

Assignment 13

Wednesday, November 30, 2022

2:50 PM

$$1. B(q) = -(q \log_2 q + (1-q) \log_2 (1-q))$$

$$B(q) = -(2/5 \log_2 2/5 + (1-2/5) \log_2 (1-2/5))$$
$$= 0.9709 \leftarrow \text{entropy}$$

$$a. \text{Gain}(A_1)$$

$$= B(2/5) - \frac{4}{5} B(1/2) - \frac{1}{5} B(0)$$

$$= B(1/2) = -(1/2 \log_2 1/2 + (1-1/2) \log_2 (1-1/2)) = 1$$

$$= B(0) = 0$$

$$= 0.9709 - 4/5 \times 1 - 1/5 \times 0$$

$$= \boxed{0.1709}$$

$$b. \text{Gain}(A_2)$$

$$B(2/5) - 3/5 B(2/3) - 2/5 B(0)$$

$$B(2/5) = -(2/5 \log_2 2/5 + (1-2/5) \log_2 (1-2/5)) = 0.9709$$

$$B(2/3) = -(2/3 \log_2 2/3 + (1-2/3) \log_2 (1-2/3)) = 0.918$$

$$= 0.9709 - 3/5 (0.918) - 0 = \boxed{0.4201}$$

c. $B(2/5) - 2/5 B(1/2) - 3/5 B(1/3)$

$$B(2/5) = -(2/5 \log_2 2/5 + (1-2/5) \log_2 (1-2/5)) = 0.9709$$

$$B(1/2) = -(1/2 \log_2 1/2 + (1-1/2) \log_2 (1-1/2)) = 1$$

$$B(1/3) = -(1/3 \log_2 1/3 + (1-1/3) \log_2 (1-1/3)) = 0.918$$

$$= 0.9709 - 2/5 \times 1 - 3/5 \times 0.918$$

$$= \boxed{0.0200}$$

2. 1 only produced when three input attributes is odd. ex: 001, 100, 010, etc

