q25 = np.percentile(heart.loc[:,x],[75,25])
    intr_qr = q75-q25

max = q75+(1.5*intr_qr)
    min = q25-(1.5*intr_qr)

    heart.loc[heart[x] < min,x] = np.nan
    heart.loc[heart[x] > max,x] = np.nan

sb.boxplot(data=heart, x="Chol")

<a href=""Axes: xlabel='Chol'>
```



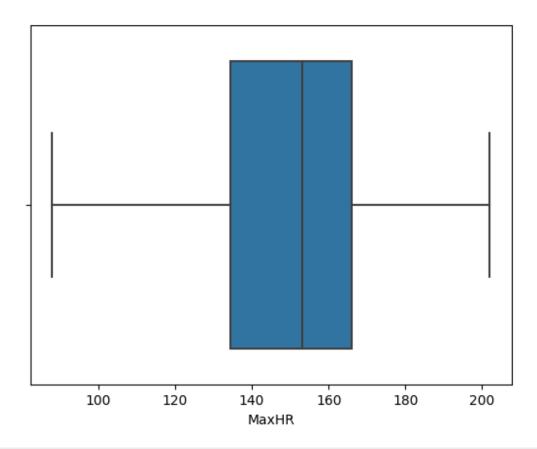
```
for x in ['MaxHR']:
    q75,q25 = np.percentile(heart.loc[:,x],[75,25])
    intr_qr = q75-q25

max = q75+(1.5*intr_qr)
    min = q25-(1.5*intr_qr)

    heart.loc[heart[x] < min,x] = np.nan
    heart.loc[heart[x] > max,x] = np.nan

sb.boxplot(data=heart, x="MaxHR")

<a href="max+name="Max+name="Axes: xlabel='MaxHR'">
```



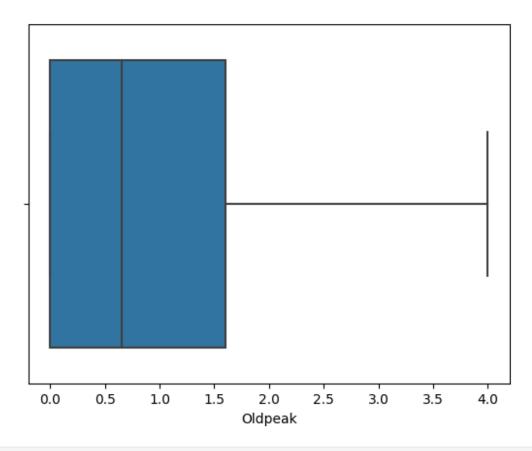
```
for x in ['Oldpeak']:
    q75,q25 = np.percentile(heart.loc[:,x],[75,25])
    intr_qr = q75-q25

max = q75+(1.5*intr_qr)
    min = q25-(1.5*intr_qr)

    heart.loc[heart[x] < min,x] = np.nan
    heart.loc[heart[x] > max,x] = np.nan

sb.boxplot(data=heart, x="Oldpeak")

<a href="mailto:Axes: xlabel='Oldpeak'>
```



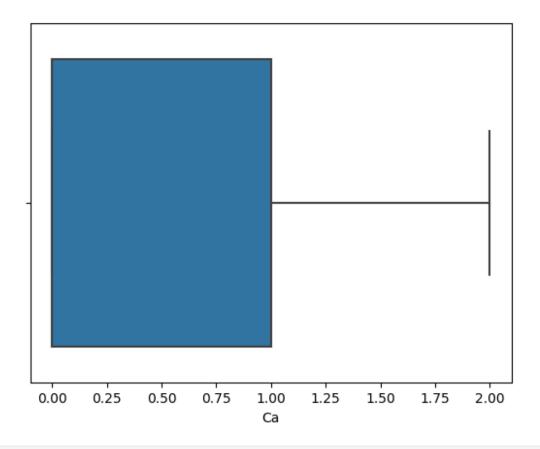
```
for x in ['Ca']:
    q75,q25 = np.percentile(heart.loc[:,x],[75,25])
    intr_qr = q75-q25

max = q75+(1.5*intr_qr)
    min = q25-(1.5*intr_qr)

    heart.loc[heart[x] < min,x] = np.nan
    heart.loc[heart[x] > max,x] = np.nan

sb.boxplot(data=heart, x="Ca")

<a href="Axes: xlabel='Ca'>
```



```
heart.isnull().sum()
Age
               0
Sex
               0
ChestPain
               0
RestBP
               9
Chol
Fbs
               0
RestECG
               0
MaxHR
               1
ExAng
               0
Oldpeak
               5
Slope
               0
              20
Ca
Thal
               0
AHD
               0
dtype: int64
data = heart.dropna(axis = 0)
data.isnull().sum()
              0
Age
Sex
              0
ChestPain
              0
```

