In [1]:
```
import numpy as np
import pandas as pd
import csv
from pgmpy.estimators import MaximumLikelihoodEstimator
from pgmpy.models import BayesianModel
from pgmpy.inference import VariableElimination



#read Cleveland Heart Disease data
heartDisease = pd.read_csv('heart.csv')
heartDisease = heartDisease.replace('?',np.nan)

#display the data
print('Sample instances from the dataset are given below')
print(heartDisease.head())

#display the Attributes names and datatyes
print('\n Attributes and datatypes')
print(heartDisease.dtypes)

#Creat Model- Bayesian Network

model=BayesianModel([('age','heartdisease'),('sex','heartdisease'),('exang','heartdisease'),
('cp','heartdisease'),('heartdisease','restecg'),('heartdisease','chol')])


#Learning CPDs using Maximum Likelihood Estimators
print('\n Learning CPD using Maximum likelihood estimators')
model.fit(heartDisease,estimator=MaximumLikelihoodEstimator)

# Inferencing with Bayesian Network
print('\n Inferencing with Bayesian Network:')

HeartDiseasetest_infer = VariableElimination(model)


#computing the Probability of HeartDisease given restecg
print('\n 1.Probability of HeartDisease given evidence=restecg :1')
q1=HeartDiseasetest_infer.query(variables=['heartdisease'],evidence={'restecg':1})
print(q1)


#computing the Probability of HeartDisease given cp
print('\n 2.Probability of HeartDisease given evidence= cp:2 ')
q2=HeartDiseasetest_infer.query(variables=['heartdisease'],evidence={'cp':2})
print(q2)
```

```
Sample instances from the dataset are given below
   age  sex  cp  trestbps  chol  fbs  restecg  thalach  exang  oldpeak  slope  \
0   63    1   1       145   233    1        2      150      0      2.3      3
1   67    1   4       160   286    0        2      108      1      1.5      2
2   67    1   4       120   229    0        2      129      1      2.6      2
3   37    1   3       130   250    0        0      187      0      3.5      3
4   41    0   2       130   204    0        2      172      0      1.4      1

  ca thal  heartdisease
0  0    6             0
1  3    3             2
2  2    7             1
3  0    3             0
4  0    3             0

 Attributes and datatypes
age             int64
sex             int64
cp              int64
trestbps        int64
chol            int64
fbs             int64
restecg         int64
thalach         int64
exang           int64
oldpeak       float64
slope           int64
ca             object
thal           object
heartdisease    int64
dtype: object

 Learning CPD using Maximum likelihood estimators

 Inferencing with Bayesian Network:

 1.Probability of HeartDisease given evidence=restecg :1
Finding Elimination Order: : 100%|██████████| 5/5 [00:00<00:00, 429.89it/s]
Eliminating: exang: 100%|██████████| 5/5 [00:00<00:00, 61.14it/s]
+----------------+--------------------+
| heartdisease   |   phi(heartdisease) |
+================+====================+
| heartdisease(0) |             0.1012 |
+----------------+--------------------+
| heartdisease(1) |             0.0000 |
+----------------+--------------------+
| heartdisease(2) |             0.2392 |
+----------------+--------------------+
| heartdisease(3) |             0.2015 |
+----------------+--------------------+
| heartdisease(4) |             0.4581 |
+----------------+--------------------+

 2.Probability of HeartDisease given evidence= cp:2
Finding Elimination Order: : 100%|██████████| 5/5 [00:00<00:00, 1002.46it/s]
Eliminating: exang: 100%|██████████| 5/5 [00:00<00:00, 143.18it/s]
+----------------+--------------------+
| heartdisease   |   phi(heartdisease) |
+================+====================+
| heartdisease(0) |             0.3610 |
+----------------+--------------------+
| heartdisease(1) |             0.2159 |
+----------------+--------------------+
| heartdisease(2) |             0.1373 |
+----------------+--------------------+
| heartdisease(3) |             0.1537 |
+----------------+--------------------+
| heartdisease(4) |             0.1321 |
+----------------+--------------------+
```

In [ ]: