

Naive Bayes

No	Color	Legs	Height	Smelly	Species
1	W	3	Short	Y	M
2	G	2	Tall	N	M
3	G	3	S	Y	M
4	W	3	S	Y	M
5	G	2	S	N	H
6	W	2	T	N	H
7	W	2	T	N	H
8	W	2	S	Y	H

$$P(M) = 1/2, \quad P(H) = 1/2$$

We have the subtable based on the features

Color	M	H
White	1/2	3/4
Green	2/4	1/4

Leg	M	H
2	1/4	4/4
3	3/4	0/4

Height	M	H
Tall	3/4	2/4
Short	1/4	2/4

Smelly	M	H
Y	3/4	1/4
N	1/4	3/4

$P(\text{New instance})$ while new instance (color = Green | legs = 2, Height = Tall, & Smelly = No)

$$P(M | \text{New Instance}) =$$

$$P(M) \times P(\text{Green} | M) \times P(1.2 | M) \times P(\text{Tall} | M) \times P(\text{No} | M)$$

$$= 0.0117$$

$$P(H | \text{New Instance}) =$$

$$P(H) \times P(\text{Green} | H) \times P(2 | H) \times P(\text{Tall} | H) \times P(\text{No} | H)$$

$$= 0.047$$

$$\text{While } P(M | \text{New Instance}) < P(H | \text{New Instance})$$

\Rightarrow Hence the possible of New Instance may be H

b) As we can see the probability $P(3 | H) = 0/4$

Using Laplace smoothing, we can represent $P(w' | \text{Positive})$

$$= \frac{\text{number of review } w' \text{ and } y = \text{positive} + \alpha}{N + \alpha \times K}$$

$$N + \alpha \times K$$

α represent smoothing parameter

K ——— number of dimensions

N number of reviews with $y = \text{positive}$

$$P(3 \text{ legs} | H) = \frac{0(\text{instance of white}^{3 \text{ legs}} \text{ color}) + 1}{4(\text{total } H \text{ instances}) + 3(\text{total } 3 \text{ legs})}$$

$$= \frac{1}{7}$$

$$= \frac{1}{7}$$

$$P(2 \text{ legs} | H) = \frac{4 + 1}{4 + 3} = \frac{5}{7}$$

$$4 + 3$$

$$5$$