Binomial Distribution

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Binomial Distribution

- Binomial Distribution gives us yes/no or 0/1 outcomes.
- Trial - An event with a discrete outcome.
- Success - The outcome of interest for a trial.
- Binomial - Having two outcomes.
- Binomial distribution - Distribution of number of successes in x trials.

Binomial Distribution

VS

Which flavor reigns supreme?

Or are they both equally loved???

Binomial Distribution

Case: 1

Case: 2

Case: 3

Binomial Distribution

To get to the bottom of this mystery, we need to get a sense of what to expect if there is no preference.

VS

$$pr(x \mid n, p) \equiv \left(\frac{n!}{x!(n-x)!} \right) p^x (1-p)^{n-x}$$

Example – Manual Calculation

So let's start with a super simple example and assume that I asked 3 people if they liked Orange Fanta more than Grape Fanta.

0.125 + 0.125 + 0.125 = 0.375

and the probability that any 2 out of 3 people would randomly say they prefer Orange Fanta is 0.375.

Example – Calculate with formula

$$pr(x \mid n, p) = \left(\frac{n!}{x!(n-x)!} \right) p^x (1-p)^{n-x}$$

Example – If 4 people say they like orange fanta and 3 people say that they like grape fanta can you conclude that people in general prefer orange fanta?

POISSON DISTRIBUTION

Poisson Distribution

- It is a discrete probability distribution of a discrete random variable X, which has no upper bound.
- It is defined for non–negative values of x.
- It is suitable for rare events for which the probability of occurrence p is very small and the number of trials n is very large.

Example

- Number of printing mistakes per page.
- Number of accidents on a highway.
- Number of defectives in a production center
- Number of telephone calls during a particular loads of times.

Formula

The Poisson probability mass function:

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

The rpois function in R does this, taking only two arguments — the quantity of random numbers sought, and lambda:

rpois(100, lambda = 2)

This code will generate 100 random numbers from a Poisson distribution with = 2. For example, if incoming customer service calls average 2 per minute, this code will simulate 100 minutes, returning the number of calls in each of those 100 minutes.

Note

- Mean and Variance of Poisson Distribution is the same and is equal to lambda.
- Standard deviation.