```
RestBP
             0
Chol
             0
Fbs
             0
RestECG
             0
             0
MaxHR
ExAng
             0
             0
Oldpeak
Slope
             0
             0
Ca
Thal
             0
AHD
dtype: int64
data.shape
(268, 14)
data.head()
   Age Sex ChestPain
                        RestBP Chol Fbs RestECG MaxHR ExAng
Oldpeak \
                         145.0 233.0
    63
       1
                     0
                                          1
                                                      150.0
                                                                 0
2.3
2
    67
          1
                     1
                         120.0 229.0
                                          0
                                                      129.0
                                                                 1
2.6
3
    37
                     2
                         130.0 250.0
                                                   0
                                                      187.0
                                                                 0
          1
                                          0
3.5
4
    41
                         130.0 204.0
                                          0
                                                      172.0
                                                                 0
          0
1.4
    56
                     3
                                                                 0
5
          1
                         120.0 236.0
                                          0
                                                   0 178.0
0.8
               Thal
   Slope
         Ca
                     AHD
0
       3
         0.0
                0.0
                       0
2
       2
                2.0
          2.0
                       1
3
       3
                       0
         0.0
                1.0
4
       1
          0.0
                1.0
                       0
5
       1
         0.0
                1.0
                       0
subset1 = data[data["Age"]>40].iloc[0:30,0:6]
sb2 = data[["RestBP", "Sex", "ChestPain", "Age", "Ca", "Thal", "AHD"]]
subset1
              ChestPain
         Sex
                         RestBP
                                  Chol
                                         Fbs
    Age
0
     63
           1
                          145.0
                                 233.0
                                           1
2
     67
           1
                          120.0
                                 229.0
                                           0
                      1
4
                      3
                          130.0
     41
           0
                                 204.0
                                           0
5
     56
           1
                      3
                           120.0
                                           0
                                 236.0
6
           0
     62
                           140.0
                                 268.0
```

```
7
     57
             0
                          1
                              120.0
                                      354.0
8
     63
                          1
                              130.0
                                      254.0
                                                 0
             1
9
     53
             1
                          1
                              140.0
                                      203.0
                                                 1
10
     57
                              140.0
             1
                          1
                                      192.0
                                                 0
                                      294.0
11
             0
                          3
                              140.0
                                                 0
     56
                         2
12
             1
                              130.0
                                      256.0
                                                 1
     56
                         3
                              120.0
13
     44
             1
                                      263.0
                                                 0
15
     57
             1
                          2
                              150.0
                                      168.0
                                                 0
                         3
             1
16
     48
                              110.0
                                      229.0
                                                 0
             1
                          1
                              140.0
                                                 0
17
     54
                                      239.0
                         2
18
                              130.0
                                      275.0
     48
             0
                                                 0
                         3
                              130.0
                                      266.0
                                                 0
19
     49
             1
20
     64
             1
                          0
                              110.0
                                      211.0
                                                 0
             0
                          0
                              150.0
                                                 1
21
     58
                                      283.0
                         3
22
     58
             1
                              120.0
                                      284.0
                                                 0
23
             1
                              132.0
                                                 0
     58
                                      224.0
                          1
             1
                                                 0
24
     60
                              130.0
                                      206.0
                         2
25
             0
                              120.0
                                      219.0
                                                 0
     50
             0
                          2
                              120.0
                                                 0
26
     58
                                      340.0
27
     66
             0
                          0
                              150.0
                                      226.0
                                                 0
28
                              150.0
     43
             1
                          1
                                      247.0
                                                 0
30
     69
             0
                              140.0
                                      239.0
                                                 0
                          0
31
             1
                              117.0
                                                 1
     60
                          1
                                      230.0
32
     64
             1
                          2
                              140.0
                                      335.0
                                                 0
33
     59
             1
                          1
                              135.0
                                      234.0
                                                 0
```

subset2 = data[data["RestBP"]<140].iloc[0:40,3:9]</pre>

subset2

	RestBP	Chol	Fbs	RestECG	MaxHR	ExAng
2	120.0	229.0	0	2	129.0	ĭ
3	130.0	250.0	0	0	187.0	0
4	130.0	204.0	0	2	172.0	0
5	120.0	236.0	0	0	178.0	0
7	120.0	354.0	0	0	163.0	1
8	130.0	254.0	0	2	147.0	0
12	130.0	256.0	1	2	142.0	1
13	120.0	263.0	0	Θ	173.0	0
16	110.0	229.0	0	Θ	168.0	0
18	130.0	275.0	0	0	139.0	0
19	130.0	266.0	0	0	171.0	0
20	110.0	211.0	0	2	144.0	1
22	120.0	284.0	0	2	160.0	0
23	132.0	224.0	0	2	173.0	0
24	130.0	206.0	0	2	132.0	1
25	120.0	219.0	0	0	158.0	0
26	120.0	340.0	0	0	172.0	0
29	110.0	167.0	0	2	114.0	1
31	117.0	230.0	1	0	160.0	1

