Subject : Naive Bayes.

Date :

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

	Temp (F)	Play Tennis
1.	warm 70	Yes
2.	32	No
3.	warm 65	No
4.	warm 75	Yes
5.	30	No.
6.	warm 75	Yes
7.	warm 72	No

50°F > warm then warm.

(a) Given the temperature is warm, calculate the probability of playing tennis.

$$P(\text{play} | \text{warm}) = \frac{P(\text{warm} | \text{Play}) * P(\text{Play})}{P(\text{warm})}$$

$$= \frac{3/3 * 3/7}{5/7}$$

$$= 0.6$$

(b) Calculate whether the player will play tennis or not given the weather is warm.

$$P(\text{play} | \text{warm}) = \frac{P(\text{warm}) * P(\text{Play})}{P(\text{warm})} = \frac{P(W|P) * P(P)}{P(W)}$$

$$= \frac{3/3 * 3/7}{5/7}$$

$$= 0.6$$

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$$P(\text{'Play'} \mid \text{Warm}) = \frac{P(\text{Warm} \mid \text{'Play'}) * P(\text{'Play'})}{P(\text{Warm})}$$

$$= \frac{2/4 * 4/7}{5/7}$$

$$= 0.4$$

As $0.6 > 0.4$, so the player will play tennis

(c) Calculate if the player will play tennis given outlook is sunny, temperature is cool, humidity is high and wind speed is strong.

Assuming conditional independence

$P(\text{play} \mid \text{sunny} \cap \overset{\text{cool}}{\text{Temp}} \cap \text{high} \cap \text{strong}) =$

$= P(\text{sunny} \cap \text{cool} \cap \text{high} \cap \text{strong} \mid \text{play}) * P(\text{play})$

$= P(\text{sunny} \mid \text{play}) * P(\text{cool} \mid \text{play}) * P(\text{high} \mid \text{play}) * P(\text{strong} \mid \text{play}) * P(P)$

$= 2/9 * 3/9 * 3/9 * 3/9 * 9/14$

$= 0.0053$

Conditional Independence

$P(A \cap B \mid C) = P(A \mid C) * P(B \mid C)$

Considering A and B are independent of each other.

$P(\text{'Play'} \mid \text{sunny} \cap \text{cool} \cap \text{high} \cap \text{strong})$

$\Rightarrow P(\text{sunny} \mid \text{'play'}) * P(\text{cool} \mid \text{'play'}) * P(\text{high} \mid \text{'play'}) * P(\text{strong} \mid \text{'play'}) * P(P)$

$\Rightarrow 3/5 * 1/5 * 4/5 * 3/5 * 5/14$

$\Rightarrow 0.0206$

$\therefore$ So will not play