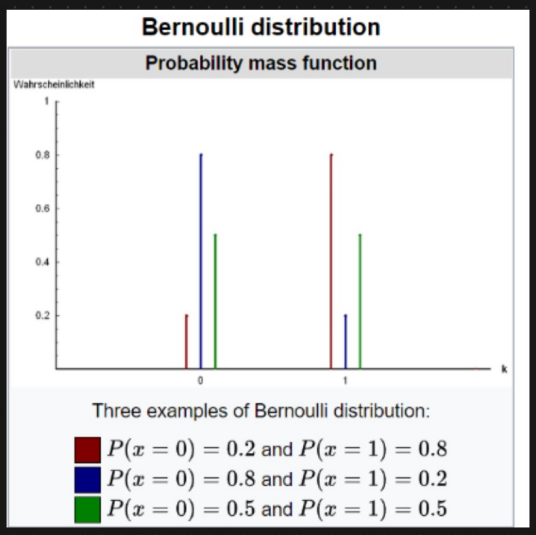
Bernoulli distribution

In probability theory and statistics, the Bernoulli distribution, named after Swiss mathematician Jacob Bernoulli,is the discrete probability distribution of a random variable which takes the value 1 with probability p and the value 0 with probability q=1-p. Less formally, it can be thought of as a model for the set of possible outcomes of any single experiment that asks a yes–no question.



① Discrete Random Variable {pmf}

② Outcomes are Binary

Eg: Tossing a coin {H, T}

$Pr(H) = 0.5 = p$

$Pr(T) = 0.5 = 1 - p = q$

② Whether the person will Pass / Fail

$Pr(Pass) = 0.7 = p$

$Pr(Fail) = 1 - 0.7 = 0.3 = q.$

Parameters

$0 \leq p \leq 1$

$q = 1 - p$

$K = \{0, 1\} \rightarrow 2$ outcomes

① PMF

$$PMF = p^k * (1-p)^{1-K} \quad K \in \{0,1\}$$

if $K = 1$

$$Pr(K=1) = p^1 (1-p)^{1-1}$$

$$= p \; //$$

Simplified

$$pmf \begin{cases} q = 1-p & \text{if } K=0 \\ p & \text{if } K=1 \end{cases}$$

if $K = 0$

$$Pr(K=0) = p^{0} * (1-p)^{1-0}$$

$$= (1-p) = q \;//.$$

② Mean of Bernoulli Distribution

$$E(K) = \sum_{i=0}^{K} K \cdot p(K)$$

$Pr(K=1) = 0.6 \Rightarrow p$

$Pr(K=0) = 0.4 \Rightarrow 1-p$

$$= [0 * 0.4 + 1 * 0.6]$$

$$= 0.6 = p \;//.$$

③ Median of Bernoulli Distribution

$$\text{Median} \begin{cases} 0 & \text{if } p < 1/2 \\ [0,1] & \text{if } p = 1/2 \\ 1 & \text{if } p > 1/2 \end{cases}$$

④ Variance

$$\text{Var} = p * (1-p)$$

$$= pq \;//$$

Std

$$\text{Std} = \sqrt{pq}.$$