```
33
     135.0
             234.0
                      0
                                    161.0
                                                0
34
     130.0
             233.0
                                   179.0
                                                1
                      0
                                0
36
     120.0
             177.0
                      0
                                2
                                    120.0
                                                1
38
     132.0
             353.0
                                0
                                    132.0
                                                1
                      0
                                                0
44
     130.0
             330.0
                      0
                                2
                                    169.0
     112.0
45
             230.0
                                2
                                    165.0
                                                0
                       0
     110.0
            175.0
                                0 123.0
                                                0
46
                       0
49
     130.0
             197.0
                       1
                                2
                                    152.0
                                                0
50
     105.0
             198.0
                      0
                                0
                                    168.0
                                                0
                      0
                                                0
51
     120.0
             177.0
                                0
                                    140.0
52
                                2 153.0
     112.0
                      0
                                                0
             290.0
                                                0
53
                      0
                                2
                                    188.0
     130.0
             219.0
54
     130.0
             253.0
                      0
                                    144.0
                                                1
                                                1
55
     124.0
             266.0
                      0
                                2
                                    109.0
                                2
57
     110.0
             172.0
                      0
                                    158.0
                                                0
58
                                                0
     125.0
             273.0
                      0
                                    152.0
                                2
59
                      0
                                    125.0
                                                1
     125.0
             213.0
60
                                    142.0
                                                1
     130.0
             305.0
                      0
                                0
                                                0
                       1
                                    170.0
63
     135.0
             304.0
                                0
64
     120.0
             188.0
                                    113.0
                                                0
                       0
71
     125.0
            254.0
                       1
                                0
                                  163.0
                                                0
```

subset1.merge(subset2,how="inner")

	Age	Sex	ChestPain	RestBP	Chol	Fbs	RestECG	MaxHR	ExAng
0	67	1	1	120.0	229.0	0	2	129.0	1
1	41	Ō	3	130.0	204.0	0	2	172.0	0
2	56	1	3	120.0	236.0	Õ	0	178.0	0
3	57	0	1	120.0	354.0	0	0	163.0	1
4	63	1	1	130.0	254.0	0	2	147.0	0
5	56	1	2	130.0	256.0	1	2	142.0	1
6	44	1	3	120.0	263.0	0	0	173.0	0
7	48	1	3	110.0	229.0		0	168.0	_
0		T				0			0
8	48	0	2	130.0	275.0	0	0	139.0	0
9	49	1	3	130.0	266.0	0	0	171.0	0
10	64	1	0	110.0	211.0	0	2	144.0	1
11	58	1	3	120.0	284.0	0	2	160.0	0
12	58	1	2	132.0	224.0	0	2	173.0	0
13	60	1	1	130.0	206.0	0	2	132.0	1
14	50	0	2	120.0	219.0	0	0	158.0	0
15	58	0	2	120.0	340.0	0	0	172.0	0
16	60	1	1	117.0	230.0	1	0	160.0	1
17	59	1	1	135.0	234.0	Θ	0	161.0	0

subset1.merge(subset2,how="cross")

	Age	Sex	ChestPain	RestBP_x	Chol_x	Fbs_x	RestBP_y	Chol_y
Fbs_y								
0	63	1	0	145.0	233.0	1	120.0	229.0
0								

1	63	1		0	145.0	233.0	1	130.0	250.0
0	05	_		U	143.0	233.0	_	130.0	230.0
2	63	1		0	145.0	233.0	1	130.0	204.0
0 3 0	63	1		0	145.0	233.0	1	120.0	236.0
				_					
4	63	1		0	145.0	233.0	1	120.0	354.0
Θ									
		• • •							
1195	59	1		1	135.0	234.0	0	125.0	213.0
0 1196	59	1		1	135.0	234.0	0	130.0	305.0
0		_		_					
1197	59	1		1	135.0	234.0	0	135.0	304.0
1									
1198	59	1		1	135.0	234.0	0	120.0	188.0
0	ΕO	1		1	125 0	224.0	0	125 0	254.0
1199 1	59	Т		T	135.0	234.0	0	125.0	254.0
_									
	RestE	CG	MaxHR	ExAng					
0 1		2	129.0	1					
1		0	187.0	0					

	RestECG	MaxHR	ExAng
0	2	129.0	ĺ
1	0	187.0	0
2	2	172.0	0
3	0	178.0	0
4	Θ	163.0	1
1195	2	125.0	1
1196	Θ	142.0	1
1197	0	170.0	0
1198	0	113.0	0
1199	0	163.0	0

[1200 rows x 12 columns]

pd.concat([subset1,subset2])

		_	Cl ID '	D 100	CI 1		D 1566	M 11D	_ ^
	Age	Sex	ChestPain	RestBP	Chol	Fbs	RestECG	MaxHR	ExAng
0	63.0	1.0	0.0	145.0	233.0	1	NaN	NaN	NaN
2	67.0	1.0	1.0	120.0	229.0	0	NaN	NaN	NaN
4	41.0	0.0	3.0	130.0	204.0	0	NaN	NaN	NaN
5	56.0	1.0	3.0	120.0	236.0	0	NaN	NaN	NaN
6	62.0	0.0	1.0	140.0	268.0	0	NaN	NaN	NaN
59	NaN	NaN	NaN	125.0	213.0	0	2.0	125.0	1.0
60	NaN	NaN	NaN	130.0	305.0	0	0.0	142.0	1.0
63	NaN	NaN	NaN	135.0	304.0	1	0.0	170.0	0.0
64	NaN	NaN	NaN	120.0	188.0	0	0.0	113.0	0.0
