Binomial & Geometric Disrribution

Today → You have an interview

Binomial

→ 1. Give 10 interviews – pick the best offer.

→ 2. Keep giving interwiews till you succeed.

Geometric

1 1 1 1 1 1 1 1

100th

$k = 100$

$(1-p)^{99}\, p$

strategy 1:

→ Fixed no. of interviews (n) ✓

→ Success prob. is constant (p) ✓

→ Each interview is independent of another.

→ X : number of successes

Q: 1 interview (1 trial)

$X \leftarrow$ no. of successes $\leftarrow \{0, 1\}$

$X \to 0$ ✓

$X \to 1$

⇒ 2 interwiews (2 trials)

$X \in \{0, 1, 2\}$

Sample space $\Rightarrow \{FF, \boxed{FS}, SF, SS\}$

$p = 0.1, n = 2$

$\rightarrow P(X=0) = (1-p) * (1-p)$

$P(X=1) = (1-p) \times p + p \times (1-p)$

$P(X=2) = p \times p$

$\Rightarrow$ 3 interviews

$SS \rightarrow \{SSS, FFS, FSF, SFF, SSF, FSS, SFS, FFF\}$

$\boxed{PMF}$

(CDF)

$X = 0$

$X = 1$

$X = 2$

$X = 3$ $p \times p \times p$

1 − binom.cdf( )

$n = 3$

$X = 4$

$n = 2$

$X = 3$

$X = (n+1)$ vals

$$\boxed{\texttt{x\_vals = np.arange(0, n+1)}}$$

n ✓

p ✓

N trials

sample space size $\rightarrow 2^n$

Out of 2^n outcomes, how may map to K

$n=3 \rightarrow$ { sss, ssf, sfs, fss, sff, fsf ffs, fff } successes.

$n=3, K=2 \rightarrow$ { ssf, sfs, fss }

n K $\longrightarrow \{ {}^nC_K \}$

$\downarrow$

These may outcomes will map to K successes out of 2^n outcomes for n trials

$n=5$

$x = \{0, 1, 2, 3, 4, 5\}$ $(K) \rightarrow$ succes

$(n-K) \rightarrow$ failures

$$\boxed{P(X = K) = \left({}^{n}C_{K}\right) p^{K} (1-p)^{n-K}}$$

Binomial Formula

$n = 2$
$K = 0$

$$P(X=0) = {}^{2}C_{0} \; p^{0} \; (1-p)^{2-0}$$

$$= 1 \times (1-p)^{2}$$

$n = \checkmark$
$K = \checkmark$

$n \Rightarrow$	5 $\leftarrow$	n
K	3	K
	$\rightarrow 2$	$n-K$

PMF $\rightarrow$

Manufacturing $\rightarrow$ Bottle { 'at most' 1 defective bottle in 50 bottles sample }

$\boxed{K = 3}$

Geometric : What is the prob. that you'd succeed in your 25^{th} interview?

$\xrightarrow{fff} S$

$S = \{ s, fs, ffs, fffs, \ldots \}$

$q \quad 1-p$

Here, X = no. of interviews

p = prob. of success.

$P(X = 1) = p$

$P(X = 2) = (1-p) \times p$

$P(X = 3) = (1-p) \times (1-p) \times p$

$\rightarrow P(X = 4) = (1-p)^3 \, p$

$P(X = 5) = (1-p)^4 \times p$

$$\boxed{P(X = K) = (1-p)^{K-1} \times p}$$

Bottles $\rightarrow$ 1 by 1

Find the probability that the first defective bottle shows up on the 25th bottle

Q:

Messi's penalty success rate : 80%

He kicks 10 times What is the prob. of having 7 or less successes?

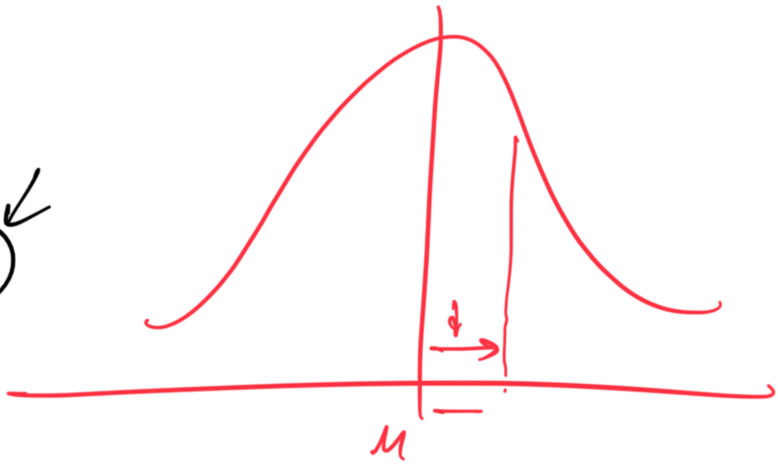
$p = 0.8$
$n = 10$ $\Big\}$ $X = \{0, 1, 2, 3 \ldots 7\}$

$P(X <= 7) = P(X=0) + P(X=1) + P(X=2) + P(\ldots P(X=7)$

CDF

$= {}^{10}C_0 (0.8)^0 (0.2)^{10} +$

=



σ

Variance (σ^2) $= \dfrac{\sum_{i=1}^{n} (X_i - \bar{x})^2}{n-1}$

scores = [85, 89, 76, 92, 90]

$\bar{x} = \dfrac{85 + \dots 90}{5} = 87$

$(85 - 87)^2 = 4$

$(89 - 87)^2$

$(76 - 87)^2$

$\vdots$

$\sqrt{\dfrac{\quad}{5-1}}$

Std.