```
pip install pgmpy -q
```

```
Note: you may need to restart the kernel to use updated packages.
```

```
import numpy as np
import csv
import pandas as pd
from pgmpy.models import DiscreteBayesianNetwork
from pgmpy.estimators import MaximumLikelihoodEstimator
from pgmpy.inference import VariableElimination

# Step 1: Read Cleveland Heart Disease data
heartDisease = pd.read_csv('heart.csv')
heartDisease = heartDisease.replace('?',np.nan)

# Step 2: Define Bayesian Network Structure
model = DiscreteBayesianNetwork([
    ('age', 'trestbps'),
    ('age', 'fbs'),
    ('sex', 'trestbps'),
    ('exang', 'trestbps'),
    ('trestbps', 'target'),
    ('fbs', 'target'),
    ('target', 'restecg'),
    ('target', 'thalach'),
    ('target', 'chol'),
    ('age', 'target'),
    ('sex', 'target')
])

# Step 3: Train Model using MLE
print('\nLearning CPD using Maximum Likelihood Estimators')
model.fit(heartDisease, estimator=MaximumLikelihoodEstimator)
```

```
INFO:pgmpy: Datatype (N=numerical, C=Categorical Unordered,
O=Categorical Ordered) inferred from data:
 {'age': 'N', 'sex': 'N', 'cp': 'N', 'trestbps': 'N', 'chol': 'N',
'fbs': 'N', 'restecg': 'N', 'thalach': 'N', 'exang': 'N', 'oldpeak':
'N', 'slope': 'N', 'ca': 'N', 'thal': 'N', 'target': 'N'}


Learning CPD using Maximum Likelihood Estimators

<pgmpy.models.DiscreteBayesianNetwork.DiscreteBayesianNetwork at
0x1b10eb781a0>
```

```
# Step 4: Perform Inference
print('\n Inferencing with Bayesian Network:')
HeartDisease_infer = VariableElimination(model)
```

```
 Inferencing with Bayesian Network:
```

```python
# Example 1: Probability of Heart Disease given Age
print('\n1. Probability of Heart Disease given Age=29')
q = HeartDisease_infer.query(variables=['target'], evidence={'age':
29})
print(q)
```

```
1. Probability of Heart Disease given Age=29
+-----------+---------------+
| target    |   phi(target) |
+===========+===============+
| target(0) |        0.2677 |
+-----------+---------------+
| target(1) |        0.7323 |
+-----------+---------------+
```

```python
# Example 2: Probability of Heart Disease given Cholesterol level
print('\n 2. Probability of HeartDisease given cholesterol=131')
q=HeartDisease_infer.query(variables=['target'],evidence={'chol':131})
print(q)
```

```
 2. Probability of HeartDisease given cholesterol=131
+-----------+---------------+
| target    |   phi(target) |
+===========+===============+
| target(0) |        1.0000 |
+-----------+---------------+
| target(1) |        0.0000 |
+-----------+---------------+
```