71	NaN	NaN	NaN	125.0	254.0	1	0.0	163.0	0.0
71	NaN	NaN	NaN	125.0	254.0	1	0.0	163.0	0.0

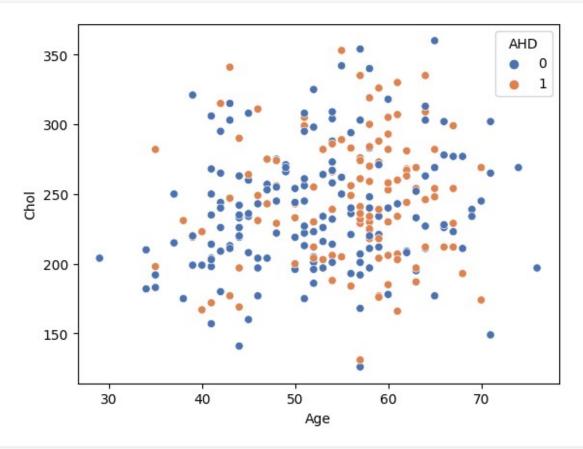
```
[70 rows x 9 columns]
pd.melt(subset1,id vars="Age")
    Age variable value
0
      63
              Sex
                     1.0
1
      67
              Sex
                     1.0
2
      41
              Sex
                     0.0
3
      56
              Sex
                     1.0
4
      62
                     0.0
              Sex
      43
145
              Fbs
                     0.0
146
      69
              Fbs
                     0.0
              Fbs
147
      60
                     1.0
148
      64
              Fbs
                     0.0
149
      59
              Fbs
                     0.0
[150 rows x 3 columns]
pd.pivot_table(data,index="RestECG",values="AHD",columns="ChestPain",a
gqfunc="sum")
ChestPain
            0
               1
RestECG
           4.0
                34.0
                     8.0
                           2.0
1
           NaN
                1.0
                      0.0
                           NaN
2
           3.0
                50.0
                     6.0
                           5.0
data.corr()
                         Sex ChestPain
                                            RestBP
                                                        Chol
                                                                   Fbs
                Age
Age
           1.000000 -0.082313
                              -0.167917 0.273692 0.144322 0.112548
                               -0.162160 -0.003163 -0.145834
Sex
          -0.082313 1.000000
                                                             0.070901
ChestPain -0.167917 -0.162160
                              1.000000 -0.149945 0.020044 -0.021731
RestBP
           0.273692 - 0.003163 - 0.149945 1.000000 0.100947 0.129918
Chol
           0.144322 -0.145834
                                0.020044 0.100947 1.000000 -0.024842
Fbs
           0.112548 0.070901
                               -0.021731
                                         0.129918 -0.024842 1.000000
RestECG
           0.127263 0.034258
                              -0.159273 0.143882 0.115783 0.073069
MaxHR
          -0.399756 -0.046418
                                0.260866 -0.031096 0.002969 -0.010502
ExAng
           0.080525 0.179089
                               -0.324184 -0.021488 0.049062
                                                             0.024584
                              -0.327163 0.142862 -0.020917 0.021831
Oldpeak
           0.200569 0.167998
```

0.142068	0.070904	-0.225903	0.048212	-0.054274	0.096725
0.376330	0.096271	-0.213618	0.052188	0.084114	0.108020
0.063050	0.252077	-0.164349	-0.013388	0.076371	-0.061952
0.197965	0.316289	-0.367801	0.092991	0.092157	0.027863
D 1566	M UD	. .	07.1	61	•
Restect	Махнк	EXANG	отареак	Stope	Ca
0.127263	-0.399756	0.080525	0.200569	0.142068	0.376330
0.034258	-0.046418	0.179089	0.167998	0.070904	0.096271
-0.159273	0.260866	-0.324184	-0.327163	-0.225903	-0.213618
0.143882	-0.031096	-0.021488	0.142862	0.048212	0.052188
0.115783	0.002969	0.049062	-0.020917	-0.054274	0.084114
0.073069	-0.010502	0.024584	0.021831	0.096725	0.108020
1.000000	-0.107348	0.103136	0.101184	0.134971	0.077498
-0.107348	1.000000	-0.411041	-0.333459	-0.369553	-0.241072
0.103136	-0.411041	1.000000	0.347531	0.275077	0.182204
0.101184	-0.333459	0.347531	1.000000	0.527522	0.276203
0.134971	-0.369553	0.275077	0.527522	1.000000	0.051044
0.077498	-0.241072	0.182204	0.276203	0.051044	1.000000
-0.048357	-0.144927	0.253427	0.179483	0.084955	0.123461
0.159887	-0.393276	0.432982	0.433068	0.316661	0.450196
Thal 0.063050 0.252077 -0.164349 -0.013388 0.076371 -0.061952 -0.048357 -0.144927 0.253427	AHD 0.197965 0.316289 -0.367801 0.092991 0.092157 0.027863 0.159887 -0.393276 0.432982				
	0.376330 0.063050 0.197965 RestECG 0.127263 0.034258 -0.159273 0.143882 0.115783 0.073069 1.000000 -0.107348 0.103136 0.101184 0.134971 0.077498 -0.048357 0.159887 Thal 0.063050 0.252077 -0.164349 -0.013388 0.076371 -0.061952 -0.048357	0.376330 0.096271 0.063050 0.252077 0.197965 0.316289 RestECG MaxHR 0.127263 -0.399756 0.034258 -0.046418 -0.159273 0.260866 0.143882 -0.031096 0.115783 0.002969 0.073069 -0.010502 1.000000 -0.107348 -0.107348 1.000000 0.103136 -0.411041 0.101184 -0.3333459 0.134971 -0.369553 0.077498 -0.241072 -0.048357 -0.144927 0.159887 -0.393276 That AHD 0.063050 0.197965 0.252077 0.316289 -0.164349 -0.367801 -0.013388 0.092991 0.076371 0.092157 -0.061952 0.027863 -0.048357 -0.159887 -0.144927 -0.393276	0.376330 0.096271 -0.213618 0.063050 0.252077 -0.164349 0.197965 0.316289 -0.367801 RestECG MaxHR ExAng 0.127263 -0.399756 0.080525 0.034258 -0.046418 0.179089 -0.159273 0.260866 -0.324184 0.143882 -0.031096 -0.021488 0.115783 0.002969 0.049062 0.073069 -0.010502 0.024584 1.000000 -0.107348 0.103136 -0.107348 1.000000 -0.411041 0.103136 -0.411041 1.000000 0.101184 -0.333459 0.347531 0.134971 -0.369553 0.275077 0.077498 -0.241072 0.182204 -0.048357 -0.144927 0.253427 0.159887 -0.393276 0.432982 That AHD 0.063050 0.197965 0.252077 0.316289 -0.164349 -0.367801 -0.013388 0.092991 0.076371 0.092157 -0.061952 0.027863 -0.048357 -0.159887 -0.144927 -0.393276	0.376330	0.376330 0.096271 -0.213618 0.052188 0.084114 0.063050 0.252077 -0.164349 -0.013388 0.076371 0.197965 0.316289 -0.367801 0.092991 0.092157 RestECG MaxHR ExAng Oldpeak Slope 0.127263 -0.399756 0.080525 0.200569 0.142068 0.034258 -0.046418 0.179089 0.167998 0.070904 -0.159273 0.260866 -0.324184 -0.327163 -0.225903 0.143882 -0.031096 -0.021488 0.142862 0.048212 0.115783 0.002969 0.049062 -0.020917 -0.054274 0.073069 -0.010502 0.024584 0.021831 0.096725 1.000000 -0.107348 0.103136 0.101184 0.134971 -0.107348 1.000000 -0.411041 -0.333459 -0.369553 0.103136 -0.411041 1.000000 0.347531 0.275077 0.101184 -0.333459 0.347531 1.000000 0.527522 0.134971 -0.369553 0.275077 0.527522 1.000000 0.077498 -0.241072 0.182204 0.276203 0.051044 -0.048357 -0.144927 0.253427 0.179483 0.084955 0.159887 -0.393276 0.432982 0.433068 0.316661

