

**Department of Computer Applications Session: 2024- 2025 AI-LAB KCA 351**

**Experiment-No.7**

**Objective: To demonstrate the working of Bayesian network**

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| **Scheduled Date:** | **Compiled Date:** | **Submitted Date:** |
| 12 Nov 2024 | 12 Nov 2024 | 20 Nov2024 |
|  |  |  |

!pip install pgmpy  # Install the pgmpy library

from pgmpy.models import BayesianModel

from pgmpy.inference import VariableElimination

from pgmpy.factors.discrete import TabularCPD

# Define the model structure

model = BayesianModel([

    ('D', 'S'),  # Disease influences Symptom

    ('D', 'T'),  # Disease influences Test Result

])

# Define the CPDs (Conditional Probability Distributions)

# P(Disease)

cpd\_disease = TabularCPD(variable='D', variable\_card=2, values=[[0.95], [0.05]])  # P(Disease)

# P(Symptom | Disease)

cpd\_symptom = TabularCPD(

    variable='S',

    variable\_card=2,

    values=[

        [0.90, 0.20],  # P(S=0 | D=0), P(S=0 | D=1)

        [0.10, 0.80]   # P(S=1 | D=0), P(S=1 | D=1)

    ],

    evidence=['D'],

    evidence\_card=[2]

)

# P(Test | Disease)

cpd\_test = TabularCPD(

    variable='T',

    variable\_card=2,

    values=[

        [0.95, 0.10],  # P(T=0 | D=0), P(T=0 | D=1)

        [0.05, 0.90]   # P(T=1 | D=0), P(T=1 | D=1)

    ],

    evidence=['D'],

    evidence\_card=[2]

)

# Add CPDs to the model

model.add\_cpds(cpd\_disease, cpd\_symptom, cpd\_test)

# Check model validity

assert model.check\_model()

# Perform inference

inference = VariableElimination(model)

# Querying the probability of having the disease given a symptom

result\_symptom = inference.query(variables=['D'], evidence={'S': 1})  # Given that the symptom is present

print("Probability of having the disease given the symptom is present:")

print(result\_symptom)

# Querying the probability of having the disease given a test result

result\_test = inference.query(variables=['D'], evidence={'T': 1})  # Given that the test is positive

print("\nProbability of having the disease given a positive test result:")

print(result\_test)

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