

Naive Bayes Classifier

[Considered term of Naive Bayes]

Prior probabilities — Prob of Yes & No

$$P(\text{Yes}) = 9/14 = 0.64$$

$$P(\text{No}) = 5/14 = 0.36$$

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current probabilities / conditional probabilities for all attributes

| outlook | Y | N |
|----------|-----|-----|
| Sunny | 2/9 | 3/5 |
| overcast | 4/9 | 0 |
| rain | 3/9 | 2/5 |

| humidity | Y | N |
|----------|-----|-----|
| high | 3/9 | 4/5 |
| normal | 6/9 | 1/5 |

| temp | Y | N |
|------|-----|-----|
| hot | 2/9 | 2/5 |
| mild | 2/9 | 2/5 |
| cool | 3/9 | 1/5 |

| windy | Y | N |
|--------|-----|-----|
| strong | 3/9 | 3/5 |
| weak | 6/9 | 2/5 |

classify into Yes/No

(outlook = sunny, Temperature = cool, Humidity = high,
wind = strong) — Given this condition
chc this instance belong to Yes/No

$$V_{NB} = \arg \max_{V_j \in \{yes, no\}} P(V_j) \prod_i P(a_i | V_j)$$

$$= \arg \max_{V_j \in \{yes, no\}} P(V_j) P(\text{Outlook} = \text{sunny} | V_j)$$

$$P(\text{Temp} = \text{cool} | V_j)$$

$$P(\text{Humidity} = \text{high} | V_j) P(\text{Wind} = \text{strong} | V_j)$$

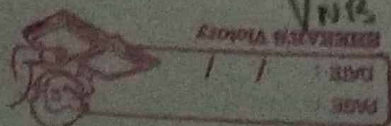
Sub yes in (Vj)

$$\begin{aligned} V_{NB}(yes) &= P(yes) P(\text{sunny} | yes) \\ &\quad P(\text{cool} | yes) P(\text{high} | yes) \\ &\quad P(\text{strong} | yes) = \\ &\quad 0.063 \end{aligned}$$

Sub no in (Vj)

$$\begin{aligned} V_{NB}(no) &= P(no) P(\text{sunny} | no) P(\text{cool} | no) \\ &\quad P(\text{high} | no) P(\text{strong} | no) \\ &= 0.0206 \end{aligned}$$

$$V_{NB}(yes) = \frac{V_{NB}(yes)}{V_{NB}(yes) + V_{NB}(no)} = 0.205$$



$$V_{NB}(NO) = \frac{V_{NB}(NO)}{V_{NB}(YU) + V_{NB}(NO)} = 0.795$$

$$P(YU) + P(NO) = 0.205 + 0.795 \\ = 1$$

Since $\text{prob}(NO) > \text{prob}(YU)$

then person want to able to
play tennis