

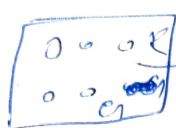
# Naive Bayes (Intuition)

① Naive Bayes Intuition {classification}  
↳ {BAYE'S THEOREM}

Rolling a Dice

{1, 2, 3, 4, 5, 6}

$2 \rightarrow \frac{1}{6}$ ,  $3 \rightarrow \frac{1}{6} \rightarrow$  {Independent Events}



$$P(R) = \frac{2}{5} \rightarrow \text{Red}$$

$$P(G) = \frac{2}{4} = \frac{1}{2} \rightarrow \text{Green}$$

event

$$P(R \text{ and } G) = P(R) * P(G|R) \rightarrow \text{conditional probability}$$

$$P(A \text{ and } B) = P(A) * P(B|A)$$

$$\textcircled{*} \boxed{P(A \text{ and } B) = P(B \text{ and } A)}$$

$$P(\text{yes}/K_i) = \frac{0.13}{0.13 + 0.05} = 0.72 = 72\%$$

$$P(\text{No}/K_i) = 1 - 0.72 = 0.28 = 28\%$$

Problem:-      Dataset  $\rightarrow$

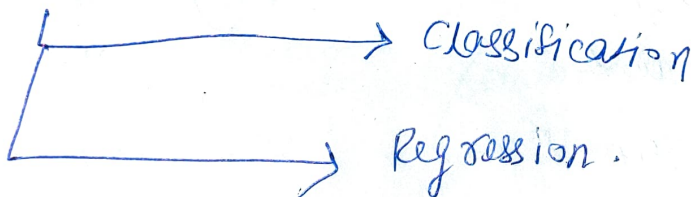
	<u>Outlook</u>		$P(Y)$	$P(N)$
	Yes	No		
Sunny	2	3	$\frac{2}{9}$	$\frac{3}{5}$
Overcast	4	0	$\frac{4}{9}$	$\frac{0}{5}$
Rain	3	2	$\frac{3}{9}$	$\frac{2}{5}$
Total $\rightarrow$	9	5		

		<u>Temperature</u>			
		Yes	No	$P(Y)$	$P(N)$
Hot	—	2	2	$2/9$	$2/5$
Mild	—	4	2	$4/9$	$2/5$
Cold	—	3	1	$3/9$	$1/5$
		9	5		

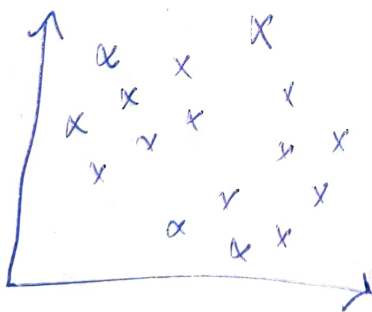
<u>PLAY</u>		$P(Y)$	$P(N)$
Yes	5	$\frac{9}{14}$	$\frac{5}{14}$
No	14		

$$\begin{aligned}
 P(\text{Yes} | \text{sunny, hot}) &= \frac{P(\text{Yes}) * P(\text{sunny} | \text{Yes}) * P(\text{hot} | \text{Yes})}{P(\text{sunny}) * P(\text{hot})} \\
 &= \frac{\frac{9}{14} * \frac{2}{9} * \frac{2}{9}}{\frac{2}{9}} = \frac{2}{9} = \boxed{0.031}
 \end{aligned}$$

KNN (K-Nearest Neighbour)

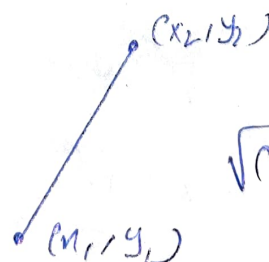


Classification



$K=5$

Eucledian distance



$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

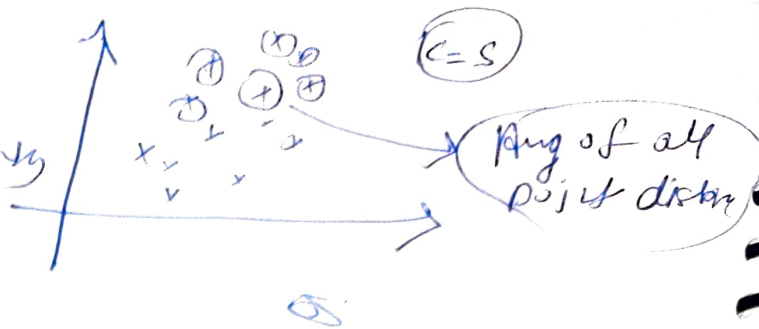
Manhattan



Regression

$K=S \rightarrow$  Hyperparameter

✱ Error rate  $\uparrow\uparrow$



$\rightarrow$  K-Nearest works very bad with outliers

$\rightarrow$  Imbalanced datasets.

Decision & Tree