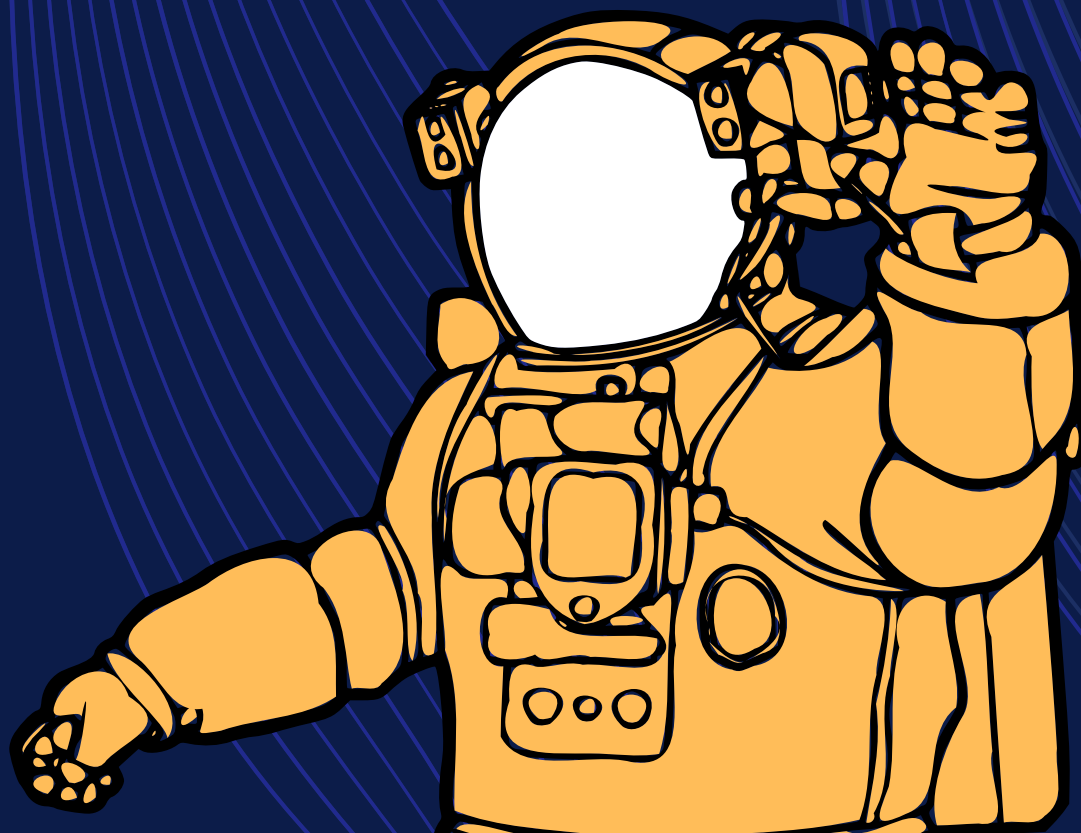


BERNOULLI DISTRIBUTION

It is actually
EASIER
to understand
than it sounds!



All you cricket junkies out there! At the beginning of any cricket match, how do you decide who is going to bat or ball?

A TOSS!



It all depends on whether you win or lose the toss, right? Let's say if the toss results in a head, you win. Else, you lose.

There's no midway.

- A **Bernoulli distribution** has only two possible outcomes, namely 1 (**success**) and 0 (**failure**), and a single trial.
- So the random variable X which has a Bernoulli distribution can take value 1 with the **probability of success**, say p , and the value 0 with the **probability of failure**, say q or $1-p$.

- Here, the occurrence of a head denotes success, and the occurrence of a tail denotes failure.
- Probability of getting a head = 0.5 = Probability of getting a tail since there are only two possible outcomes.
- The probability mass function is given by: $p^x(1-p)^{1-x}$ where $x \in (0, 1)$.
- It can also be written as

