H(S) = 0.94

Wind

Wind Grouped DataFrame:

	Wind	PlayTennis	Count
0	Strong	No	3
1	Strong	Yes	3
2	Weak	Yes	6
3	Weak	No	2

Entropy_Strong:1.000000
Entropy_Weak:0.811278
Weighted Entropy of Wind = 1.000000 * (6 / 14) + 0.811278 * (8 / 14)
Weighted Entropy: 0.8921589282623617
IG(S, Wind): 0.04812703040826927

Outlook

Outlook Grouped DataFrame:

	Outlook	PlayTennis	Count
0	Overcast	Yes	4
1	Rain	Yes	3
2	Rain	No	2
3	Sunny	No	3
4	Sunny	Yes	2

Entropy_Overcast:-0.000000
Entropy_Rain:0.970951
Entropy_Sunny:0.970951
Weighted Entropy of Outlook = -0.000000 * (4 / 14) + 0.970951 * (5 / 14) + 0.970951 * (5 / 14)
Weighted Entropy: 0.6935361388961918
IG(S, Outlook): 0.2467498197744391

Humidity

Humidity Grouped DataFrame:

	Humidity	PlayTennis	Count
0	High	No	4
1	High	Yes	3
2	Normal	Yes	6
3	Normal	No	1

Entropy_High:0.985228
Entropy_Normal:0.591673
Weighted Entropy of Humidity = 0.985228 * (7 / 14) + 0.591673 * (7 / 14)
Weighted Entropy: 0.7884504573082896
IG(S, Outlook): 0.15183550136234136

Temperature

Temperature Grouped DataFrame:

	Temperature	PlayTennis	Count
0	Cool	Yes	3
1	Cool	No	1
2	Hot	Yes	3

3 Hot No 2
4 Mild Yes 3
5 Mild No 2
Entropy_Cool:0.811278
Entropy_Hot:0.970951
Entropy_Mild:0.970951
Weighted Entropy of Temperature = 0.811278 * (4 / 14) + 0.970951 * (5 / 14) + 0.970951 * (5 / 14)
Weighted Entropy: 0.9253298887416583
IG(S, Outlook): 0.014956069928972582
We can clearly observe that **IG(S, Outlook)** has the highest information gain of **0.246**, which makes **Outlook** the best choice for the root node.

So we will split dataset based on outlook

H(S, sunny) = (0.970)

wind

Wind Grouped DataFrame:
Wind PlayTennis Count
0 Strong No 1
1 Strong Yes 1
2 Weak No 2
3 Weak Yes 1
Entropy_Strong:1.000000
Entropy_Weak:0.918296
Weighted Entropy of Wind = 1.000000 * (2 / 5) + 0.918296 * (3 / 5)
Weighted Entropy: 0.9509775004326937
IG(S, Wind): 0.01997309402197489

Humidity

Humidity Grouped DataFrame:
Humidity PlayTennis Count
0 High No 3
1 Normal Yes 2
Entropy_High:-0.000000
Entropy_Normal:-0.000000
Weighted Entropy of Humidity = -0.000000 * (3 / 5) + -0.000000 * (2 / 5)
Weighted Entropy: 0.0
IG(S, Humidity): 0.9709505944546686

Temperature

Temperature Grouped DataFrame:
Temperature PlayTennis Count
0 Cool Yes 1
1 Hot No 2
2 Mild No 1
3 Mild Yes 1
Entropy_Cool:-0.000000
Entropy_Hot:-0.000000

Entropy_Mild:1.000000
Weighted Entropy of Temperature = -0.000000 * (1 / 5) + -0.000000 * (2 / 5) + 1.000000 * (2 / 5)
Weighted Entropy: 0.4
IG(S, Temperature): 0.5709505944546686

Highest information gain is for Humidity so we will split sunny node based on humidity.

H(S,Rain) = 0.970

Wind

Wind Grouped DataFrame:
    Wind PlayTennis Count
0 Strong   No   2
1   Weak   Yes   3
Entropy_Strong:-0.000000
Entropy_Weak:-0.000000
Weighted Entropy of Wind = -0.000000 * (2 / 5) + -0.000000 * (3 / 5)
Weighted Entropy: 0.0
IG(S, Wind): 0.9709505944546686

Humidity

Humidity Grouped DataFrame:
  Humidity PlayTennis Count
0   High   No   1
1   High   Yes   1
2   Normal   Yes   2
3   Normal   No   1
Entropy_High:1.000000
Entropy_Normal:0.918296
Weighted Entropy of Humidity = 1.000000 * (2 / 5) + 0.918296 * (3 / 5)
Weighted Entropy: 0.9509775004326937
IG(S, Humidity): 0.01997309402197489

Temperature

Temperature Grouped DataFrame:
  Temperature PlayTennis Count
0   Cool   No   1
1   Cool   Yes   1
2   Mild   Yes   2
3   Mild   No   1
Entropy_Cool:1.000000
Entropy_Mild:0.918296
Weighted Entropy of Temperature = 1.000000 * (2 / 5) + 0.918296 * (3 / 5)
Weighted Entropy: 0.9509775004326937
IG(S, Temperature): 0.01997309402197489

Since wind has highest information gain split rain node based on wind.

After this all nodes are pure no further splitting is required.