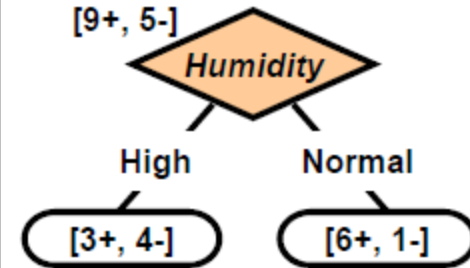


- **Selecting The Root Attribute**

Day	Outlook	Temperature	Humidity	Wind	PlayTennis?
1	Sunny	Hot	High	Light	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Light	Yes
4	Rain	Mild	High	Light	Yes
5	Rain	Cool	Normal	Light	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Light	No
9	Sunny	Cool	Normal	Light	Yes
10	Rain	Mild	Normal	Light	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Light	Yes
14	Rain	Mild	High	Strong	No



- **Prior (unconditioned) distribution: 9+, 5-**

$$H(X) = -(9/14) \lg (9/14) - (5/14) \lg (5/14) \text{ bits} = 0.94 \text{ bits}$$

Y = Humidity

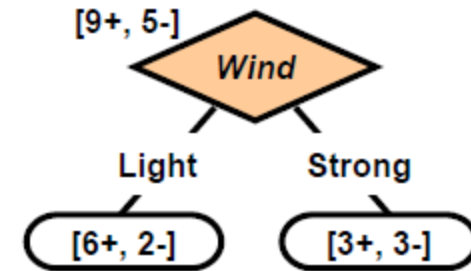
$$H(X|Y=\text{High}) = -(3/7) \lg (3/7) - (4/7) \lg (4/7) = 0.985 \text{ bits}$$

$$H(X|Y=\text{Normal}) = -(6/7) \lg (6/7) - (1/7) \lg (1/7) = 0.592 \text{ bits}$$

$$IG(X|Y) = 0.94 - (7/14) * 0.985 + (7/14) * 0.592 = 0.151 \text{ bits}$$

- **Selecting The Root Attribute**

Day	Outlook	Temperature	Humidity	Wind	PlayTennis?
1	Sunny	Hot	High	Light	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Light	Yes
4	Rain	Mild	High	Light	Yes
5	Rain	Cool	Normal	Light	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Light	No
9	Sunny	Cool	Normal	Light	Yes
10	Rain	Mild	Normal	Light	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Light	Yes
14	Rain	Mild	High	Strong	No

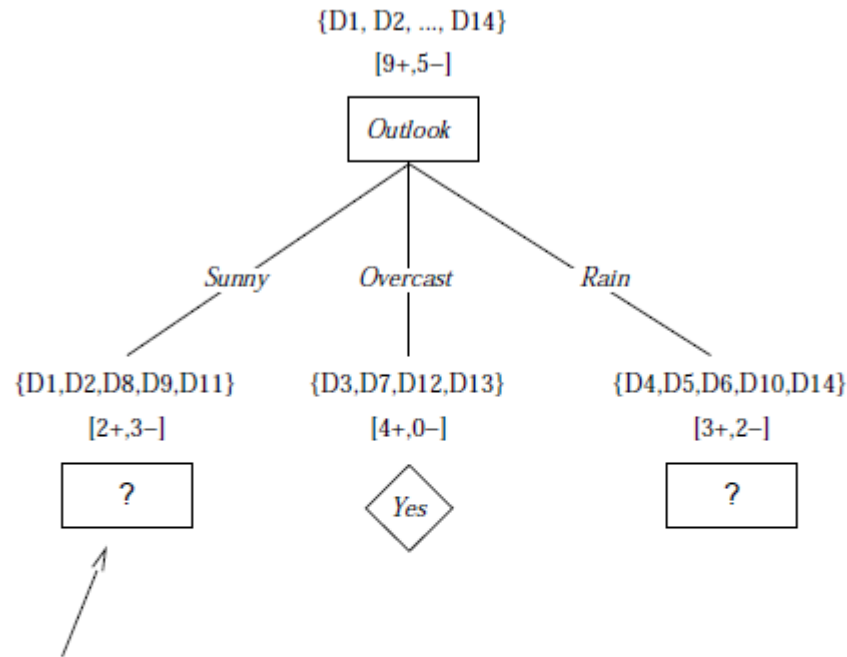


- Prior (unconditioned) distribution: 9+, 5-

$$H(X) = -(9/14) \lg (9/14) - (5/14) \lg (5/14) \text{ bits} = 0.94 \text{ bits}$$

Y = Wind

$$IG(X|Y) = 0.94 - (8/14) * 0.811 + (6/14) * 1.0 = 0.048 \text{ bits}$$



Which attribute should be tested here?

$$S_{\text{sunny}} = \{D1,D2,D8,D9,D11\}$$

$$\text{Gain}(S_{\text{sunny}}, \text{Humidity}) = .970 - (3/5) 0.0 - (2/5) 0.0 = .970$$

$$\text{Gain}(S_{\text{sunny}}, \text{Temperature}) = .970 - (2/5) 0.0 - (2/5) 1.0 - (1/5) 0.0 = .570$$

$$\text{Gain}(S_{\text{sunny}}, \text{Wind}) = .970 - (2/5) 1.0 - (3/5) .918 = .019$$

Day	Outlook	Temperature	Humidity	Wind	PlayTennis?
1	Sunny	Hot	High	Light	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Light	Yes
4	Rain	Mild	High	Light	Yes
5	Rain	Cool	Normal	Light	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Light	No
9	Sunny	Cool	Normal	Light	Yes
10	Rain	Mild	Normal	Light	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Light	Yes
14	Rain	Mild	High	Strong	No