Oldpeak Slope Ca Thal AHD	0. 0. 1.	179483 084955 123461 000000 386752	0.433 0.316 0.450 0.386 1.000	661 196 752					
data									
Age		Chest	Pain	RestBP	Chol	Fbs	RestECG	MaxHR	ExAng
Oldpeak 0 63	\ 3 1		0	145.0	233.0	1	2	150.0	0
2.3			1	120.0	229.0		2	129.0	
2 6	7 1		1	120.0	229.0	0	Z	129.0	1
3 3° 3.5	7 1		2	130.0	250.0	0	0	187.0	0
4 4:	1 6		3	130.0	204.0	0	2	172.0	0
1.4 5 50	5 1		3	120.0	236.0	0	0	178.0	0
0.8	_			12010	230.0	J		270.0	·
298 4	5 1		0	110.0	264.0	0	0	132.0	0
1.2 299 68	3 1		1	144.0	193.0	1	0	141.0	0
3.4 300 5	7 1		1	130.0	131.0	0	Θ	115.0	1
1.2									
301 51 0.0	7 O		3	130.0	236.0	0	2	174.0	0
302 38	3 1		2	138.0	175.0	0	0	173.0	0
0.0									
510 0 2 3 4 5 298 299 300 301 302	2 2 3 6 1 6 1 6 2 6 2 2 2 1 2 1	Ca 0.000000 0.000000 0.000000 0.000000 0.000000	Thal 0.0 2.0 1.0 1.0 2.0 2.0 2.0 1.0 1.0	1 0 0 0 1 1 1					

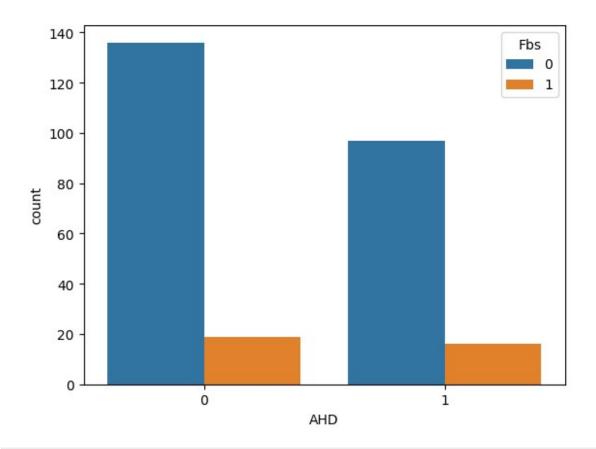
[268 rows x 14 columns]

sb.scatterplot(data=data, x='Age', y='Chol', hue="AHD",palette="deep")
<Axes: xlabel='Age', ylabel='Chol'>



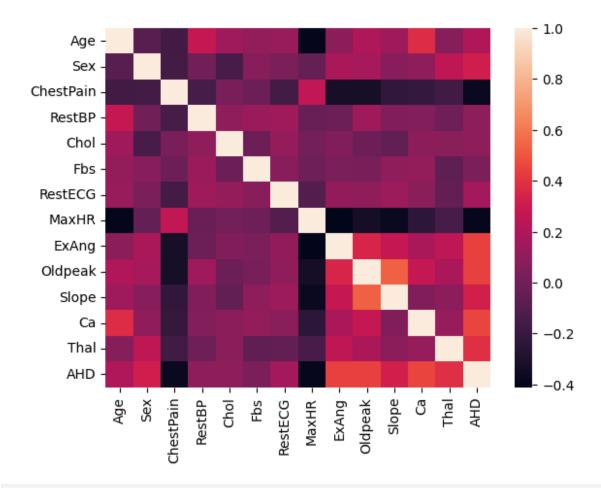
sb.countplot(data=data,x="AHD",hue="Fbs")

<Axes: xlabel='AHD', ylabel='count'>

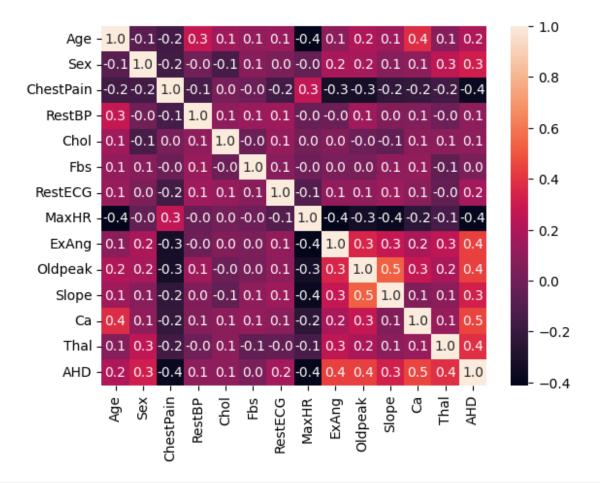


c = data.corr()
sb.heatmap(c)

<Axes: >



sb.heatmap(c, annot = True, fmt = '0.1f')
<Axes: >



data.corr(()					
\	Age	Sex	ChestPain	RestBP	Chol	Fbs
\ Age	1.000000	-0.082313	-0.167917	0.273692	0.144322	0.112548
Sex	-0.082313	1.000000	-0.162160	-0.003163	-0.145834	0.070901
ChestPain	-0.167917	-0.162160	1.000000	-0.149945	0.020044	-0.021731
RestBP	0.273692	-0.003163	-0.149945	1.000000	0.100947	0.129918
Chol	0.144322	-0.145834	0.020044	0.100947	1.000000	-0.024842
Fbs	0.112548	0.070901	-0.021731	0.129918	-0.024842	1.000000
RestECG	0.127263	0.034258	-0.159273	0.143882	0.115783	0.073069
MaxHR	-0.399756	-0.046418	0.260866	-0.031096	0.002969	-0.010502
ExAng	0.080525	0.179089	-0.324184	-0.021488	0.049062	0.024584
Oldpeak	0.200569	0.167998	-0.327163	0.142862	-0.020917	0.021831

0.142068	0.070904	-0.225903	0.048212	-0.054274	0.096725
0.376330	0.096271	-0.213618	0.052188	0.084114	0.108020
0.063050	0.252077	-0.164349	-0.013388	0.076371	-0.061952
0.197965	0.316289	-0.367801	0.092991	0.092157	0.027863
D 1500	M 115	. .	07.1	61	•
Restect	Махнк	EXANG	отареак	Stope	Ca
0.127263	-0.399756	0.080525	0.200569	0.142068	0.376330
0.034258	-0.046418	0.179089	0.167998	0.070904	0.096271
-0.159273	0.260866	-0.324184	-0.327163	-0.225903	-0.213618
0.143882	-0.031096	-0.021488	0.142862	0.048212	0.052188
0.115783	0.002969	0.049062	-0.020917	-0.054274	0.084114
0.073069	-0.010502	0.024584	0.021831	0.096725	0.108020
1.000000	-0.107348	0.103136	0.101184	0.134971	0.077498
-0.107348	1.000000	-0.411041	-0.333459	-0.369553	-0.241072
0.103136	-0.411041	1.000000	0.347531	0.275077	0.182204
0.101184	-0.333459	0.347531	1.000000	0.527522	0.276203
0.134971	-0.369553	0.275077	0.527522	1.000000	0.051044
0.077498	-0.241072	0.182204	0.276203	0.051044	1.000000
-0.048357	-0.144927	0.253427	0.179483	0.084955	0.123461
0.159887	-0.393276	0.432982	0.433068	0.316661	0.450196
-0.013388 0.076371 -0.061952 -0.048357 -0.144927	AHD 0.197965 0.316289 -0.367801 0.092991 0.092157 0.027863 0.159887 -0.393276				
	0.376330 0.063050 0.197965 RestECG 0.127263 0.034258 -0.159273 0.143882 0.115783 0.073069 1.000000 -0.107348 0.103136 0.101184 0.134971 0.077498 -0.048357 0.159887 Thal 0.063050 0.252077 -0.164349 -0.013388 0.076371 -0.061952 -0.048357	0.376330 0.096271 0.063050 0.252077 0.197965 0.316289 RestECG MaxHR 0.127263 -0.399756 0.034258 -0.046418 -0.159273 0.260866 0.143882 -0.031096 0.115783 0.002969 0.073069 -0.010502 1.000000 -0.107348 -0.107348 1.000000 0.103136 -0.411041 0.101184 -0.3333459 0.134971 -0.369553 0.077498 -0.241072 -0.048357 -0.144927 0.159887 -0.393276 That AHD 0.063050 0.197965 0.252077 0.316289 -0.164349 -0.367801 -0.013388 0.092991 0.076371 0.092157 -0.061952 0.027863 -0.048357 -0.159887 -0.144927 -0.393276	0.376330 0.096271 -0.213618 0.063050 0.252077 -0.164349 0.197965 0.316289 -0.367801 RestECG MaxHR ExAng 0.127263 -0.399756 0.080525 0.034258 -0.046418 0.179089 -0.159273 0.260866 -0.324184 0.143882 -0.031096 -0.021488 0.115783 0.002969 0.049062 0.073069 -0.010502 0.024584 1.000000 -0.107348 0.103136 -0.107348 1.000000 -0.411041 0.103136 -0.411041 1.000000 0.101184 -0.333459 0.347531 0.134971 -0.369553 0.275077 0.077498 -0.241072 0.182204 -0.048357 -0.144927 0.253427 0.159887 -0.393276 0.432982 That AHD 0.063050 0.197965 0.252077 0.316289 -0.164349 -0.367801 -0.013388 0.092991 0.076371 0.092157 -0.061952 0.027863 -0.048357 -0.159887 -0.144927 -0.393276	0.376330	0.376330 0.096271 -0.213618 0.052188 0.084114 0.063050 0.252077 -0.164349 -0.013388 0.076371 0.197965 0.316289 -0.367801 0.092991 0.092157 RestECG MaxHR ExAng Oldpeak Slope 0.127263 -0.399756 0.080525 0.200569 0.142068 0.034258 -0.046418 0.179089 0.167998 0.070904 -0.159273 0.260866 -0.324184 -0.327163 -0.225903 0.143882 -0.031096 -0.021488 0.142862 0.048212 0.115783 0.002969 0.049062 -0.020917 -0.054274 0.073069 -0.010502 0.024584 0.021831 0.096725 1.000000 -0.107348 0.103136 0.101184 0.134971 -0.107348 1.000000 -0.411041 -0.333459 -0.369553 0.103136 -0.411041 1.000000 0.347531 0.275077 0.101184 -0.333459 0.347531 1.000000 0.527522 0.134971 -0.369553 0.275077 0.527522 1.000000 0.077498 -0.241072 0.182204 0.276203 0.051044 -0.048357 -0.144927 0.253427 0.179483 0.084955 0.159887 -0.393276 0.432982 0.433068 0.316661

