

Practical no: 4

Aim: Write a program to construct a Bayesian network for the given data

Input

```
import numpy as np

import csv

import pandas as pd

from pgmpy.models import BayesianModel

from pgmpy.estimators import MaximumLikelihoodEstimator

from pgmpy.inference import VariableElimination

#read Cleveland Heart Disease data

heartDisease = pd.read_csv('/content/sample_data/dataset.csv')

heartDisease = heartDisease.replace('?',np.nan)

# print(heartDisease.head)

# #Model Bayesian Network

model=BayesianModel([('age','trestbps'),('age','fbs'),

('sex','trestbps'),('exang','trestbps'),('trestbps','target'),('fbs','target'),('target','restecg'), ('target','thalach'

),('target','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:")

HeartDisease_infer = VariableElimination(model)

#computing the Probability of HeartDisease given Age

print("\n 1. Probability of HeartDisease given Age=37")

q=HeartDisease_infer.query(variables=['target'],evidence={'age':37})

print(q)
```

```
#computing the Probability of HeartDisease given tresbps

print('\n 2. Probability of HeartDisease given tresbps=145')

q=HeartDisease_infer.query(variables=['target'],evidence={'trestbps':145})

print(q)
```

Given Dataset

age	sex	cp	tresbps	chol	fbs	restceg	thalach	exang	Old peak	slope	ca	thal	target
63	1	1	145	233	1	2	150	0	23	3	0	6	0
67	1	4	160	286	0	2	108	1	1.5	2	3	3	2
67	1	4	120	229	0	2	129	1	2.6	2	2	7	1
41	0	2	130	204	0	2	172	0	1.4	1	0	3	0
62	0	4	140	268	0	2	160	0	3.6	3	2	3	3
60	1	4	130	206	0	2	132	1	2.4	2	2	7	4

Output

1. Probability of HeartDisease given Age=37

```
+-----+-----+
| target | phi(target) |
+=====+=====+
| target(0) | 0.3741 |
+-----+-----+
| target(1) | 0.6259 |
+-----+-----+
```

2. Probability of HeartDisease given tresbps=145

```
+-----+-----+
| target | phi(target) |
+=====+=====+
| target(0) | 0.8777 |
+-----+-----+
| target(1) | 0.1223 |
+-----+-----+
```