

Definition 2.13 The entropy $H(X)$ of a random variable X is defined as

$$H(X) = - \sum_x p(x) \log p(x).$$

- Convention: summation is taken over \mathcal{S}_X .
- When the base of the logarithm is α , write $H(X)$ as $H_\alpha(X)$.
- Entropy measures the uncertainty of a discrete random variable.
- The unit for entropy is

bit	if $\alpha = 2$
nat	if $\alpha = e$
D -it	if $\alpha = D$

- A bit in information theory is different from a bit in computer science.