```
Oldpeak
           0.179483
                     0.433068
Slope
                     0.316661
           0.084955
Ca
           0.123461
                     0.450196
           1.000000
                     0.386752
Thal
AHD
           0.386752
                     1.000000
data=data.drop("Fbs",axis=1)
X = data.iloc[:,0:11]
Χ
     Age Sex ChestPain RestBP Chol
                                         RestECG
                                                  MaxHR ExAng
Oldpeak \
                           145.0 233.0
0
      63 1
                       0
                                               2
                                                  150.0
                                                             0
2.3
2
      67
            1
                       1
                           120.0 229.0
                                                  129.0
                                                             1
2.6
3
      37
            1
                       2
                           130.0 250.0
                                                  187.0
                                                             0
3.5
      41
            0
                           130.0 204.0
                                                 172.0
                                                             0
4
1.4
5
      56
                           120.0 236.0
                                                  178.0
         1
0.8
. .
298
      45
                           110.0
                                 264.0
                                                  132.0
                                                             0
1.2
299
      68
                       1
                           144.0
                                 193.0
                                                  141.0
            1
3.4
300
      57
                       1
                           130.0
                                 131.0
                                               0 115.0
                                                             1
            1
1.2
301
      57
            0
                       3
                           130.0 236.0
                                               2 174.0
                                                             0
0.0
302
      38
                       2
                           138.0 175.0
                                               0 173.0
0.0
     Slope
                  Ca
            0.000000
0
         3
2
         2
            2.000000
3
         3
            0.000000
4
         1
            0.000000
5
         1
            0.000000
298
         2
            0.000000
            2.000000
299
         2
         2
            1.000000
300
         2
            1.000000
301
            0.672241
302
```

