

Information and Entropy

Chapter 1: Bits

The bit, is the fundamental unit of information.

We use a common understanding **code**, which are sequence of 0 and 1, to convey information. For an instance, we use 0 and 1 to describe each side of a coin. In this case, when n coins are flipped, the amount of outcomes is 2^n , and we need n **bits** to describe it.

There's some important things about information:

1. Information can be learned through observation, experiment, or measurement.
2. Information is subjective, or "observer-dependent"
3. A person's uncertainty can be increased upon learning that there is an observation about which information may be available, and then can be reduced by receiving that information
4. Information can be lost, either through loss of the data itself, or through loss of the code
5. The physical form of information is localized in space and time. As a consequence,
 - Information can be sent from one place to another
 - Information can be stored and then retrieved later

The Boolean Function

Let me show some often used boolean functions with two input variables and one output value: AND, OR, XOR, NAND, and NOR:

$$\begin{aligned} NOT & \bar{A} \\ AND & A \cdot B \\ NAND & \overline{A \cdot B} \\ OR & A + B \\ NOR & \overline{A + B} \\ XOR & A \oplus B \end{aligned}$$