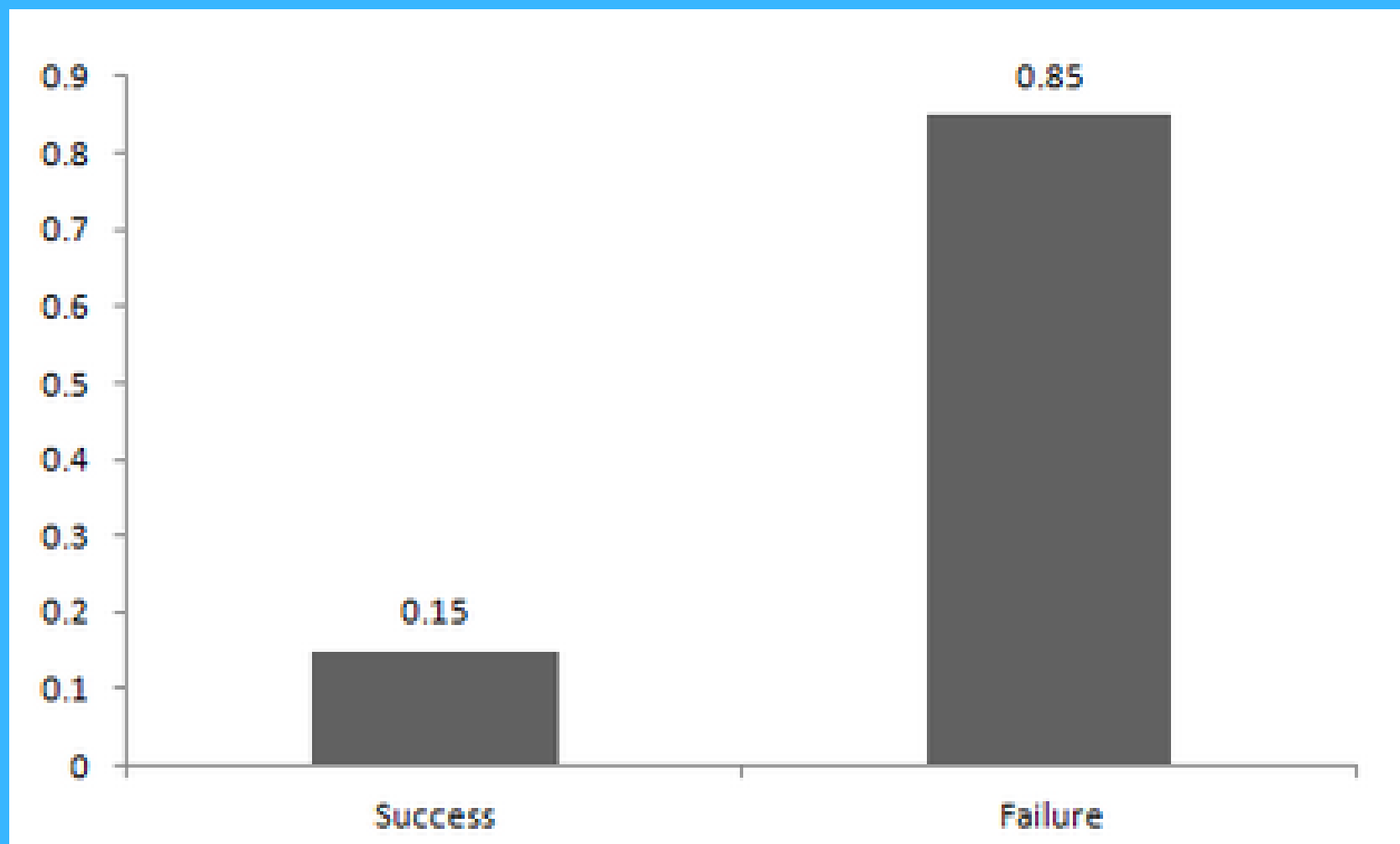
$$P(x) = \begin{cases} 1 - p, & x = 0 \\ p, & x = 1 \end{cases}$$

The probabilities of **success** and **failure** need not be equally likely, like the result of a



between me and **Undertaker**. He is pretty much certain to win. So in this case probability of my success is 0.15 while my failure is 0.85

- Here, the probability of success(p) is not same as the probability of failure.
- So, the chart below shows the Bernoulli Distribution of our fight.



- Here, the probability of success = 0.15 and probability of failure = 0.85.
- The expected value is exactly what it sounds. If I punch you, I may expect you to punch me back. Basically expected value of any distribution is the mean of the distribution.
- The expected value of a random variable X from a Bernoulli distribution is found as follows:

$$E(X) = 1 * p + 0 * (1 - p) = p$$

- The variance of a random variable from a bernoulli distribution is:
- $V(X) = E(X^2) - [E(X)]^2 = p - p^2 = p(1-p)$
- There are many examples of Bernoulli distribution such as whether it's going to rain tomorrow or not where rain denotes success and no rain denotes failure and Winning (success) or losing (failure) the game.