Entropy

Two states, A or B
50% 50%

$0.5 \rightarrow 1$. $\log_2 \frac{1}{0.5} = 1$ bit.

Reduce the uncertainty by a factor of 2.

A: 75%, B: 25%

猜对 B 需要 3. $\log_2 \frac{1}{0.25} = 2$

A 需要 3. $\log_2 \frac{1}{0.75} \approx 0.41$

$0.75 \times 0.41 + 0.25 \times 2$

Entropy: $-\sum_i p_i \log p_i$

Cross-Entropy

A B C D
0.25 0.25 0.25 0.25
00 01 10 11

$(-0.25 \log 0.25) \times 4 = 2$ bit.

$(2 \times 0.25) \times 4 = 2$ bit.

0.5 0.25 0.125 0.125

$-(0.5 \log 0.5 + 0.25 \log 0.25 + \cdots)$

$= 1.75$.

0 10 110 111

$0.5 \times 1 + 0.25 \times 2 + 0.125 \times 3 + 0.125 \times 3$

$= 1.75$.

0 1 10 11 ?