

Using Play Tennis dataset, we have predict whether the person will play tennis or not.

day	outlook	temp	humidity	wind	play
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

Day 15 :-

Outlook = Sunny	}
Temp = Cool	
Humidity = High	
Wind = Strong	



To find :- $P(D = \text{Yes} \mid \text{Outlook} = \text{Sunny}), P(D = \text{Yes} \mid \text{Humidity} = \text{High})$
 $P(D = \text{Yes} \mid \text{Temp} = \text{Cool}), P(D = \text{Yes} \mid \text{Wind} = \text{Strong})$

$P(D = \text{No} \mid \text{Outlook} = \text{Sunny}), P(D = \text{No} \mid \text{Humidity} = \text{High})$

$$V_{NB} = \underset{V_j \in [\text{Yes}, \text{No}]}{\text{Argmax}} P(V_j) \prod_i P(a_i | V_j)$$

$$= \underset{V_j \in [\text{Yes}, \text{No}]}{\text{Argmax}} P(V_j) * P(\text{Outlook} = \text{Sunny} | V_j) \\ * P(\text{Temp} = \text{Cool} | V_j) \\ * P(\text{Humidity} = \text{High} | V_j) \\ * P(\text{Wind} = \text{Strong} | V_j)$$

When $V_j = \text{Yes}$.

$$V_{NB}(\text{yes}) = P(\text{yes}) * P(\text{Outlook} = \text{Sunny} | \text{Yes}) \\ * P(\text{Temp} = \text{Cool} | \text{Yes}) \\ * P(\text{Humidity} = \text{High} | \text{Yes}) \\ * P(\text{Wind} = \text{Strong} | \text{Yes}) \\ = (9/14) * (2/9) * (3/9) * (3/9) \\ * (3/9) \\ = \underline{\underline{0.0053}}$$

When $V_j = \text{No}$.

$$V_{NB}(\text{No}) = P(\text{no}) * P(\text{Sunny} | \text{No}) * P(\text{Cool} | \text{No}) \\ * P(\text{High} | \text{No}) * P(\text{Strong} | \text{No})$$

$$= \left(\frac{5}{14}\right) * \left(\frac{3}{5}\right) * \left(\frac{1}{5}\right) * \left(\frac{4}{5}\right) * \left(\frac{3}{5}\right)$$

$$= 0.0205$$

———— X ——— X ——— X ——— X ———

$$V_{NB}(\text{yes}) = \frac{V_{NB}(\text{yes})}{V_{NB}(\text{yes}) + V_{NB}(\text{No})} = \frac{0.0053}{0.0053 + 0.0205}$$

$$= 0.2054$$

$$V_{NB}(\text{No}) = \frac{V_{NB}(\text{No})}{V_{NB}(\text{yes}) + V_{NB}(\text{No})} = \frac{0.0205}{0.0053 + 0.0205}$$

$$= 0.795$$

We observe
 There is 79.5% chance that person won't play tennis
 There is 20.5% chance that person will play tennis.

Hence, we conclude that person won't play tennis on the 15th Day.