```
[268 rows x 11 columns]
Y = data["AHD"].values
Υ
array([0, 1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1,
       1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1,
0,
       1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1,
0,
       1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
1,
       1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 0, 0,
1,
       1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1,
0,
       1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0,
1,
       0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0,
0,
       1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0,
1,
       1, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 1, 0,
0,
       0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 1,
0,
       0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 1,
1,
       1, 1, 1, 0])
X_{train}, X_{test}, Y_{train}, Y_{test} = tts(X,Y)
X_train
     Age Sex ChestPain RestBP
                                    Chol
                                          RestECG
                                                   MaxHR ExAng
Oldpeak \
297
                           140.0
                                  241.0
                                                   123.0
      57
0.2
                           170.0
68
      59
                       1
                                  326.0
                                                2
                                                   140.0
                                                              1
            1
3.4
143
      64
                       2
                           125.0
                                  309.0
                                                   131.0
            1
                                                              1
1.8
299
      68
                           144.0
                                  193.0
                                                   141.0
3.4
264
      61
            1
                           138.0
                                  166.0
                                                2
                                                   125.0
                                                              1
3.6
. .
```

200								
208	55	1	3	130.0	262.0	0	155.0	0
216	46	0	3	105.0	204.0	0	172.0	0
0.0 292	44	1	1	120.0	169.0	0	144.0	1
2.8 128	44	1	3	120.0	220.0	Θ	170.0	Θ
0.0								
207 0.9	50	1	1	144.0	200.0	2	126.0	1
	Slope	Ca						
297 68 143 299 264	2 3 2 2 2	0.0 0.0 0.0 2.0 1.0						
208 216 292 128 207	1 1 3 1 2	0.0 0.0 0.0 0.0						
[201	rows >	< 11 c	olumns]					
X_tes	st							
01 dpc	Age S	Sex C	hestPain	RestBP	Chol	RestECG	MaxHR	ExAng
144		Sex C	hestPain 2	RestBP	Chol 240.0	RestECG 2	MaxHR	ExAng
144 0.6 256	Age S							
144 0.6 256 0.3	Age 5 eak \ 58 67	1 0	2	105.0 106.0	240.0	2	154.0 142.0	1
144 0.6 256 0.3 151 0.6	Age Seak \ 58 67 42	1 0 0	2 1 1	105.0 106.0 102.0	240.0 223.0 265.0	2 0 2	154.0 142.0 122.0	1 0 0
144 0.6 256 0.3 151 0.6 287 0.4	Age 5 eak \ 58 67 42 58	1 0	2 1 1 3	105.0 106.0 102.0 125.0	240.0	2 0 2 0	154.0 142.0 122.0 144.0	1 0 0
144 0.6 256 0.3 151 0.6 287 0.4 109	Age Seak \ 58 67 42	1 0 0	2 1 1	105.0 106.0 102.0 125.0	240.0 223.0 265.0	2 0 2	154.0 142.0 122.0	1 0 0
144 0.6 256 0.3 151 0.6 287 0.4 109	Age 5 eak \ 58 67 42 58	1 0 0	2 1 1 3	105.0 106.0 102.0 125.0	240.0 223.0 265.0 220.0	2 0 2 0	154.0 142.0 122.0 144.0	1 0 0
144 0.6 256 0.3 151 0.6 287 0.4 109 1.2 	Age 5 eak \ 58 67 42 58	1 0 0	2 1 1 3	105.0 106.0 102.0 125.0	240.0 223.0 265.0 220.0	2 0 2 0	154.0 142.0 122.0 144.0	1 0 0
144 0.6 256 0.3 151 0.6 287 0.4 109 1.2 7	Age 58 67 42 58 39	1 0 0 1 1	2 1 1 3 1 	105.0 106.0 102.0 125.0 118.0 	240.0 223.0 265.0 220.0 219.0 	2 0 2 0 0	154.0 142.0 122.0 144.0 140.0 	1 0 0 0
144 0.6 256 0.3 151 0.6 287 0.4 109 1.2 7 0.6 273 1.6	Age 5 eak 5 67 42 58 39 57	1 0 0 1 1 0	2 1 1 3 1 1	105.0 106.0 102.0 125.0 118.0 120.0	240.0 223.0 265.0 220.0 219.0 354.0 149.0	2 0 2 0 0	154.0 142.0 122.0 144.0 140.0 163.0 125.0	1 0 0 0 1
144 0.6 256 0.3 151 0.6 287 0.4 109 1.2 7 0.6 273 1.6 210	Age 58 67 42 58 39	1 0 0 1 1	2 1 1 3 1 	105.0 106.0 102.0 125.0 118.0 	240.0 223.0 265.0 220.0 219.0 	2 0 2 0 0	154.0 142.0 122.0 144.0 140.0 	1 0 0 0 1 0
144 0.6 256 0.3 151 0.6 287 0.4 109 1.2	Age 5 eak 5 67 42 58 39 57	1 0 0 1 1 0	2 1 1 3 1 1	105.0 106.0 102.0 125.0 118.0 120.0 112.0 120.0	240.0 223.0 265.0 220.0 219.0 354.0 149.0	2 0 2 0 0	154.0 142.0 122.0 144.0 140.0 163.0 125.0 170.0	1 0 0 0 1

