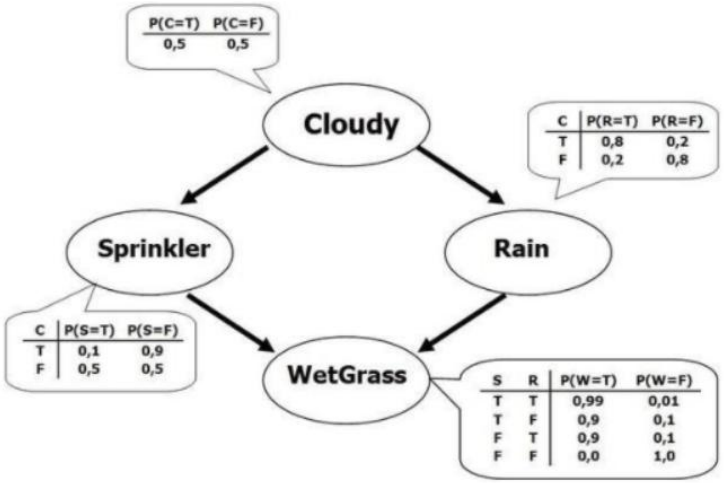
P Sai Deekshith (1BM18CS148)



In [30]:
```
from pgmpy.models import BayesianModel
from pgmpy.factors.discrete import TabularCPD
from pgmpy.inference import VariableElimination
```

In [31]:
```
model = BayesianModel([('Cloudy', 'Sprinkler'),
                       ('Sprinkler', 'WetGrass'),
                       ('Cloudy', 'Rain'),
                       ('Rain', 'WetGrass')])
```

Classes | Inbox (2,96 | Inbox (236) | Meet - | Meet - | ML_LAB_TE | Write-up - | B4_ML_LAB | 1BM18CS1 | Home Page

localhost:8888/notebooks/ML-Academics/1BM18CS148_PSAIDEEKSHITH.ipynb

jupyter 1BM18CS148_PSAIDEEKSHITH Last Checkpoint: 3 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

Run Code

In [32]:
```
print('Bayesian network nodes are :')
print("\t", model.nodes())
print()
print('Bayesian network edges are: ')
print("\t", model.edges())
```

```
Bayesian network nodes are :
        ['Cloudy', 'Sprinkler', 'WetGrass', 'Rain']

Bayesian network edges are:
        [('Cloudy', 'Sprinkler'), ('Cloudy', 'Rain'), ('Sprinkler', 'WetGrass'), ('Rain', 'WetGrass')]
```

In [33]:
```
cpd_cloudy = TabularCPD(variable='Cloudy',variable_card=2,values=[[0.5],[0.5]])
```

In [34]:
```
od_sprinkler = TabularCPD(variable='Sprinkler',variable_card=2,values=[[0.5,0.9],[0.5,0.1]],evidence=['Cloudy'],evidence_card=[2]
```

In [35]:
```
cpd_rain = TabularCPD(variable='Rain',variable_card=2,values=[[0.8,0.2],[0.2,0.8]],evidence=['Cloudy'],evidence_card=[2])
```

In [39]:
```
e='WetGrass',variable_card=2,values=[[1.0, 0.1, 0.1, 0.01],[0.0, 0.9, 0.9, 0.99]],evidence=['Sprinkler','Rain'],evidence_card=[2,
```

In [40]:
```
model.add_cpds(cpd_cloudy,cpd_sprinkler,cpd_rain,cpd_wetgrass)
print('Model generated by adding cpts(cpds)')
print('Checking correctness of model:',end=' ')
print(model.check_model())
```

```
WARNING:root:Replacing existing CPD for Cloudy
WARNING:root:Replacing existing CPD for Sprinkler
WARNING:root:Replacing existing CPD for Rain
WARNING:root:Replacing existing CPD for WetGrass

Model generated by adding cpts(cpds)
Checking correctness of model: True
```

Classes | Inbox (2,96 | Inbox (236) | Meet - | Meet - | ML_LAB_TE | Write-up - | B4_ML_LAB | 1BM18CS1 | Home Page

localhost:8888/notebooks/ML-Academics/1BM18CS148_PSAIDEEKSHITH.ipynb

jupyter 1BM18CS148_PSAIDEEKSHITH Last Checkpoint: 3 minutes ago (autosaved) Logout

File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

Run Code

In [41]:
```
print('Displaying  CPDs')
print()
print(model.get_cpds('Cloudy'))
print()
print(model.get_cpds('Sprinkler'))
print()
print(model.get_cpds('Rain'))
print()
print(model.get_cpds('WetGrass'))
print()
```

```
Displaying  CPDs

+-----------+-----+
| Cloudy(0) | 0.5 |
+-----------+-----+
| Cloudy(1) | 0.5 |
+-----------+-----+

+--------------+-----------+-----------+
| Cloudy       | Cloudy(0) | Cloudy(1) |
+--------------+-----------+-----------+
| Sprinkler(0) | 0.5       | 0.9       |
+--------------+-----------+-----------+
| Sprinkler(1) | 0.5       | 0.1       |
+--------------+-----------+-----------+

+---------+-----------+-----------+
| Cloudy  | Cloudy(0) | Cloudy(1) |
+---------+-----------+-----------+
| Rain(0) | 0.8       | 0.2       |
+---------+-----------+-----------+
| Rain(1) | 0.2       | 0.8       |
+---------+-----------+-----------+

+-------------+--------------+--------------+--------------+--------------+
| Sprinkler   | Sprinkler(0) | Sprinkler(0) | Sprinkler(1) | Sprinkler(1) |
+-------------+--------------+--------------+--------------+--------------+
```

```
+-------------+--------------+--------------+--------------+--------------+
| Sprinkler   | Sprinkler(0) | Sprinkler(0) | Sprinkler(1) | Sprinkler(1) |
+-------------+--------------+--------------+--------------+--------------+
| Rain        | Rain(0)      | Rain(1)      | Rain(0)      | Rain(1)      |
+-------------+--------------+--------------+--------------+--------------+
| WetGrass(0) | 1.0          | 0.1          | 0.1          | 0.01         |
+-------------+--------------+--------------+--------------+--------------+
| WetGrass(1) | 0.0          | 0.9          | 0.9          | 0.99         |
+-------------+--------------+--------------+--------------+--------------+
```

In [42]:
```
infer=VariableElimination(model)
```

P(Sprinkler, WetGrass | Cloudy):

In [43]:
```
print('\nInferencing with bayesian network')
print("\n\nProbability of sprinkler and wetgrass given cloudy")
q=infer.query(variables=['Sprinkler','WetGrass'],evidence={'Cloudy':1})
print(q)
```

```
Finding Elimination Order: : 100%|| 1/1 [00:00<00:00, 999.83it/s]
Eliminating: Rain: 100%|| 1/1 [00:00<00:00, 333.28it/s]

Inferencing with bayesian network


Probability of sprinkler and wetgrass given cloudy
+-------------+--------------+---------------------------+
| WetGrass    | Sprinkler    |   phi(WetGrass,Sprinkler) |
+=============+==============+===========================+
| WetGrass(0) | Sprinkler(0) |                    0.2520 |
+-------------+--------------+---------------------------+
| WetGrass(0) | Sprinkler(1) |                    0.0028 |
+-------------+--------------+---------------------------+
| WetGrass(1) | Sprinkler(0) |                    0.6480 |
+-------------+--------------+---------------------------+
| WetGrass(1) | Sprinkler(1) |                    0.0972 |
+-------------+--------------+---------------------------+
```