打王求决策树

解：首先确定第一个属性：我们记 A_1 = outlook，A_2 = temperature，A_3 = humidity，A_4 = windy

则 $Gain(A_1) = B(\frac{9}{14}) - [\frac{5}{14}B(\frac{2}{5}) + \frac{4}{14}B(1) + \frac{5}{14}B(\frac{3}{5})] \approx 0.2435$

$Gain(A_2) = B(\frac{9}{14}) - [\frac{4}{14}B(\frac{2}{4}) + \frac{6}{14}B(\frac{4}{6}) + \frac{4}{14}B(\frac{3}{4})] \approx 0.0292$

$Gain(A_3) = B(\frac{9}{14}) - [\frac{7}{14}B(\frac{3}{7}) + \frac{7}{14}B(\frac{6}{7})] \approx 0.1518$

$Gain(A_4) = B(\frac{9}{14}) - [\frac{8}{14}B(\frac{6}{8}) + \frac{6}{14}B(\frac{3}{6})] \approx 0.0481$

所以第一个属性我们选择 A_1 = outlook.

其次确定第二个属性.

先考虑 sunny 分支下：

$Gain(A_2) = B(\frac{2}{5}) - [\frac{2}{5}B(0) + \frac{2}{5}B(\frac{1}{2}) + \frac{1}{5}B(1)] \approx$ ~~0.5687~~ 0.5641.

$Gain(A_3) = B(\frac{2}{5}) - [\frac{3}{5}B(0) + \frac{2}{5}B(1)] \approx 0.9595$

$Gain(A_4) = B(\frac{2}{5}) - [\frac{3}{5}B(\frac{1}{3}) + \frac{2}{5}B(\frac{1}{2})] \approx$ ~~0.0194~~ 0.0200

所以 sunny 分支下我们选择 A_3 = ~~temperature~~ humidity 作为判定属性.

考虑 rainy 分支下：

$Gain(A_2) = B(\frac{3}{5}) - [\frac{0}{5}B(0) + \frac{3}{5}B(\frac{2}{3}) + \frac{2}{5}B(\frac{1}{2})] \approx 0.0200$

$Gain(A_3) = B(\frac{3}{5}) - [\frac{2}{5}B(\frac{1}{2}) + \frac{3}{5}B(\frac{2}{3})] \approx 0.0200$

$Gain(A_4) = B(\frac{3}{5}) - [\frac{3}{5}B(1) + \frac{2}{5}B(0)] \approx 0.9595$

所以 rainy 分支下我们选择 A_4 = windy 作为判定属性.

所以最终决策树如下：