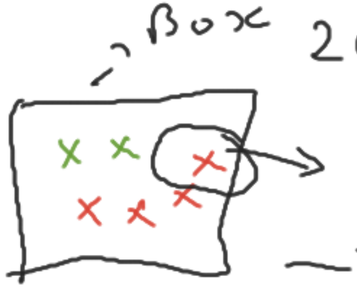
Naive Bayes Algorithm

Rolling Dice = {1, 2, 3, 4, 5, 6}

$n = 6$

$P(2) = \frac{1}{6}$ → Independent event

$P(4) = \frac{1}{6}$



→ Dependent

$P(R) = \frac{4}{6}$

$P(G) = \frac{2}{5}$

$$P(R \text{ and } G) = P(R) * P(G/R) \rightarrow \text{Dependent event}$$

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

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

$$P(A) * P(B/A) = P(B) * P(A/B)$$

(Given)

$$P(B/A) = \frac{P(B) * P(A/B)}{P(A)}$$

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

In this example,

$$Entropy(S) = -\left(\frac{9}{14}\right)\log_2\left(\frac{9}{14}\right) - \left(\frac{5}{14}\right)\log_2\left(\frac{5}{14}\right) = 0.9450 \qquad \text{Eq.3}$$

$$P(B/A) = \frac{P(B) * P(A/B)}{P(A)}$$

	P(y)	P(n)
Hot	2/9	2/5
Mild	4/9	2/5
Cool	3/9	1/5

Outlook:	yes	NO
Sunny	2	3
Overcast	4	0
Rain	3	2
	9	5

	P(y)	P(n)
Sunny	2/9	3/5
Overcast	4/9	0/5
Rain	3/9	2/5

	P(any)	P(y)	P(N)
Yes	9	9/14	= 5/14
NO	5		
	14		

Input (Sunny, Hot) → Output .. (y or N)

P . B = yes

P(A) = input(yes)(sunny)(hot)

$$P(B/A) = P(B) * P(A/B)$$

$$P(yes/(sunny, hot)) = P(yes) * P\left(\frac{sunny}{yes}\right) * P\left(\frac{hot}{yes}\right)$$

$$= \frac{9}{14} * \frac{2}{9} * \frac{2}{9}$$

$$= \frac{2}{63} \Rightarrow 0.031 \rightarrow yes$$

$$P\left(\frac{NO}{Sunny, hot}\right) = P(NO) * P\left(\frac{Sunny}{NO}\right) * P\left(\frac{hot}{NO}\right)$$

$$= \frac{5}{14} * \frac{3}{5} * \frac{2}{5} \qquad 0.031$$

$$1 - 0.73 = \frac{3}{35} \Rightarrow \boxed{0.085}$$

Sunny hot.

$$\frac{0.085}{0.085 + 0.031} \Rightarrow 0.73 \Rightarrow 73\% \quad \boxed{NO}$$