**Probability**

Probability use in machine learning, deep learning.

E.g., Suppose we have two categories of dataset Class A and Class B

x Liner line ( best fit line) (linear regression).

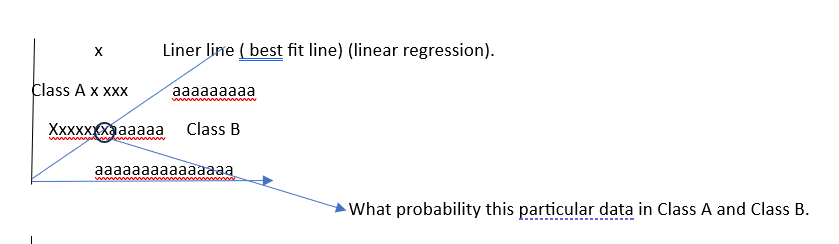
Class A x xxx aaaaaaaaa

Xxxxxxxaaaaaa Class B

aaaaaaaaaaaaaaa

What probability this particular data in Class A and Class B.

Because it is passing through the line.



Based on the probability we can definitely get a lot of things in linear regression.

it is used and logistically.

it is used and

so, probability really focuses like base is basically used over there.

Probability base is basically used over there.

In different things

**What exactly probability?**

**Probability** is a measure of the likelihood of an event.

E.g.,1 – Role a dice possible sample event, you know that it is one {1,2,3,4, 5,6}

From above sample distribution when role a dice, what is the probability of getting 6

P (6) = # no of ways an event can occur /# no of possible outcomes = 1/6.

E.g.,2 – Toss a coin obviously sample space {head, tail}

Q – what is the probability of getting head P(h) = 1/ 2 because no of ways and event can occur /no of possible outcome.

Or Sample spaces = 2 and number of events that can occur is 1.

So, we basically say this as probability of header ½

**Additional rule**

Mutual Exclusive Event

Two events are mutual exclusive if they cannot occur at the same time.

1 E.g. – Role a dice gets one sample {1 or 2 or 3 or 4 or 5 or 6}

You will not get {1 and 2} same time. Or {1 and 2 and 3 and 4 } at the same time.

Only able to get at one probably one experiment or on event that you are probably rolling a dice at a single time

2 Tossing a coin in this case also. What happens you may either get head or tail, you can’t get both.

Non-mutual exclusive

Multiple events can occur at the same time.

Deck of cards when I pull out a card. {K 0r Q, Heart}

A king can also come. Or a queen card can come along with the screen card a red color heart card can.

Or King can be red or black in from the Deck of cards.

This is a perfect example of a non-mutual exclusive.

Based on this there is some amazing problem statements that you can basically solve mutual exclusion,

Suppose if I toss a coin, what is the probability of the coin landing on heads or tails?

First, you must figure out whether it is mutual exclusive or not?

This is mutually exclusive.

Find, what is the probability of getting heads or tails from specific events.

P (Heads or Tails)

P (A or B) = P(A) + P(B) # whenever you have a mutual exclusive event at that point of time you can define this specific definition which is also called as additional rule for mutual exclusive.

P (A or B) = P(A) + P(B) = ½ + ½ = 1

If I roll a dice what is the probability of getting one or there or six

P (1 or 3 or 6) = P (1) + P (3) + P (6) = 1/6 + 1/6 + 1/6 = 3/6 = ½ = 0.5

Non-Mutual Exclusive

You are picking a card randomly from a deck.

Question

What is the probability of choosing a card that is queen or heart?

Answer - 1 This non mutual exclusive

2 What is the probability of getting the queen P(Q) = 4/52

3 What is the probability of getting the Heart P(Heart)= 13/52

4 What is the probability of getting the Queen and heart = P (Queen & heart) – 1 /52

So, these are the possible things that can occur right this is the thing now if I come to the formula and this is the

**addition rule for non-mutual exclusive event.**

P (A or B) = P(A) + P (B) – P (A inter section B) # A intersection B means A and B.

P (Q or Heart) = P(Q) + P (Heart) – P (Q and Heart) = 4/52 + 13/52 - 1/52 = 16/52 = 0.3076

**Multiplication Rule**

Independent events and non-independent rules

E.g., Rolling a dice I may get {1,2,3,4,5,6}

In 1st instance I may get 1

In 2nd instances it is possible I may get one

In 3rd instances I may get two, I may get any number.

So, one event is not at all dependent on the other event, because any time we roll every possibility or every outcome has an equal probability to come so over here,

what you can understand is that each event is independent. If any number comes it does not impact of any other event.

Every time you roll, and everybody has an equal probability to come over here this is what is an independent event called let me talk about non-independent event or I will also say it as non-not non-independent but instead I’ll say dependent event so I will talk about

Dependent Event

E.g., In the bag, 3 Red Marble, and 2 Green Marble

1st instance if I pick out a marble. What is the probability of red marble.

P (Red) = 3/5

Let suppose in 1st instance you pick up red marble,

How many marbles are remaining.

Now what is the probability of picking up green marble P(Green) = 2/4

**This is perfect example of dependent.**

Multiplication rule basically says that in the case of an independent event we must solve it in a different way in the case of a dependent event we have to solve in a different way.

Because of this dependent event there is an amazing algorithm which is called as Nive Bayes

Naive Bayes {Conditional Probability}

There is topic which is called as conditional probability.

This is where conditional probability will come into existence.

So, I will talk about it.

**Independent Events**

E.g.

Q What is the probability of rolling a “5” and then a “4” in a dice?

Answer - 5 and then 4

This is Independent Event

Here we apply multiplication rule.

P (A and B) = P (A) \* P (B) = 1/6 x 1/6 = 1/36

E.g., What is the probability of drawing a Queen and then an Aces from a deck of cards?

Answer – This is dependent event, because a deck of card will get reduced so in this particular case I am saying what is the probability of P(A and B) = P(A) \* P (B/A)

Conditional Probability

Let’s test,

What is the probability of green and then Red. P (G and R) =

In the 1st Instances = 3/5 = P(G)

In the 2nd Instances = 2/4 = P(R/G)

P (G and R) = P(G) \* P(R/G)

Green events already occurred.

This is called conditional probability.

This is very helpful in something called Naive Bays or Bays theorem. Bayes theorem

P (Q and A) = P (Q) \* P (A/Q) = 4/52 \* 4/50

**Permutation and Combination**

**Permutation**

School Trip {Chocolate factory}

Manufacture 6 different of chocolate {Dairy, 5 Star, Milky bar, Eclairs, Gems, Silk}

Student {Assignment} Right after you enter the factory which ever you see name first you see.

{for first name 6, for second name 5, for third name 4}

6 X 5 x 4 = 120 (120 is all the possible permutations respect to the chocolate name that he may see different combinations (Dairy, Gems, Milky), {Milky, Gems, Dairy}.

Permutation npr = n! /(n-r)! = 6! / (6-3)! = 6x5x4x3! / 3! = 120

n= name of chocolates = 6

r = 3 How many names of chocolate student to write.

**Combination**

**1 Combination {Dairy Gems Eclear }**

**In the next combination can’t use same elements – Dairy – Gems and Eclear**

In case of combination, you have another formula which will actually for help you to focus on the uniqueness of the objects that you are picking up so for this formula is

ncr = n! /r! (n-r) = 6! / 3! (6-3)! = 6x5x4x3! / 3x2x1x3! = 20 it means you can have 20 unique combination you have from above combination.