

Outlook
/ Overcast

Sunny

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

Rain

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

Temp

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

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

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

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

$$Gain = .48 - .2 = .28$$

Humidity

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

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

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

Wind

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

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

$$Gini(\text{Sunny} | \text{Wind}) = \left(\frac{3}{5} \cdot 0.4\right) = 0.27$$

$$Gain = 0.48 - 0.27 = .213$$

Temp

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

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

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

$$Gain = .48 - .467 = 0.013$$

Humidity

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

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

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

$$Gain = .48 - .467 = 0.013$$

Wind

$$\text{Weak: } 1 - \left[\left(\frac{3}{5}\right)^2 + \left(\frac{0}{5}\right)^2 \right] = 0$$

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

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

