

<u>Outlook</u>	<u>Temperature</u>	<u>Humidity</u>	<u>Wind</u>	<u>Play Tennis</u>
Overcast: 4	Hot: 4	Normal: 7	Weak: 8	yes: 9
Sunny: 5	Mild: 6	High: 7	Strong: 6	no: 5
Rain: 5	Cool: 4			

$$E(S) = -\left(\frac{9}{14} \cdot \log_2\left(\frac{9}{14}\right)\right) - \left(\frac{5}{14} \cdot \log_2\left(\frac{5}{14}\right)\right) = 0.410 + 0.530 = 0.940$$

Outlook

$$S: 5, Y: 2, N: 3 = -\left(\frac{2}{5}\right) \log_2\left(\frac{2}{5}\right) - \left(\frac{3}{5}\right) \log_2\left(\frac{3}{5}\right) = 0.971$$

$$O: 4, Y: 4, N: 0 = 0 \rightarrow \text{All yes}$$

$$R: 5, Y: 3, N: 2 = -\left(\frac{3}{5}\right) \log_2\left(\frac{3}{5}\right) - \left(\frac{2}{5}\right) \log_2\left(\frac{2}{5}\right) = 0.971$$

$$E(S|Outlook) = \left(\frac{5}{14} \cdot 0.971\right) + (0) + \left(\frac{5}{14} \cdot 0.971\right)$$

Temperature

$$H: 4, Y: 2, N: 2 = 1.0$$

$$M: 6, Y: 4, N: 2 = -\left(\frac{4}{6}\right) \log_2\left(\frac{4}{6}\right) - \left(\frac{2}{6}\right) \log_2\left(\frac{2}{6}\right) = 0.918$$

$$C: 4, Y: 3, N: 1 = -\left(\frac{3}{4}\right) \log_2\left(\frac{3}{4}\right) - \left(\frac{1}{4}\right) \log_2\left(\frac{1}{4}\right) = 0.811$$

$$IG: 0.940 - 0.693 = \underline{\underline{0.246}}$$

$$E(S|Temperature) =$$

$$\left(\frac{4}{14} \cdot 1\right) + \left(\frac{6}{14} \cdot 0.918\right) +$$

$$\left(\frac{4}{14} \cdot 0.811\right) = 0.029$$

Humidity

$$N: 7, Y: 3, N: 4 = -\left(\frac{3}{7}\right) \log_2\left(\frac{3}{7}\right) - \left(\frac{4}{7}\right) \log_2\left(\frac{4}{7}\right) = 0.985$$

$$H: 7, Y: 6, N: 1 = -\left(\frac{6}{7}\right) \log_2\left(\frac{6}{7}\right) - \left(\frac{1}{7}\right) \log_2\left(\frac{1}{7}\right) = 0.592$$

$$E(S|Humidity) =$$

$$\left(\frac{7}{14} \cdot 0.985\right) + \left(\frac{7}{14} \cdot 0.592\right)$$

$$IG: 0.940 - 0.789 = 0.151$$

Wind

$$W: 8, Y: 6, N: 2 = -\left(\frac{6}{8}\right) \log_2\left(\frac{6}{8}\right) - \left(\frac{2}{8}\right) \log_2\left(\frac{2}{8}\right) = 0.811$$

$$S: 6, Y: 3, N: 3 = 1.0$$

$$E(S|Wind) = \left(\frac{8}{14} \cdot 0.811\right) + \left(\frac{6}{14} \cdot 1\right) = 0.047$$

Outlook has best IG, is root node