

PROBABILISTIC REASONING

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LAB-3

Variable Elimination

```
In [ ]: ## To install pgmpy uncomment the below line
# %pip install pgmpy
```

```
In [ ]: from pgmpy.inference import VariableElimination
from pgmpy.factors.discrete import TabularCPD
from pgmpy.models import BayesianNetwork
```

```
In [ ]: G = BayesianNetwork()
G.add_nodes_from(["Burglary", "Earthquake", "Alarm", "JohnCalls", "MaryCalls"])
G.add_edges_from([("Burglary", "Alarm"), ("Earthquake", "Alarm"), ("Alarm", "JohnCalls"), ("Alarm", "MaryCalls")])
cpd_burglary = TabularCPD(variable='Burglary', variable_card=2, values=[[0.999], [0.001]])
cpd_earthquake = TabularCPD(variable='Earthquake', variable_card=2, values=[[0.998], [0.002]])
cpd_alarm = TabularCPD(variable='Alarm', variable_card=2,
    values=[[0.95, 0.94, 0.29, 0.001],
            [0.05, 0.06, 0.71, 0.999]],
    evidence=['Burglary', 'Earthquake'],
    evidence_card=[2, 2])
cpd_johncalls = TabularCPD(variable='JohnCalls', variable_card=2,
    values=[[0.9, 0.05],
            [0.1, 0.95]],
    evidence=['Alarm'],
    evidence_card=[2])
cpd_marycalls = TabularCPD(variable='MaryCalls', variable_card=2,
    values=[[0.7, 0.01],
            [0.3, 0.99]],
    evidence=['Alarm'],
    evidence_card=[2])
G.add_cpds(cpd_burglary, cpd_earthquake, cpd_alarm, cpd_johncalls, cpd_marycalls)
```

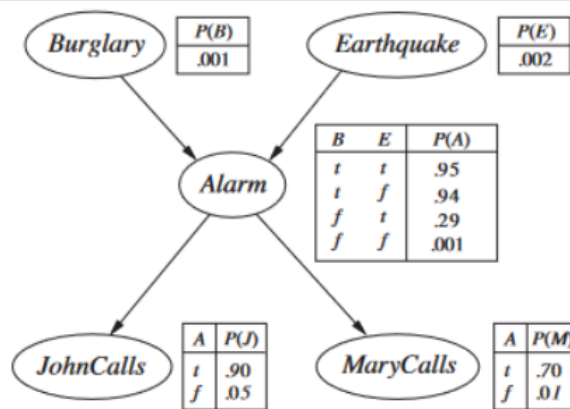


Figure 14.2 A typical Bayesian network, showing both the topology and the conditional probability tables (CPTs). In the CPTs, the letters *B*, *E*, *A*, *J*, and *M* stand for *Burglary*, *Earthquake*, *Alarm*, *JohnCalls*, and *MaryCalls*, respectively.

```
In [ ]: assert G.check_model()
```

```
In [ ]: infer = VariableElimination(G)

# Example query
result = infer.query(variables=['JohnCalls'], evidence={'Alarm': 1})
print(result)
```

```
+-----+-----+
| JohnCalls | phi(JohnCalls) |
+-----+-----+
| JohnCalls(0) | 0.0500 |
+-----+-----+
| JohnCalls(1) | 0.9500 |
+-----+-----+
```