```
import numpy as np
             import seaborn as sns
             import matplotlib.pyplot as plt
             import math
             df = pd.read csv("G://Heart2.csv")
In [111...
             df.head(5)
                                         RestBP
                                                  Chol Fbs
                                                              RestECG
                                                                        MaxHR
                                                                                          Oldpeak
Out[111...
                     Sex
                              ChestPain
                                                                                 ExAng
                                                                                                    Slope
                                                                                                           Ca
               Age
            0
                 63
                                             145
                                                   233
                                                           1
                                                                     2
                                                                            150
                                                                                      0
                                                                                               2.3
                                                                                                             0
                        1
                                                                                                        3
                                 typical
            1
                 67
                           asymptomatic
                                             160
                                                   286
                                                           0
                                                                     2
                                                                            108
                                                                                      1
                                                                                               1.5
                                                                                                        2
                                                                                                             3
                                                   229
                                                           0
                                                                     2
                                                                            129
                                                                                       1
                                                                                               2.6
            2
                 67
                           asymptomatic
                                             120
                                                                                                        2
                                                                                                             2
                        1
                                                                                                                reve
                                                   250
                                                                     0
                                                                            187
                                                                                                        3
            3
                 37
                                             130
                                                           0
                                                                                      0
                                                                                               3.5
                                                                                                             0
                             nonanginal
            4
                 41
                       0
                                             130
                                                   204
                                                           0
                                                                     2
                                                                            172
                                                                                      0
                                                                                               1.4
                                                                                                        1
                                                                                                             0
                              nontypical
             df.head(14)
In [112...
                               ChestPain
                                           RestBP
Out[112...
                                                   Chol
                                                          Fbs
                                                               RestECG
                                                                         MaxHR
                                                                                   ExAng
                                                                                           Oldpeak Slope Ca
                      Sex
                Age
                  63
                                              145
                                                     233
                                                                      2
                                                                             150
                                                                                                2.3
                                                                                                              0
             0
                         1
                                                            1
                                                                                        0
                                                                                                          3
                                   typical
                                                                      2
             1
                  67
                            asymptomatic
                                              160
                                                     286
                                                            0
                                                                             108
                                                                                        1
                                                                                                 1.5
                                                                                                          2
                                                                                                              3
                                              120
                                                                      2
                                                                                        1
             2
                  67
                            asymptomatic
                                                     229
                                                            0
                                                                             129
                                                                                                2.6
                                                                                                          2
                                                                                                              2
                         1
                                                                                                                 re
             3
                  37
                                              130
                                                     250
                                                            0
                                                                      0
                                                                             187
                                                                                        0
                                                                                                 3.5
                                                                                                          3
                                                                                                              0
                         1
                               nonanginal
             4
                  41
                         0
                               nontypical
                                              130
                                                     204
                                                            0
                                                                      2
                                                                             172
                                                                                        0
                                                                                                 1.4
                                                                                                          1
                                                                                                              0
             5
                  56
                                              120
                                                     236
                                                            0
                                                                      0
                                                                             178
                                                                                        0
                                                                                                8.0
                                                                                                              0
                         1
                               nontypical
                                                                                                          1
             6
                  62
                         0
                            asymptomatic
                                              140
                                                     268
                                                            0
                                                                      2
                                                                             160
                                                                                        0
                                                                                                3.6
                                                                                                          3
                                                                                                              2
             7
                  57
                                              120
                                                                      0
                                                     354
                                                            0
                                                                             163
                                                                                        1
                                                                                                0.6
                                                                                                          1
                                                                                                              0
                            asymptomatic
                                                                      2
             8
                  63
                                              130
                                                     254
                                                            0
                                                                             147
                                                                                        0
                                                                                                 1.4
                                                                                                          2
                                                                                                              1
                            asymptomatic
                                                                                                                 re
             9
                  53
                            asymptomatic
                                              140
                                                     203
                                                            1
                                                                      2
                                                                             155
                                                                                        1
                                                                                                 3.1
                                                                                                          3
                                                                                                              0
                                                                                                                 re
                                                                      0
                                                                                                              0
            10
                  57
                                              140
                                                     192
                                                            0
                                                                             148
                                                                                        0
                                                                                                0.4
                                                                                                          2
                         1
                            asymptomatic
                                              140
                                                     294
                                                                      2
                                                                                                 1.3
            11
                  56
                         0
                               nontypical
                                                            0
                                                                             153
                                                                                        0
                                                                                                          2
                                                                                                              0
                         1
                                                            1
                                                                      2
                                                                                        1
                                                                                                          2
            12
                  56
                               nonanginal
                                              130
                                                     256
                                                                             142
                                                                                                0.6
                                                                                                              1
                                                                                        0
                         1
                                              120
                                                                      0
                                                                             173
                                                                                                0.0
            13
                  44
                               nontypical
                                                     263
                                                            0
                                                                                                              0
                                                                                                                 re
             df['Thal'] = pd.factorize(df['Thal'])[0].astype(np.int)
In [113...
             df.head()
Out[113...
               Age
                     Sex
                              ChestPain
                                         RestBP
                                                  Chol
                                                        Fbs
                                                              RestECG MaxHR
                                                                                 ExAng
                                                                                          Oldpeak
                                                                                                    Slope
                                                                                                           Ca
                                                                                                                Tha
                                                                     2
                                                                                                             0
            0
                 63
                       1
                                 typical
                                             145
                                                   233
                                                           1
                                                                            150
                                                                                      0
                                                                                               2.3
                                                                                                        3
                                                   286
                                                           0
                                                                     2
                                                                            108
                                                                                      1
            1
                 67
                           asymptomatic
                                             160
                                                                                               1.5
                                                                                                        2
                                                                                                             3
```

