

```
!pip install pgmpy
```

Looking in indexes: <https://pypi.org/simple>, <https://us-python.pkg.dev/colab-wheels/public/simple/>

Collecting pgmpy

Downloading pgmpy-0.1.21-py3-none-any.whl (1.9 MB)

1.9/1.9 MB 17.2 MB/s eta 0:00:00

Requirement already satisfied: statsmodels in /usr/local/lib/python3.9/dist-packages (from pgmpy) (0.13.5)  
 Requirement already satisfied: numpy in /usr/local/lib/python3.9/dist-packages (from pgmpy) (1.22.4)  
 Requirement already satisfied: torch in /usr/local/lib/python3.9/dist-packages (from pgmpy) (1.13.1+cu116)  
 Requirement already satisfied: scikit-learn in /usr/local/lib/python3.9/dist-packages (from pgmpy) (1.2.2)  
 Requirement already satisfied: tqdm in /usr/local/lib/python3.9/dist-packages (from pgmpy) (4.65.0)  
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 Requirement already satisfied: networkx in /usr/local/lib/python3.9/dist-packages (from pgmpy) (3.0)  
 Requirement already satisfied: pandas in /usr/local/lib/python3.9/dist-packages (from pgmpy) (1.4.4)  
 Requirement already satisfied: scipy in /usr/local/lib/python3.9/dist-packages (from pgmpy) (1.10.1)  
 Requirement already satisfied: joblib in /usr/local/lib/python3.9/dist-packages (from pgmpy) (1.1.1)  
 Requirement already satisfied: pyparsing in /usr/local/lib/python3.9/dist-packages (from pgmpy) (3.0.9)  
 Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.9/dist-packages (from pandas->pgmpy) (2022.7)  
 Requirement already satisfied: python-dateutil>=2.8.1 in /usr/local/lib/python3.9/dist-packages (from pandas->pgmpy)  
 Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.9/dist-packages (from scikit-learn->pgmpy)  
 Requirement already satisfied: patsy>=0.5.2 in /usr/local/lib/python3.9/dist-packages (from statsmodels->pgmpy) (0)  
 Requirement already satisfied: packaging>=21.3 in /usr/local/lib/python3.9/dist-packages (from statsmodels->pgmpy)  
 Requirement already satisfied: typing-extensions in /usr/local/lib/python3.9/dist-packages (from torch->pgmpy) (4.4.0)  
 Requirement already satisfied: six in /usr/local/lib/python3.9/dist-packages (from patsy>=0.5.2->statsmodels->pgmpy)  
 Installing collected packages: pgmpy  
 Successfully installed pgmpy-0.1.21

```
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
```

```
heartDisease = pd.read_csv('heart.csv')
```

```
print('Sample instances from the dataset are given below')
print(heartDisease.head())
```

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

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

/usr/local/lib/python3.9/dist-packages/pgmpy/models/BayesianModel.py:8: FutureWarning: BayesianModel has been renamed to BayesianModelV2
warnings.warn(
```

```
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:

```
print('\n 1.Probability of HeartDisease given evidence=restecg :2')
```

1.Probability of HeartDisease given evidence=restecg :2

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

```
/usr/local/lib/python3.9/dist-packages/pgmpy/models/BayesianModel.py:8: FutureWarning: BayesianModel has been rena
warnings.warn(
```

```
print(q1)
```

heartdisease	phi(heartdisease)
heartdisease(0)	0.1016
heartdisease(1)	0.0000
heartdisease(2)	0.2361
heartdisease(3)	0.2017
heartdisease(4)	0.4605

```
print(model.get_cpds('sex'))
```

sex(0)	0.320132
sex(1)	0.679868

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