Probability: Random Variables

Introduction to Discrete Random Variables

Discrete random variables are variables the outcome of which are random. We do not know what next value they will take. For example we toss a fair coin five times, what is the total number of heads we would get ? We do not know. It is random. But we can find probability of obtaining a certain number of heads in these five tosses.

Example

Suppose we have 20 candies in a jar. Each candy is out of Blue, Red, Green or Purple.

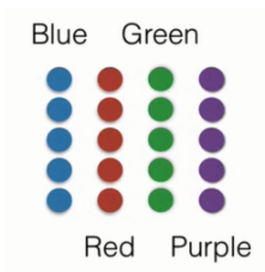

Figure 1: Candy Example

Suppose we pull one random candy out of the jar. *What is the probability of obtaining a certain color?*

Here we have 5 Blue, 5 Green, 5 Red and 5 Purple candies in the jar (total 20 candies). So the probability of each color is:

Blue	$\frac{5}{20} = \frac{1}{4}$
Red	$\frac{5}{20} = \frac{1}{4}$
Green	$\frac{5}{20} = \frac{1}{4}$
Purple	$\frac{5}{20} = \frac{1}{4}$

We can make a picture of this distribution using probability plot:

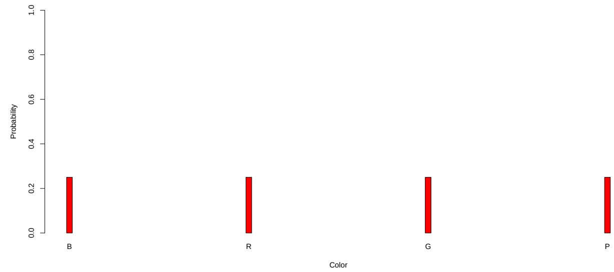

Figure 2: Probability Plot 1

This is example of *Discrete Uniform Distribution*.

Suppose now we do not have Red candies but instead of 5 we have 10 Green candies. The probabilities become

Blue	$\frac{5}{20} = \frac{1}{4}$
Red	$\frac{0}{20} = 0$
Green	$\frac{10}{20} = \frac{1}{2}$
Purple	$\frac{5}{20} = \frac{1}{4}$

The graph of this new distribution is no longer uniform:

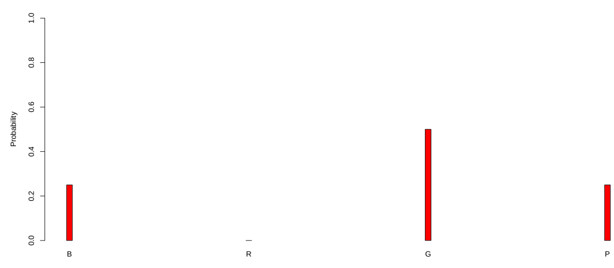

Figure 3: Probability Plot 2

Hence this is still a discrete random variable but it is not uniform.