import pandas as pd

In [110...

asymptomatic

2.6

2 2

```
ChestPain RestBP Chol Fbs RestECG MaxHR ExAng Oldpeak Slope Ca Tha
                Age Sex
             3
                  37
                               nonanginal
                                               130
                                                      250
                                                              0
                                                                        0
                                                                                187
                                                                                           0
                                                                                                    3.5
                                                                                                             3
                                                                                                                  0
             4
                  41
                         0
                                nontypical
                                               130
                                                      204
                                                              0
                                                                        2
                                                                                172
                                                                                           0
                                                                                                    1.4
                                                                                                             1
                                                                                                                  0
In [114...
              df['ChestPain'] = pd.factorize(df['ChestPain'])[0].astype(np.int)
              df['AHD'] = pd.factorize(df['AHD'])[0].astype(np.int)
             df.head()
In [115...
                                        RestBP
Out[115...
                            ChestPain
                                                 Chol Fbs
                                                             RestECG MaxHR ExAng
                                                                                           Oldpeak Slope
                                                                                                             Ca Thal
                Age
                     Sex
             0
                  63
                         1
                                     0
                                            145
                                                   233
                                                          1
                                                                     2
                                                                            150
                                                                                       0
                                                                                                2.3
                                                                                                          3
                                                                                                              0
                                                                                                                     0
                                                                     2
                                                                            108
             1
                  67
                                            160
                                                   286
                                                          0
                                                                                       1
                                                                                                1.5
                                                                                                          2
                                                                                                                     1
                                                                     2
                                                                                                          2
                                                                                                               2
                                                                                                                     2
             2
                  67
                         1
                                     1
                                            120
                                                  229
                                                          0
                                                                            129
                                                                                       1
                                                                                                2.6
                                     2
                                                                     0
                                                                                       0
             3
                  37
                         1
                                            130
                                                  250
                                                          0
                                                                            187
                                                                                                3.5
                                                                                                          3
                                                                                                              0
                                                                                                                     1
             4
                  41
                         0
                                     3
                                            130
                                                  204
                                                          0
                                                                     2
                                                                            172
                                                                                       0
                                                                                                1.4
                                                                                                          1
                                                                                                              0
                                                                                                                     1
              cols = ['Age','Sex','ChestPain','RestBP','Chol','Fbs','RestECG','MaxHR','ExAr
In [116...
In [117...
             import numpy as np
              cm = np.corrcoef(df[cols].values.T)
              hm = sns.heatmap(cm,
                                     cbar=True,
                                     annot=True,
                                     square=True,
                                     fmt='.2f',
                                     annot kws={'size': 10},
                                     yticklabels=cols,
                                     xticklabels=cols)
              plt.show()
                                                                   - 1.0
                  Age 1.00.1-0.60330.18.10.4-0.7036.00.10.6-0.05.
                  Sex 4.1 L00.20.040.444.330.140.241.40.04.2 D.09.06.2
                                                                   - 0.8
             ChestPain -0.63.2 L00.40.00.36.20.50.34.39.58.3614.4
                                                                   - 0.6
                RestBP + 35.040.4 L00.003.24.48.565.05.20.54.40.34.2
                  Chol -0.18.48.040.01.000.247.140.00.240.240.2418.040.0
                                                                   - 0.4
                  Fbs -0.10.3-20.305.2-40.2 L000.3-20.105.3-40.16.4-50.107.3-0.2
                                                                   - 0.2
              RestECG 4.45.14.20.48.14.31.00.50.24.39.39.49.00.65
                MaxHR -0.79.24.52.56.07.18.51.00.58.04.16.75.09.6
                                                                   - 0.0
                        .36.14.34.05.26.34.2<mark>4.5</mark>1.00.02.00.48.14.
                ExAng
              Oldpeak - 0.04.04.39.270.2016.39.04.0 L00.80.26.19.3
                                                                   - -0.2
                 Slope 4.18.240.58540.29446.340.16.00.81.00.149.18.3
                                                                    -0.4
                   Ca 9.69.09.3640 18.17.49.75.48 26 11.00.14.76
                  That -0.05.06.14.39.04.30.08.05.14.19.16.14.00.3
                                                                    -0.6
                        56.2-20.402.2-70.005.2-9.6-50.64.5-6.30.3-0.7-0.3-1.00
                                       RestECG
                                                Oldpeak
                               RestBP
Chol
                                             ExAng
                                                   Sope
Ca
Thal
AHD
                             ChestPain
                       & &
```

df.drop(['ChestPain', 'MaxHR'],axis=1,inplace=True)

