

Remark $H(X)$ depends only on the distribution of X but not on the actual values taken by X , hence also write $H(p_X)$.

Example Let X and Y be random variables with $\mathcal{X} = \mathcal{Y} = \{0, 1\}$, and let

$$p_X(0) = 0.3, \quad p_X(1) = 0.7$$

and

$$p_Y(0) = 0.7, \quad p_Y(1) = 0.3.$$

Although $p_X \neq p_Y$, $H(X) = H(Y)$.