<u>IC 252:LAB1</u>

Conditional probability and Bayes' rule

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1. When coded messages are sent, sometimes there are errors in transmission. In particular, Morse code uses "dots" and "dashes", which are known to occur in the proportion of 3:4. i.e. P (dot sent) = 3/7 and (P(dash sent) = 1-P(dot sent)). Suppose there is interference in transmission line, and with probability 1/8 a dot is mistakenly received as dash, and vice versa. Write a program to find the probability of dot sent given that dot received. Take the probability of sending "dot" and probability of "dot" received as "dash" as user inputs.

2. A bin contains x defective (that immediately fail when put in use), y partially defective (that fail after a couple of hours of use), and z acceptable transistors. Write program to accept the values for x, y and z (user inputs). A transistor is chosen at random from the bin and put into use. If it does not immediately fail, write a program to find the probability it is acceptable i.e. P(accepted | not defective).

3. A publishing firm wants to develop special printing machines for English. For this, they need to determine the probability of occurrence of specific letters and words. You are given large text file (fileA-TimeMachine.txt). In this problem, uppercase and lowercase alphabets are considered the same and other characters like whitespace, punctuation and numerals are to be omitted. Write a program to accept the file name and two alphabets, say X

and Y from the user. The program should compute a) Prior probability of X i.e. P(X). b) Prior probability of Y i.e. P(Y). c) Conditional probabilities i.e., probability of occurrence of X given Y and probability of occurrence of Y given X. Example: We are looking for the bigrams . Let X = ‘a’ and Y = ‘b’. Prior probability of X means P(X = ‘a’). Conditional probability P(X = ‘a’ | Y = ‘b’) means probability of observing alphabet ‘a’ immediately after observing (given) alphabet ‘b’ (i.e. Y followed by X). d) Determine the posterior probabilities (probability of Y given X, P(Y|X) and probability of X given Y, P(X|Y)) using Bayes rule.

1) Gen soln

P (dot sent) = a

P (mistakenly dot received as dash) = b

$$P\,(\text{dot sent} \mid \text{dot received}) = \frac{a(1-b)}{a(1-b) + (1-a)\,b}$$

Part. soln

a = 3/7 , b = 1/8

$$\text{Prob} = \frac{3/7 \times 7/8}{3/7 \times 7/8 + 4/7 \times 1/8} = \frac{21}{25} = 0.84$$

2) P (defective) = x , P (partially defective) = y

P (acceptable) = z

$$P\,(\text{accepted} / \text{not defective}) = \frac{z}{y + z}$$

Code is displayed & in terminal, output is displayed with an examples as mentioned in question