

Ex ML Decision Tree

$p \wedge (q \vee r)$

p	q	r	$q \vee r$	$p \wedge (q \vee r)$
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

$$S: p \wedge (q \vee r) \quad [3T; 5F]$$

$$A: p, q, r$$

$$E(S) = -\frac{5}{8} \cdot \log_2\left(\frac{5}{8}\right) - \frac{3}{8} \cdot \log_2\left(\frac{3}{8}\right) = 0,9544$$

$$(S_2 = p)$$

$$E(S_2 = \bar{1}) = -\frac{1}{4} \log_2\left(\frac{1}{4}\right) - \frac{3}{4} \log_2\left(\frac{3}{4}\right) = 0,811$$

$$E[S_2 = p] = -\frac{4}{4} \log_2\left(\frac{4}{4}\right) = 0$$

$$G(S_2) = 0,9544 - \frac{4}{8} \cdot 0 - \frac{4}{8} \cdot 0,811 = 0,548$$

$$(z=0)$$

$$E(S_{z=0}) = -\frac{2}{4} \log_2\left(\frac{2}{4}\right) - \frac{2}{4} \log_2\left(\frac{2}{4}\right) = 1$$

$$E(S_{z=1}) = -\frac{3}{4} \log_2\left(\frac{3}{4}\right) - \frac{1}{4} \log_2\left(\frac{1}{4}\right) = 0,811$$

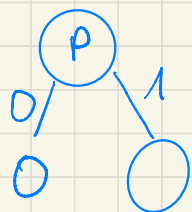
$$G(S_{z=0}) = 0,994 - \frac{4}{8} \cdot 0,811 - \frac{4}{8} \cdot 1 = 0,0485$$

$$(z=1)$$

$$E(S_{z=1}) = -\frac{2}{4} \log_2\left(\frac{2}{4}\right) - \frac{2}{4} \log_2\left(\frac{2}{4}\right) = 1$$

$$E(S_{z=2}) = -\frac{3}{4} \log_2\left(\frac{3}{4}\right) - \frac{1}{4} \log_2\left(\frac{1}{4}\right) = 0,811$$

$$G(S_{z=1}) = 0,994 - \frac{4}{8} \cdot 0,811 - \frac{4}{8} \cdot 1 = 0,0485$$



$$\max(G(S_{z=0})) = G(S_{z=0}) \rightarrow p \text{ is selected}$$

00	0
01	1
10	1
11	1

$$E(S) = -\frac{1}{4} \log_2\left(\frac{1}{4}\right) - \frac{3}{4} \log_2\left(\frac{3}{4}\right) = 0,811$$

(z=q)

$$E(S_{z=q}) = 0$$

$$E(S_{z=r}) = -\frac{1}{2} \log_2\left(\frac{1}{2}\right) - \frac{1}{2} \log_2\left(\frac{1}{2}\right) = 1$$

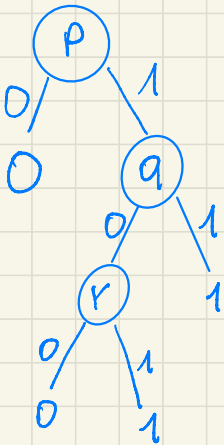
$$G(S, z) = 0,811 - \frac{2}{4} \cdot 1 - \frac{2}{4} \cdot 0 = 0,311$$

(z=r)

$$E(S_{z=r}) = 0$$

$$E(S_{z=q}) = -\frac{1}{2} \log_2\left(\frac{1}{2}\right) - \frac{1}{2} \log_2\left(\frac{1}{2}\right) = 1$$

$$G(S, z) = 0,811 - \frac{2}{4} \cdot 1 - \frac{2}{4} \cdot 0 = 0,311$$



$\max(G(S, z)) = G(S, q) \rightarrow q$ is selected
but also r can be selected