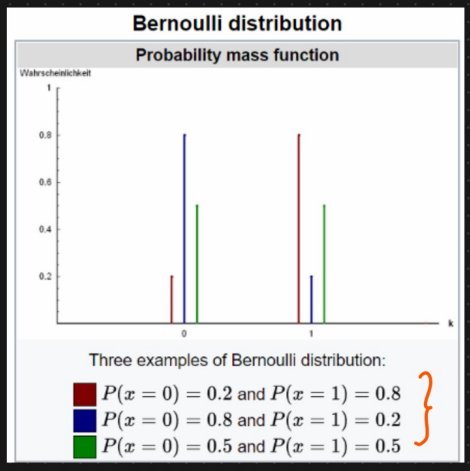
① Bernoulli Distribution [Binary outcomes]

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. Such questions lead to outcomes that are boolean-valued: a single bit whose value is **success/yes/true/one with probability p and failure/no/false/zero with probability q**.



Outcomes are Binary H ↓ ↓ T

Eg: Tossing a Fair Coin {0, 1}

$P(T) = 0.5 = p$ //

$P(H) = 1 - 0.5 = 1 - p = q$ //

Eg: Whether the Person Pass/Fail

pmf vs pdf

pmf ⇓ Discrete random variable

pdf ⇓ Continuous random variable

Pmf

K = 0 or 1

$$P(x = K) = p^K (1-p)^{1-K}$$

⇓

① $P(x = 1) = p^1 (1-p)^0$

$P(x = 1) = p$ //

② $P(x = 0) = p^0 (1-p)^{1-0}$

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

Simplified way of PMF

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

② Mean, Variance And Standard Deviation

Mean = P in bernoulli

$K = 1$ or 0

$$E(K) = \sum_{i=1}^{K} K \cdot p(K)$$

$P(k=1) = 0.6 = p$

$P(k=0) = 1 - 0.6 = q = 0.4$

$= 1 * 0.6 + 0 * 0.4$

$= 0.6 = p$

Median of Bernoulli Distribution

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

$p = 0.5 \quad q = 0.5$

Variance & Std

Variance $= p(1-p) = pq$

Std $= \sqrt{pq}$.