```
!pip install pgmpy
```

```
    Downloading pgmpy-0.1.26-py3-none-any.whl.metadata (9.1 kB)
    Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from pgmpy) (3.4.2)
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    Requirement already satisfied: torch in /usr/local/lib/python3.10/dist-packages (from pgmpy) (2.5.0+cu121)
    Requirement already satisfied: statsmodels in /usr/local/lib/python3.10/dist-packages (from pgmpy) (0.14.4)
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    Requirement already satisfied: requests<3.0.0dev0,>=2.18.0 in /usr/local/lib/python3.10/dist-packages (from google-api-core->goo
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    Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests<3.0.0.dev0,>=2.
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    Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests<3.0.0.dev0,>=2.18.0->
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    Installing collected packages: pgmpy
    Successfully installed pgmpy-0.1.26
```

```python
import numpy as np
import pandas as pd
from pgmpy.models import BayesianNetwork
from pgmpy.estimators import ParameterEstimator, BayesianEstimator, MaximumLikelihoodEstimator
from pgmpy.inference import VariableElimination
```

```python
data = pd.read_csv('heart_cleveland_upload.csv')
data.head()
```

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	condition
0	69	1	0	160	234	1	2	131	0	0.1	1	1	0	0
1	69	0	0	140	239	0	0	151	0	1.8	0	2	0	0
2	66	0	0	150	226	0	0	114	0	2.6	2	0	0	0
3	65	1	0	138	282	1	2	174	0	1.4	1	1	0	1
4	64	1	0	110	211	0	2	144	1	1.8	1	0	0	0

Next steps: | Generate code with `data` | | View recommended plots | | New interactive sheet |

```python
data.tail()
```

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	condition
292	40	1	3	152	223	0	0	181	0	0.0	0	0	2	1
293	39	1	3	118	219	0	0	140	0	1.2	1	0	2	1
294	35	1	3	120	198	0	0	130	1	1.6	1	0	2	1
295	35	0	3	138	183	0	0	182	0	1.4	0	0	0	0
296	35	1	3	126	282	0	2	156	1	0.0	0	0	2	1

```python
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 297 entries, 0 to 296
Data columns (total 14 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   age        297 non-null    int64
 1   sex        297 non-null    int64
 2   cp         297 non-null    int64
 3   trestbps   297 non-null    int64
 4   chol       297 non-null    int64
 5   fbs        297 non-null    int64
 6   restecg    297 non-null    int64
 7   thalach    297 non-null    int64
 8   exang      297 non-null    int64
 9   oldpeak    297 non-null    float64
 10  slope      297 non-null    int64
 11  ca         297 non-null    int64
 12  thal       297 non-null    int64
 13  condition  297 non-null    int64
dtypes: float64(1), int64(13)
memory usage: 32.6 KB
```

```python
data.describe()
```

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope
count	297.000000	297.000000	297.000000	297.000000	297.000000	297.000000	297.000000	297.000000	297.000000	297.000000	297.000000
mean	54.542088	0.676768	2.158249	131.693603	247.350168	0.144781	0.996633	149.599327	0.326599	1.055556	0.602694
std	9.049736	0.468500	0.964859	17.762806	51.997583	0.352474	0.994914	22.941562	0.469761	1.166123	0.618187
min	29.000000	0.000000	0.000000	94.000000	126.000000	0.000000	0.000000	71.000000	0.000000	0.000000	0.000000
25%	48.000000	0.000000	2.000000	120.000000	211.000000	0.000000	0.000000	133.000000	0.000000	0.000000	0.000000
50%	56.000000	1.000000	2.000000	130.000000	243.000000	0.000000	1.000000	153.000000	0.000000	0.800000	1.000000
75%	61.000000	1.000000	3.000000	140.000000	276.000000	0.000000	2.000000	166.000000	1.000000	1.600000	1.000000
max	77.000000	1.000000	3.000000	200.000000	564.000000	1.000000	2.000000	202.000000	1.000000	6.200000	2.000000

```python
model = BayesianNetwork([('age','condition'),('sex','condition'),('cp','condition'),('trestbps','condition'),('chol','condition')])
```

```python
model.fit(data, estimator=MaximumLikelihoodEstimator)
```

```
WARNING:pgmpy:Replacing existing CPD for age
WARNING:pgmpy:Replacing existing CPD for condition
WARNING:pgmpy:Replacing existing CPD for sex
WARNING:pgmpy:Replacing existing CPD for cp
WARNING:pgmpy:Replacing existing CPD for trestbps
WARNING:pgmpy:Replacing existing CPD for chol
```

```python
heart = VariableElimination(model)
```

```python
q1 = heart.query(variables=['condition'], evidence={'cp':3})
print(q1)
```

```
+--------------+------------------+
| condition    |   phi(condition) |
+==============+==================+
| condition(0) |           0.4997 |
+--------------+------------------+
| condition(1) |           0.5003 |
+--------------+------------------+
```

```
q2 = heart.query(variables=['condition'],evidence={'trestbps':140})
print(q2)
```

```
+--------------+------------------+
| condition    |   phi(condition) |
+==============+==================+
| condition(0) |           0.5000 |
+--------------+------------------+
| condition(1) |           0.5000 |
+--------------+------------------+
```

```
q3 = heart.query(variables=['condition'],evidence={'age':50})
print(q3)
```

```
+--------------+------------------+
| condition    |   phi(condition) |
+==============+==================+
| condition(0) |           0.4999 |
+--------------+------------------+
| condition(1) |           0.5001 |
+--------------+------------------+
```

```
q4 = heart.query(variables=['condition'],evidence={'chol':220})
print(q4)
```

```
+--------------+------------------+
| condition    |   phi(condition) |
+==============+==================+
| condition(0) |           0.5003 |
+--------------+------------------+
| condition(1) |           0.4997 |
+--------------+------------------+
```

Start coding or generate with AI.