

```
pip install pgmpy
```

```
Collecting pgmpy
```

```
  Downloading pgmpy-0.1.16-py3-none-any.whl (1.9 MB)
```

```
    |████████████████████████████████████████| 1.9 MB 14.8 MB/s
```

```
Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages (from p
Requirement already satisfied: scipy in /usr/local/lib/python3.7/dist-packages (from pg
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from pg
Requirement already satisfied: torch in /usr/local/lib/python3.7/dist-packages (from pg
Requirement already satisfied: statsmodels in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages (from pgm
Requirement already satisfied: joblib in /usr/local/lib/python3.7/dist-packages (from p
Requirement already satisfied: networkx in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: pyparsing in /usr/local/lib/python3.7/dist-packages (fro
Requirement already satisfied: scikit-learn in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/dist-
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: patsy>=0.4.0 in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packa
Installing collected packages: pgmpy
Successfully installed pgmpy-0.1.16
```

```
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
import pandas.util.testing as tm
```

```
heartDisease = pd.read_csv('data7_heart.csv')
heartDisease = heartDisease.replace('?', np.nan)
```

Automatic saving failed. This file was updated remotely or in another tab. [Show diff](#)

```
Sample instances from the dataset are given below
```

	age	sex	cp	trestbps	chol	...	oldpeak	slope	ca	thal	heartdisease
0	63	1	1	145	233	...	2.3	3	0	6	0
1	67	1	4	160	286	...	1.5	2	3	3	2
2	67	1	4	120	229	...	2.6	2	2	7	1
3	37	1	3	130	250	...	3.5	3	0	3	0
4	41	0	2	130	204	...	1.4	1	0	3	0

```
[5 rows x 14 columns]
```

```
print('\n Attributes and datatypes')
```

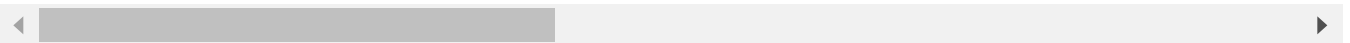
```
print(heartDisease.dtypes)
```

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
```

```
model = BayesianModel([('age','heartdisease'),('sex','heartdisease'),('exang','heartdisease')
```

```
/usr/local/lib/python3.7/dist-packages/pgmpy/models/BayesianModel.py:10: FutureWarning:
  FutureWarning,
```



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

Learning CPD using Maximum likelihood estimators

```
print('\n Inferencing with Bayesian Network:')
HeartDiseasetest_infer = VariableElimination(model)
```

Inferencing with Bayesian Network:

Automatic saving failed. This file was updated remotely or in another tab. [Show](#)

```
diff
q1=heartDiseasetest_infer.query(variables=[ 'heartdisease'],evidence={ 'restecg':1})
print(q1)
```

1.Probability of HeartDisease given evidence= restecg :1

Finding Elimination Order: : 100%

4/4 [00:00<00:00, 67.15it/s]

Eliminating: sex: 100%

4/4 [00:00<00:00, 67.24it/s]

```
+-----+-----+
| heartdisease | phi(heartdisease) |
+=====+
```

```
print('\n 2.Probability of HeartDisease given evidence= cp:2 ')
```

```
q2=HeartDiseasetest_infer.query(variables=['heartdisease'],evidence={'cp':2})
```

```
print(q2)
```

2.Probability of HeartDisease given evidence= cp:2

Finding Elimination Order: : 100%

3/3 [01:21<00:00, 27.05s/it]

Eliminating: sex: 100%

3/3 [00:00<00:00, 54.98it/s]

```
+-----+-----+
| heartdisease | phi(heartdisease) |
+=====+
```

heartdisease(0)	0.3610
heartdisease(1)	0.2159
heartdisease(2)	0.1373
heartdisease(3)	0.1537
heartdisease(4)	0.1321

```
+-----+-----+
```

```
print('\n 2.Probability of HeartDisease given evidence= chol:3 ')
```

```
q3=HeartDiseasetest_infer.query(variables=['heartdisease'],evidence={'chol':3})
```

```
print(q3)
```

Automatic saving failed. This file was updated remotely or in another tab.  
[diff](#)

[Show](#)

2.Probability of HeartDisease given evidence= chol:3  
/usr/local/lib/python3.7/dist-packages/pgmpy/factors/discrete/DiscreteFactor.py:531: UserWarning

19881A1267  
C.PREETHI

heartdisease(0)	0.3625
heartdisease(1)	0.6375
heartdisease(2)	0.0000
heartdisease(3)	0.0000
heartdisease(4)	0.0000

✓ 0s completed at 21:57



Automatic saving failed. This file was updated remotely or in another tab. [Show diff](#)