EE306002: Probability **Spring 2022**
College of Electrical Engineering
National Tsing Hua University

Homework #3
Coverage: chapter 5

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Problem 5.1.24 Vincent is a patient with the life threatening blood cancer leukemia, and he is in need of a bone marrow transplant. He asks n people whether or not they are willing to donate bone marrow to him if they are a close bone marrow match for him. Suppose that each person's response, independently of others, is positive with probability p_1 and negative with probability $1 - p_1$. Furthermore, suppose that, independently of the others, the probability is p_2 that a person tested is a close match. Find the probability that Vincent finds at least one close bone marrow match among these n people.
(*Hint*: For $0 \leq i \leq n$, let A_i be the event that i of the n individuals respond positively to Vincent's request. Let X be the number of close bone marrow matches among those who will be tested. To find $P(X \geq 1) = 1 - P(X = 0)$, calculate $P(X = 0)$ by using the Law of Total Probability.)

Problem 5.3.14 For certain software, independently of other users, the probability is 0.07 that a user encounters a fault. What are the chances that the 30th user is the 5th person encountering a fault?

Problem Ch5-Review 2. The time between the arrival of two consecutive customers at a post office is 3 minutes, on average. Assuming that customers arrive in accordance with a Poisson process, find the probability that tomorrow during the lunch hour (between noon and 12:30 p.m.) fewer than seven customers arrive.

Problem Ch5-Review 20. Passengers are making reservations for a particular flight on a small commuter plane 24 hours a day at a Poisson rate of 3 reservations per 8 hours. If 24 seats are available for the flight, what is the probability that by the end of the second day all the plane seats are reserved?

Problem Ch5-Review 26. Suppose that n babies were born at a county hospital last week. Also suppose that the probability of a baby having blonde hair is p. If k of these n babies are blondes, what is the probability that the i-th baby born is blonde? (Note: Please show the detail of your proof.)

References

[1] Saeed Ghahramani, *Fundamentals of Probability: With Stochastic Processes,* Chapman and Hall/CRC; 4th edition (September 4, 2018)