

★ Multinomial Naïve Bayes :-

Date / /
DELTA Pg No.

prior probabilities :

$$P(\text{class} = A) = \frac{5}{10} = \frac{1}{2} = 0.5$$

$$P(\text{class} = B) = \frac{5}{10} = \frac{1}{2} = 0.5$$

No. of words in class A = ~~15~~ 15

No. of words in class B = 11

Unique words = { Natural, Language,

processing, Model, Learning, Ngram, Text,

classification, computer, vision, Image, object,

Segmentation, Recognition, }

$$\therefore |V| = 14$$

Conditional probabilities :

$d_1 = \{ \text{object, Recognition, Model} \}$

$d_2 = \{ \text{Text Recognition Model} \}$

$$P(\text{object}/A) = \frac{0+1}{15+14} = \frac{1}{29}$$

$$P(\text{Recognition}/A) = \frac{0+1}{15+14} = \frac{1}{29}$$

$$P(\text{Model}/A) = \frac{4+1}{15+14} = \frac{5}{29}$$

Now,

$$P(A/d_1) = P(\text{class} = A) \times P(\text{object}/A) \times P(\text{Recognition}/A) \times P(\text{Model}/A)$$

$$= \frac{1}{2} \times \frac{1}{29} \times \frac{1}{29} \times \frac{5}{29}$$

$$= \underline{\underline{1.02505 \times 10^{-4}}}$$

$$P(\text{object}/B) = \frac{2+1}{11+14} = \frac{3}{25}$$

$$P(\text{Recognition}/B) = \frac{1+1}{11+14} = \frac{2}{25}$$

$$P(\text{Model}/B) = \frac{1+1}{11+14} = \frac{2}{25}$$

$$P(B/d_1) = P(\text{class} = B) \times P(\text{object}/B) \times P(\text{Recognition}/B) \times P(\text{Model}/B)$$

$$= \frac{1}{2} \times \frac{3}{25} \times \frac{2}{25} \times \frac{2}{25} = \frac{6}{15625}$$

$$= \underline{\underline{3.84 \times 10^{-4}}}$$

$d_1 \rightarrow B$

$$P(\text{Text}/A) = \frac{2+1}{15+14} = \frac{3}{29}$$

$$P(\text{Recognition}/A) = \frac{0+1}{15+14} = \frac{1}{29}$$

$$P(\text{Model}/A) = \frac{4+1}{15+14} = \frac{5}{29}$$

$$P(d_2/A) = P(\text{class} = A) \times P(\text{Text}/A) \times P(\text{Recognition}/A) \times P(\text{Model}/A)$$

$$= \frac{1}{2} \times \frac{3}{29} \times \frac{1}{29} \times \frac{5}{29}$$

$$= \underline{\underline{3.07515683 \times 10^{-4}}}$$

$$P(\text{Text}/B) = \frac{0+1}{11+14} = \frac{1}{25}$$

$$P(\text{Recognition}/B) = \frac{0+1}{11+14} = \frac{1}{25}$$

$$P(\text{Model}/B) = \frac{1+1}{11+14} = \frac{2}{25}$$

$$P(d_2/B) = P(\text{class} = B) \times P(\text{Text}/B) \times P(\text{Recognition}/B) \times P(\text{Model}/B)$$

$$= \frac{1}{2} \times \frac{1}{25} \times \frac{1}{25} \times \frac{2}{25} = \frac{1}{15625}$$

$$= 6.4 \times 10^{-5}$$

$$= \underline{\underline{0.64 \times 10^{-4}}}$$

$$\therefore P(d_2/A) > P(d_2/B) \Rightarrow$$

$d_2 \rightarrow A$