Name: Notes

SA402 · Dynamic and Stochastic Models Fall 2019 · Uhan

Quiz 2 – 4 September 2019

Instructions. You have 15 minutes to complete this quiz. You may use your calculator. You may not use any other materials (e.g., notes, homework, books).

Problem	Weight	Score
1	1	
2	1	
3	1	
4	1	
5	1	
Total		/ 50

For Problems 1 and 2, consider the following setting.

As an analyst at the Markov Company, you have been tasked with better understanding the performance of the company's high-speed computer network. There are only two types of messages sent on the network: 100-byte messages and 10000-byte messages.

Let X be the travel time of a message on the company's network in seconds, and let Y be the size of a message in bytes. Based on historical data, you have determined the joint pmf between X and Y:

		Y	
	p_{XY}	100	10000
X	1/100	15/36	0
	1/10	10/36	0
	1	5/36	3/36
	10	0	2/36
	100	0	1/36

Problem 1. What is the probability that a message has a travel time of 1 second?

- All of you answered this problem correctly.

Problem 2. What is the probability that the message is 10000 bytes long, given that its travel time is 1 second?

- Be careful when applying the definition of conditional probability.

For Problems 3, 4 and 5, consider the following setting.

Another analyst at the Markov Company has collected some other data on the company's network performance. According to her data, 3/4 of the messages sent on the network are 100 bytes long, and 1/4 are 10000 bytes long. In addition, she found that 1/5 of 100-byte messages have a travel time of 1 second, while 2/5 of 10000-byte messages have a travel time of 1 second.

Let X be the travel time of a message on the company's network in seconds, and let Y be the size of a message in bytes.

Problem 3. What is the probability that a message has a travel time of 1 second?

- Review the law of total probability from Lesson 3.

Problem 4. Are X and Y independent? Give a numerical argument for why or why not.

- You can use the definition of independence, or...
- You may find it easier to use one of the facts about independence and conditional probabilities at the bottom of page 3 of Lesson 3.

Problem 5. What is the expected size of a message in bytes?

- Review the definition of expected value. Remember that intuitively, the expected value is a weighted average. What is the (weighted) average message size?