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BE-B-20

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# * Naive Bayes Algorithm

1000 fruits - could be either banana, orange or other.

## * Training Dataset

| Fruit | Long (x1) | Sweet (x2) | Yellow (x3) |
|---|---|---|---|
| Orange | 0 | 1 | 0 |
| Banana | 1 | 0 | 1 |
| Banana | 1 | 1 | 1 |
| Other | 1 | 1 | 0 |

## * Training Data

| Type | Long | Not Long | Sweet | Not Sweet | Yellow | Not Yellow | Total |
|---|---|---|---|---|---|---|---|
| Banana | 400 | 100 | 350 | 150 | 450 | 50 | 500 |
| Orange | 0 | 300 | 150 | 150 | 300 | 0 | 300 |
| Other | 100 | 100 | 150 | 50 | 50 | 150 | 200 |
| Total | 500 | 500 | 650 | 350 | 800 | 200 | 1000 |

Date: __/__/____

Step 1: Probabilities for class of fruit

$P(Y = \text{Banana}) = 500/1000 = 0.50$
$P(Y = \text{Orange}) = 300/1000 = 0.30$
$P(Y = \text{Other}) = 200/1000 = 0.20.$

Step 2: Probability of Evidence

$P(x1 = \text{Long}) = 500/1000 = 0.50$
$P(x2 = \text{Sweet}) = 650/1000 = 0.65$
$P(x3 = \text{Yellow}) = 800/1000 = 0.80$

Step 3: Likelihood of evidences:

$P(x1 = \text{Long} \mid Y = \text{Banana}) = 400/500 = 0.80$
$P(x2 = \text{Sweet} \mid Y = \text{Banana}) = 350/500 = 0.70$
$P(x3 = \text{Yellow} \mid Y = \text{Banana}) = 450/500 = 0.90.$

Overall probability of Likelihood of evidence of Banana =
$0.8 * 0.70 * 0.90 = 0.504$

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Step 4: If fruit is Long, Sweet & yellow

$$P(\text{Banana} \mid \text{Long, sweet \& yellow}) = \frac{P(\text{Long} \mid \text{Banana}) * P(\text{Sweet} \mid \text{Banana}) * P(\text{Yellow} \mid \text{Banana}) * P(\text{Banana})}{P(\text{Long}) * P(\text{Sweet}) * P(\text{Yellow})}$$

$$= \frac{0.8 * 0.7 * 0.9 * 0.5}{P(\text{Evidence})}$$

$$= 0.252 / P(\text{Evidence})$$