In [118...

```
In [119... df.head()
Out[119...
             Age Sex RestBP Chol Fbs RestECG ExAng Oldpeak Slope Ca Thal AHD
          0
                                               2
                                                      0
                                                             2.3
                                                                              0
                                                                                    0
              63
                    1
                          145
                                233
                                      1
                                                                     3
                                                                         0
              67
                                               2
                                                             1.5
                                                                     2
          1
                          160
                                286
                                      0
                                                                         3
                                                                                    1
                                               2
                                                      1
                                                                                    1
          2
              67
                    1
                          120
                               229
                                      0
                                                             2.6
                                                                     2
                                                                         2
                                                                              2
          3
               37
                          130
                                250
                                      0
                                               0
                                                      0
                                                             3.5
                                                                     3
                                                                         0
                                                                                    0
                                               2
                                                      0
                                                                                    0
                    0
                          130
                               204
                                      0
                                                             1.4
                                                                     1
                                                                         0
                                                                              1
          4
               41
In [152...
           def inf(p,n):
                diff = -p/14
                diff1 = -n/14
                ans = diff*(math.log(-1*diff)) + diff1*(math.log(diff1*-1))
                return ans
          df['AHD'].value counts()
In [153...
                8
Out[153...
          Name: AHD, dtype: int64
           inf(8,6)
In [154...
Out[154... 0.6829081047004717
In [124...
           df.head()
Out[124...
             Sex Fbs ExAng Slope Ca Thal AHD
          0
               1
                           0
                                     0
                                          0
                                                0
                    1
                                 3
          1
                    0
                                 2
                                     3
          2
               1
                    0
                           1
                                 2
                                     2
                                          2
                                                1
          3
               1
                    0
                           0
                                 3
                                     0
                                          1
                                                0
          4
               0
                    0
                           0
                                 1
                                     0
                                          1
                                                0
           df1 = df[(df['Sex'] == 1) & (df['AHD'] == 1)]
In [125...
           df1['AHD'].value_counts()
Out[125... 1
          Name: AHD, dtype: int64
           df1 = df[(df['Sex'] == 1) & (df['AHD'] == 0)]
In [126...
           df1['AHD'].value_counts()
                5
Out[126...
          Name: AHD, dtype: int64
           df['Slope'] = [0 if x == 1 else 1 if x == 2 else 2 for x in <math>df['Slope']]
In [147...
           df.head()
Out[147...
             Sex Fbs ExAng Slope Ca Thal AHD
          0
               1
                    1
                           0
                                 1
                                     0
                                          0
                                                0
               1
                    0
                                 0
                                     3
          1
```

```
Sex Fbs ExAng Slope Ca Thal AHD
           2
                                            2
                    0
                                  0
                                      2
                                                  1
           3
                    0
                            0
                                      0
                                                  0
                0
                    0
                            0
                                  2
                                            1
                                                  0
           4
                                      0
           def info col(col name,n):
In [181...
                l = []
                for i in range(0,n):
                     df1 = df[(df[col name] == i) & (df['AHD'] == 1)]
                     if df1.empty:
                          l.append(0)
                     else:
                         l.append(int(df1['AHD'].value counts()))
                     df1 = df[(df[col name] == i) & (df['AHD'] == 0)]
                     if df1.empty:
                          l.append(0)
                     else :
                          l.append(int(df1['AHD'].value counts()))
                j = 0
                s = 0
                while j < len(l):</pre>
                     if l[j]>0 and l[j+1]>0:
                         s = s + ((\lfloor j \rfloor + \lfloor j + 1 \rfloor)/14) * \inf(\inf(\lfloor j \rfloor), \inf(\lfloor j + 1 \rfloor))
                     j += 2
                return s
In [187...
           info col('Sex',2)
Out[187... 0.673487303713993
           info col('Fbs',2)
In [188...
Out[188... 0.6535027367351511
           info col('ExAng',2)
In [185...
```

Out[185... 0.5966591891645707

Out[182... 0.5709878794955071

Out[184... 0.3267543504994274

Out[186... 0.4313867113134571

In [182...

In [184...

In [186...

In []:

info_col('Thal',3)

info_col('Ca',4)

info_col('Slope',3)