# INTRODUCTION

# PROBABILITY DENSITY FUNCTION

In probability theory, a probability density function (PDF), or density of a continuous random variable, is a function whose value at any given sample (or point) in the sample space (the set of possible values taken by the random variable) can be interpreted as providing a **relative likelihood** that the value of the random variable would equal that sample.

In other words, while the absolute likelihood for a continuous random variable to take on any particular value is 0 (since there are an infinite set of possible values to begin with), the value of the PDF at two different samples can be used to infer, in any particular draw of the random variable, how much more likely it is that the random variable would equal one sample compared to the other sample.

In a more precise sense, the PDF is used to specify the probability of the random variable falling within a particular range of values, as opposed to taking on any one value.

Example: Suppose a species of bacteria typically lives 4 to 6 hours. What is the probability that a bacterium lives exactly 5 hours? The answer is 0%. A lot of bacteria live for approximately 5 hours, but there is no chance that any given bacterium dies at exactly 5.0000000000... hours.

Instead one might ask: What is the probability that the bacterium dies between 5 hours and 5.01 hours?

# PROBABILITY OF COIN FLIP

If a fair coin is flipped once then the possible outcomes are 2 (Head or Tails). Similarly, if a coin is tossed n times then nth toss will have 2^n outcomes and total outcomes as shown below:

for 1 flip Total op = 2

for 2 flips Total op =2 + 4 = 6

for 3 flips for Total op = 2 + 4 + 8 = 14

for 4 flips Total op = 2 + 4 + 8 + 16 = 30

Q) If a coin is tossed twice, what is the prob of getting HH

Ans) If a coin is flipped twice then HH will occur only once, hence prob = 1/6.

q) How many times a coin needs to be flipped until we get H

Ans) No of coin flips = 1/ p = 1/0.5 = 2

Q) No of coin flips required to get either HH or TT?

Ans) probability = 2/6 = 1/3 hence no of flips required = 1/p = 3