Measures of Distribution

Binomial Distribution:

Binomial **Distribution** is a discrete distribution that models the number of successes in a fixed number of independent trials, where each trial has two possible outcomes (success or failure), and the probability of success remains constant.
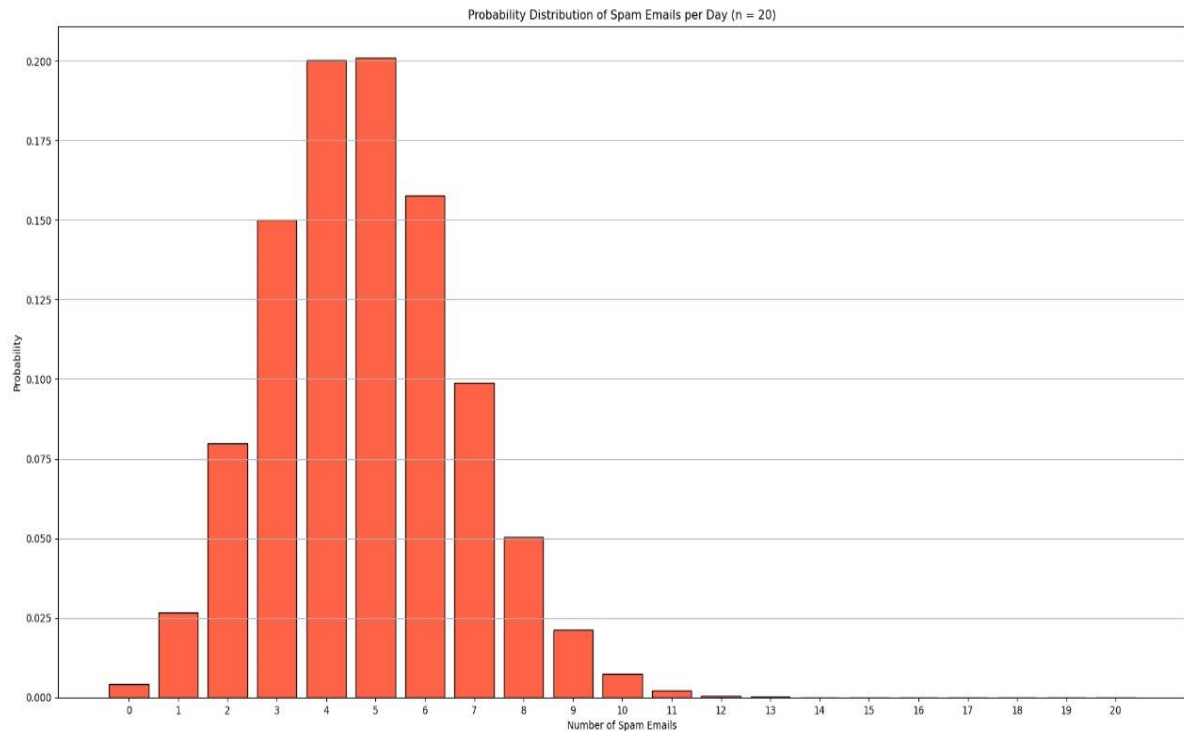
Key Parameters:

- n: number of trials

- p: probability of success in a single trial

- q = 1−p: probability of failure

Binomial Distribution Formula:

$$P(x) = \binom{n}{x} \cdot p^x \cdot (1-p)^{n-x}$$

Example:

If the number of emails received per day is 20, then the number of spam emails and their probability is given by the graph given below:

Probability Distribution of Spam Emails per Day (n = 20)

Poisson Distribution:

The Poisson Distribution is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time or space, when these events happen with a known constant mean rate and independently of the time since the last event.

Key Parameter:

- λ (lambda): the **average number of events** in the given time or space interval (Also called the **rate parameter**)

- x: number of successes

- e: Euler's number (~2.71828)

Poisson Formula:

$$P(x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

Example:

Based on the previous data, the prediction of the number of goals to be scored in 2026 FIFA world cup and their probability of occurring is depicted in the graph:

Poisson Distribution of Goals in 2026 FIFA World Cup
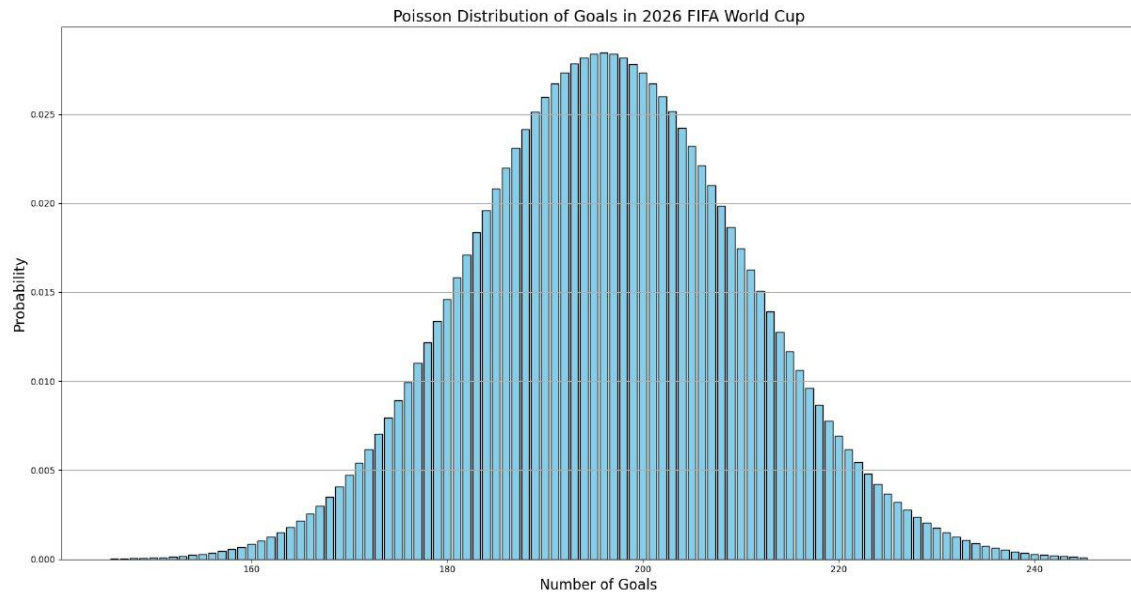
Example:

The below mentioned graph shows the prediction of number of goals to be scored by team Germany and it's probability:

Poisson Prediction: Germany Goals in 2026 World Cup