Day	outlook	temperature	humidity	wind	Play Tennis
1	sunny	hot	high	weak	No
2	Sunny	hot	high	strong	No
3	overcast	hot	high	weak	Yes
4	rain	mild	high	weak	Yes
5	rain	cool	normal	weak	Yes
6	rain	cool	normal	strong	No
7	Overcast	cool	normal	Strong	Yes
8	Sunny	mild	high	weak	No
9	Sunny	cool	normal	weak	Yes
10	rain	mild	normal	weak	Yes
11	Sunny	mild	normal	strong	Yes
12	Overcast	mild	high	strong	Yes
13	Overcast	hot	normal	weak	Yes
14	rain	mild	high	strong	No

Question :- If the condition [sunny, Hot, High, Strong], what is the output in Naive Bayes Classifier?

Navie bayes Classifier

$P(Yes \mid [sunny, Hot, High, Strong]) = ?$

$P(No \mid [sunny, Hot, High, Strong]) = ?$

In my data set $P(yes) = \frac{9}{14}$ and $P(No) = \frac{5}{14}$

Total Feature → 4 [outlook, temperature, humidity, wind]

Total Number of yes 9

Total Number of No 5

Total number of yes and No = 14

① For "outlook" Feature :-

outlook	yes	No	P(yes)	P(No)
sunny	2	3	2/9	3/5
overcast	4	0	4/9	0/5
Rain	3	2	3/9	2/5
	9yes	5No		

(B) For "temperature" Feature :-

temperature	Yes	No	P(yes)	P(No)
hot	2	2	2/9	2/5
mild	4	2	4/9	2/5
cool	3	1	3/9	2/5
	9	5		

(C) For "humitidy" Feature :-

humidity	Yes	No	P(yes)	P(No)
high	3	4	3/9	4/5
Normal	6	1	6/9	1/5
	9	5		

(D) For "Wind" Feature :-

Wind	Yes	No	P(yes)	P(No)
weak	6	2	6/9	2/5
strong	3	3	3/9	3/5
	9	5		

P(Yes|[sunny, hot, high, strong]) =

$$\frac{P(yes) \times P(sunny|yes) \times P(hot|yes) \times P(high|yes) \times P(strong|yes)}{P(sunny) \times P(hot) \times P(high) \times P(strong)}$$

$$= \frac{9}{14} \times \frac{2}{9} \times \frac{2}{9} \times \frac{3}{9} \times \frac{3}{9} = 0.00705$$

P(No|[sunny, hot, high, strong]) =

$$\frac{P(No) \times P(sunny|No) \times P(hot|No) \times P(high|No) \times P(strong|No)}{P(sunny) \times P(hot) \times P(high) \times P(strong)}$$

$$= \frac{5}{14} \times \frac{3}{5} \times \frac{2}{5} \times \frac{4}{5} \times \frac{3}{5} = 0.0411$$

$$P(Yes|[sunny, hot, high, strong]) = \frac{0.007}{0.007 + 0.041} = \frac{0.007}{0.048}$$

$$= 0.145 = 14\%$$

$P(No|[Sunny, hot, High, Strong]) = \frac{0.041}{0.007+0.041} = \frac{0.041}{0.048}$

$= 0.854$

$= 85\%$

∴ Here we can see that the probability of "No" is greater than probability of "yes", so the output is "NO".