

Outlook
|
Overcast

Sunny

$$\text{Gini}(\text{Sunny}) = 1 - \left(\left(\frac{2}{5} \right)^2 + \left(\frac{3}{5} \right)^2 \right) = 0.48$$

Temp

$$\text{Hot}: 1 - \left[\left(\frac{0}{2} \right)^2 + \left(\frac{2}{2} \right)^2 \right] = 0$$

$$\text{Mild}: 1 - \left[\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \right] = .5$$

$$\text{Cool}: 1 - \left[\left(\frac{1}{1} \right)^2 + \left(\frac{0}{1} \right)^2 \right] = 0$$

$$\text{Gini}(\text{Sunny}|\text{Temp}) = \left(\frac{2}{5} \cdot .5 \right) = .2$$

$$\text{Gain} = .48 - .2 = .28$$

Humidity

$$\text{High}: 1 - \left[\left(\frac{0}{3} \right)^2 + \left(\frac{3}{3} \right)^2 \right] = 0$$

$$\text{Normal}: 1 - \left[\left(\frac{2}{2} \right)^2 + \left(\frac{0}{2} \right)^2 \right] = 0$$

$$\text{Gain} = 0.48 - 0 = .48 \leftarrow \text{Best}$$

Wind

$$\text{Weak}: 1 - \left[\left(\frac{0}{2} \right)^2 + \left(\frac{2}{2} \right)^2 \right] = 0$$

$$\text{Strong}: 1 - \left[\left(\frac{2}{3} \right)^2 + \left(\frac{1}{3} \right)^2 \right] = 0.4$$

$$\text{Gini}(\text{Sunny}|\text{Wind}) = \left(\frac{3}{5} \cdot 0.4 \right) = 0.24$$

$$\text{Gain} = 0.48 - 0.24 = .24$$

Rain

$$\text{Gini}(\text{Rain}) = 1 - \left(\left(\frac{3}{5} \right)^2 + \left(\frac{2}{5} \right)^2 \right) = 0.48$$

Temp

$$\text{Mild}: 1 - \left[\left(\frac{2}{3} \right)^2 + \left(\frac{1}{3} \right)^2 \right] = 0.4$$

$$\text{Cool}: 1 - \left[\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \right] = .5$$

$$\text{Gini}(\text{Rain}|\text{Temp}) = \left(\frac{3}{5} \cdot .4 \right) + \left(\frac{2}{5} \cdot .5 \right) = 0.467$$

$$\text{Gain} = .48 - .467 = 0.013$$

Humidity

$$\text{High}: 1 - \left[\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \right] = .5$$

$$\text{Normal}: 1 - \left[\left(\frac{2}{3} \right)^2 + \left(\frac{1}{3} \right)^2 \right] = 0.4$$

$$\text{Gini}(\text{Rain}|\text{Humid}) = \left(\frac{2}{5} \cdot .4 \right) + \left(\frac{3}{5} \cdot .5 \right) = 0.467$$

$$\text{Gain} = .48 - .467 = 0.013$$

Wind

$$\text{Weak}: 1 - \left[\left(\frac{3}{3} \right)^2 + \left(\frac{0}{0} \right)^2 \right] = 0$$

$$\text{Strong}: 1 - \left[\left(\frac{0}{2} \right)^2 + \left(\frac{2}{2} \right)^2 \right] = 0$$

$$\text{Gain} = .48 \leftarrow \text{Best}$$