```
112
      52
            1
                       0
                           118.0 186.0
                                               2 190.0
0.0
     Slope
                  Ca
            0.000000
144
256
         1
            2.000000
151
         2
            0.000000
287
         2
            0.672241
            0.000000
109
7
         1
            0.000000
273
            0.000000
         2
210
         1
            0.000000
47
         2
            0.000000
112
         2
            0.000000
[67 rows x 11 columns]
Y train
array([1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0,
       0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 1, 0, 0,
0,
       0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1,
1,
       0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0,
0,
       0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 0, 0,
1,
       1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1,
1,
       0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0,
0,
       1, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1,
1,
       0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0, 0,
0,
       1, 0, 1])
Y test
array([0, 0, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0,
       1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0,
0,
       1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0,
1,
       0])
lrm = LogisticRegression(max iter=1000).fit(X train,Y train)
```

```
Y_pred = lrm.predict(X_test)
metrics.confusion_matrix(Y_test,Y_pred)
array([[34, 5],
       [ 8, 20]])
metrics.accuracy_score(Y_test,Y_pred)
0.8059701492537313
metrics.recall_score(Y_test,Y_pred)
0.7142857142857143
metrics.precision_score(Y_test,Y_pred)
0.8
df1 = pd.DataFrame({
    "Age":[63],
    "Sex":[1],
    "ChestPain":[1],
    "RestBP":[145],
    "RestECG":[2],
    "MaxHR":[150],
    "ExAng":[0],
    "Oldpeak": [2.3],
    "Slope":[3],
    "Ca":[0.0],
    "Thal":[1]
})
```