# Types of Naive Bayes Variants

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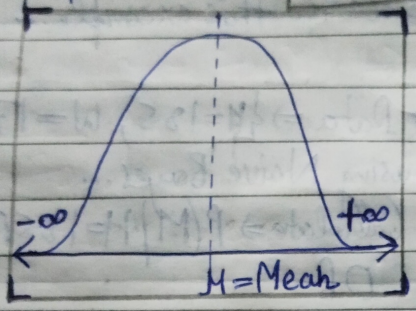
## Gaussian Distribution

→ Gaussian Distribution is applied when your data is Continuous.
→ The Probability Density function "f(x)" is calculated as :-

$$f(x) = \frac{1}{\sqrt{2\pi\sigma}} e^{\frac{-1}{2\sigma^2}(x-\mu)^2}$$

$\mu \Rightarrow$ Mean
$\sigma^2 \Rightarrow$ Variance
$\sigma \Rightarrow$ Standard Variation

→ The range of f(x) is :- $-\infty < f(x) < +\infty$




## Bernouli Distribution

→ Bernouli Distribution is mostly used where your Predicted data values are as Binary i.e; Positive/Negative, 0/1, True/False, Yes/No. then apply this Distribution.

→ P(Success) = "p"
→ P(Failure) = "q" = "1-p"

X = 1 { Success }
X = 0 { Failure }

P(X) is a Bernouli Distribution

if $X = x[0/1] = p^x \cdot (1-p)^{1-x}$

let x = 0 $= p^0 \cdot (1-p)^{1-0} \Rightarrow 1 \cdot 0 = 0$

let x = 1 $= p^1 \cdot (1-p)^{1-1} \Rightarrow p^1 = p \Rightarrow$ Success

∴ Hence Proved...

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# Multinomial Distribution

→ Discrete Count. i.e; where you want to count the occurances or the frequency of the data [Predicted data].

→ Formula to Calculate the Multinomial Distribution :-

$$P(X_1=x_1, X_2=x_2, \ldots\ldots X_K=x_K)$$

$X_1$ is the occurance or the total occurances of the Outcome...

$$\Rightarrow \frac{n!}{x_1! \cdot x_2! \cdot x_3!} p_1^{x_1} * p_2^{x_2} * p_3^{x_3} \cdots p_K^{x_K}$$

For example:-

| Blood | O | A | B | AB |
|---|---|---|---|---|
| Probability | 0.44 | 0.42 | 0.10 | 0.04 |

6 Indians

1 = O , 2 = A , 2 = B , 1 = AB

| 1 Person is having Blood Groups as 'O'. | 2 Persons having Blood Groups as "A" | 2 Persons having Blood Group as = "B". | 1 Person having Blood Groups as "AB". |
|---|---|---|---|

$$\Rightarrow P(X_1=1, X_2=2, X_3=2, X_4=1)$$

$$\Rightarrow \frac{6!}{1! \cdot 2! \cdot 2! \cdot 1!} 0.44^1 * 0.42^2 * 0.10^2 * 0.04^1$$

⇒ Evaluated :

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Coming Back of our Numerical Data Handling Question...

To Calculate the $P(H=185|M) * P(W=170|M) * 1/2$

We will apply Gaussian Distribution Formula:-

$$f(x) = \frac{1}{\sqrt{2\pi\sigma}} e^{\frac{-1}{2\sigma^2}(x-\mu)^2}$$

Here $x = 185$

Similarly for the $P(W=170|M) \Rightarrow$ $f(x) = \frac{1}{\sqrt{2\pi\sigma}} e^{\frac{-1}{2\sigma^2}(x-\mu)^2}$

Here $x = 170$