Vahe Aleksanyan Homework 5. Machine Learning.

Pr.1. a) {Yellow, sweet, Long}.

$P(Y|X) = P(Y = C_k | X = x_0)$ $k = 1 \dots K$ $X = (X_1, \dots X_p)$ p feature

Y belongs to classes $C_1 \dots C_k$.

Y = Mango, Banana, others.

X = Yellow, sweet, Long

$$P(\text{fruit} | \text{Yellow, sweet, Long}) = \frac{P(\text{Yellow, sweet, Long} | \text{Fruit}) \cdot P(\text{Fruit})}{P(\text{Yellow, sweet, Long})}$$

$P(\text{Mango}) = \frac{650}{1200}$

$P(\text{Banana}) = \frac{400}{1200}$

$P(\text{other}) = \frac{150}{1200}$

Liklihoods:

For Mango

$P(\text{Yellow} | \text{Mango}) = \frac{500}{650}$

$P(\text{sweet} | \text{Mango}) = \frac{320}{650}$

$P(\text{Long} | \text{Mango}) = \frac{100}{650}$

For Banana.

$P(\text{Yellow} | \text{Banana}) = \frac{320}{400}$

$P(\text{sweet} | \text{Banana}) = \frac{370}{400}$

$P(\text{Long} | \text{Banana}) = \frac{350}{400}$

others.

$P(\text{Yellow} | \text{others}) = \frac{50}{150}$

$P(\text{sweet} | \text{others}) = \frac{140}{150}$.

$P(\text{Long} | \text{others}) = \frac{70}{150}$.

$$P(\text{Mango} \mid \text{Yellow, sweet, Long}) = \frac{\frac{200}{650} \cdot \frac{300}{650} \cdot \frac{100}{650} \cdot \frac{650}{1200}}{P(\text{Yellow, sweet, Long})} = X_1$$

$$P(\text{Banana} \mid \text{Yellow, sweet, Long}) = \frac{\frac{320}{400} \cdot \frac{370}{400} \cdot \frac{350}{400} \cdot \frac{400}{1200}}{P(\text{Yellow, sweet Long})} = X_2.$$

$$P(\text{others} \mid \text{Yellow, sweet, Long}) = \frac{\frac{50}{150} \cdot \frac{140}{150} \cdot \frac{70}{150} \cdot \frac{150}{1200}}{P(\text{Yellow, sweet, Long})} = X_3$$

$X_1 \simeq 0,01$

$X_2 \simeq 0,22.$

$X_3 \simeq 0,02$

So the prediction will be banana.