



National Institute of Technology, Tiruchirappalli – 15
Department of Computer Science & Engineering

ASSIGNMENT # 2

Degree / Branch : B.Tech / CSE
Subject Code / Name : CSPE63/ Artificial Intelligence & its applications
Year / Semester : III / VI

Problem 1

Consider a test to detect a disease that 0.1 % of the population have. The test is 99 % effective in detecting an infected person. However, the test gives a false positive result in 0.5 % of cases. If a person tests positive for the disease what is the probability that they actually have it?

Problem 2

Two production lines produce the same part. Line 1 produces 1,000 parts per week of which 100 are defective. Line 2 produces 2,000 parts per week of which 150 are defective. If you choose a part randomly from the stock what is the probability it is defective? If it is defective what is the probability it was produced by line 1?

Problem 3

Marie is getting married tomorrow, at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman correctly forecasts rain 90 % of the time. When it doesn't rain, he incorrectly forecasts rain 10 % of the time. What is the probability that it will rain on the day of Marie's wedding? (Assume that there are no leap years).

Problem 4

You are selling a product in an area where 30 % of the people live in the city and the rest live in the suburbs. Currently 20 % of the city dwellers use your product and 10 % of the suburbanites use your product. You are presented with two new sales strategies the first will increase your market share in the suburbs to 15 %. The second will increase your market share in the city to 25 %. Which strategy should you adopt? What percentage of the people who own your product are city dwellers before your new sales drive?

Problem 5

In a casino in Blackpool there are two slot machines: one that pays out 10 % of the time, and one that pays out 20 % of the time. Obviously, you would like to play on the machine that pays out 20 % of the time but you do not know which of the two machines is the more generous. You thus adopt the following strategy: you assume initially that the two machines are equally likely to be the generous machine. You then select one of the two machines at random and put a coin into it. Given that you lose that first bet estimate the probability that the machine you selected is the more generous of the two machines.

Problem 6 :Empirical Example:

Suppose a survey of 1000 drivers in a metropolitan area during a 3-year period was taken. The following results were found.

Age Group	18-25	26-39	40-55	55+	
0-1 Accidents	100	150	250	75	575
2-3 Accidents	150	25	125	25	325
3+ accidents	50	25	25	0	100
Totals	300	200	400	100	1000

Suppose we randomly select a driver from the group. What is the probability that the driver,

- a) Is in the 26-39 age group, given they have more than 3 accidents.
- b) Had 2-3 accidents, given they are in the 18-25 age group.
- c) Had 0-1 accidents, given they are in the 40-55 age group.
- d) Is in the 40-55 age group, given they had 0-1 accidents

Problem 7 :

Suppose we send 30% of our products to company A and 70% of our products to company B. Company A reports that 5% of our products are defective and company B reports that 4% of our products are defective. (Use a tree diagram)

- a) Find the probability that a product is sent to company A and it is defective.
- b) Find the probability that a product is sent to company A and it is not defective.
- c) Find the probability that a product is sent to company B and it is defective.
- d) Find the probability that a product is sent to company B and it is not defective.

Problem 8 :

One box has 7 red balls and 3 white balls; a second box has 6 red balls and 4 white balls. A pair of dice are tossed. If the sum of the dice are less than five, a ball is selected from the first box, otherwise the ball is selected from the second box. Find the probability of getting a red ball.

Problem 9: Bayes Formula:

One urn has 4 red balls and 1 white ball; a second urn has 2 red balls and 3 white balls. A single card is randomly selected from a standard deck. If the card is less than 5 (aces count as 1), a ball is drawn out of the first urn; otherwise a ball is drawn out of the second urn. If the drawn ball is red, what is the probability that it came out of the second urn?

Problem 10: Bayes Formula:

To evaluate a new test for detecting Hansen's disease, a group of people 5% of which are known to have Hansen's disease are tested. The test finds Hansen's disease among 98% of those with the disease and 3% of those who don't. What is the probability that someone testing positive for Hansen's disease under this new test actually has it?
