Probability Formula

Geometric Probability

Probability is defined as the likelihood of occurrence of a certain event. Geometric probability is similar to this concept, the only difference being that in geometric probability the likelihood of hitting a certain area from a given total area is calculated. The formula of geometric probability is little different from the general probability formula. In general, probability is the calculated as the ratio of number of favorable events to total number of events. Geometric probability is calculated as the ratio of desired area to the total given area. Geometric distribution is a probability distribution used for a Bernoulli's trial.

Definition

Geometric probability can be defined as the likelihood of getting a point or hitting a point in a desired area out of the total given area. The probability of getting a point in the desired area can be written as the ratio of the desired area to the total area. For example, we have got a dart of radius 10cm, having a small red circle in the center with radius 2cm. Now the probability that we hit the small circle is the ratio of area of the red circle to the area of the bigger circle.

Now, Total Area = Area of Bigger Circle = $\pi 10 \times 10 = 100\pi$

Desired Area = Area of Smaller Circle = $\pi 2 \times 2 = 4\pi$

Geometric Probability = $\frac{4\pi}{100\pi} = \frac{1}{25}$

Hence, the geometric probability is $\frac{1}{25}$.

Formula

The formula for geometric probability can be written as,
Geometric Probability = $\frac{\text{Desired Area}}{\text{Total Area}}$ Let us take an example and understand. Let us take a square of side 5cm, and have a rectangle of area 10cm squares within it. If we throw a coin in the square then find the probability of the coin hitting the rectangle.

We have, desired area = 10cm squares

Total Area = Area of Square = $5 \times 5 = 25$cm squares

Geometric Probability = $\frac{10}{25} = 0.4$

Geometric Probability Distribution

Geometric distribution is a probability distribution function. If p is the probability of success and $(1 - p)$ be the probability of failure and the geometric distribution **X** where **X** can have discrete values $0,\ 1,\ 2,\ 3,\ \ldots,$ then the probability that the first success happens after n trials is written as,
$P(X = n) = (1 - p)^{n-1}p$
The conditions needed for geometric distribution are:

1) The experiment should be a Bernoulli's trial.

2) The probability of success should be fixed for each trial.

3) The trials are independent of each other.

For the random geometric variable **X**, the variance of **X** can be written as $\frac{1-p}{p^2}$.

« Binomial Distribution
Random Experiment »

Topics in Geometric Probability

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