

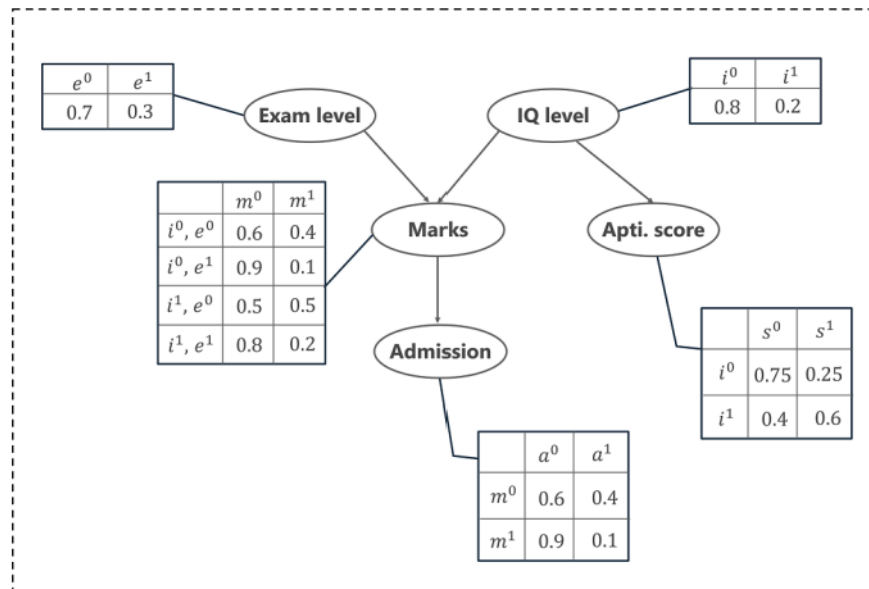
UCS1504 - Artificial Intelligence Lab

Department of CSE, SSN College of Engineering

7. Inference using Bayesian Network (BN) – Joint Probability Distribution

02.11.2023

The given Bayesian Network has 5 variables with the dependency between the variables as shown below:



1. The marks (m) of a student depends on: Exam level (e): This is a discrete variable that can take two values, (difficult, easy) and IQ of the student (i): A discrete variable that can take two values (high, low)
2. The marks will intern predict whether or not he/she will get admitted (a) to a university.
3. The IQ will also predict the aptitude score (s) of the student.

Write functions for the following using Python:

1. Construct the given DAG representation using appropriate libraries.
2. Read & Print the conditional probability values in Table Format for each variable.
3. Calculate the Joint Probability Distribution of the BN using 5 variables.

Observation: Write the formula for Joint Probability Distribution and explain each parameter.

Justify the answer with the advantage of BN.

Program code:

```
from matplotlib import pyplot as plt
import networkx as nx

def representDAG():
    g1 = nx.DiGraph()
    g1.add_edges_from([("root", "Exam Level"), ("Exam Level",
"Marks"), ("IQ Level", "Marks"), ("IQ Level", "Aptitude Score"),
("Marks", "Admission")])
    plt.tight_layout()
    nx.draw_networkx(g1, arrows=True)
    plt.savefig("g1.png", format="PNG")
    plt.clf()

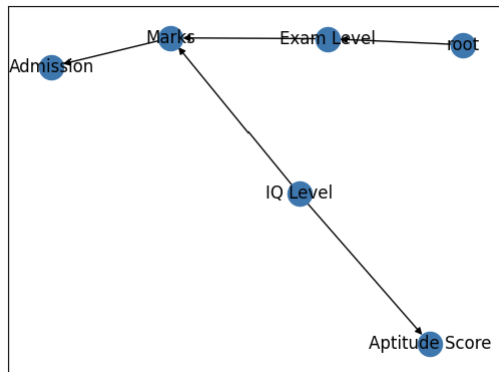
def readCPT():
    table_examlevel = [[0.7], [0.3]]
    table_iqlevel = [[0.8], [0.2]]
    table_marks = [[0.6, 0.4], [0.9, 0.1], [0.5, 0.5], [0.8, 0.2]]
    table_aptscore = [[0.75, 0.25], [0.4, 0.6]]
    table_admission = [[0.6, 0.4], [0.9, 0.1]]
    return [table_examlevel, table_iqlevel, table_marks,
table_aptscore, table_admission]

def findJPD(table):
    result = 1
    for var in table:
        temp = var[-1]
        result *= temp[-1]
    return result

print("The DAG Representation is saved in G1.png")
representDAG()
table = readCPT()
print("The Joint Probability Distribution of the BN:",
findJPD(table))
```

Output:

```
PS C:\Rohith\Backup\Desktop\SEM 5\Artificial Intelligence lab\7. Inference on Bayesian Network> python BBN_Joint_Probability.py
The DAG Representation is saved in G1.png
The Joint Probability Distribution of the BN: 0.00072
PS C:\Rohith\Backup\Desktop\SEM 5\Artificial Intelligence lab\7. Inference on Bayesian Network>
```



Learning Outcome:

Inference using Bayesian network(BN) – Joint Probability Distribution has been implemented.