UC Berkeley
Department of Electrical Engineering and Computer Sciences

EE126: Probability and Random Processes

Discussion 5
Spring 2016

Date: Wednesday, February 24, 2016

Problem 1. Many casino games are only slightly biased in favor of the casino, so that the casino makes a profit while customers maintain interest. Imagine such a game, where the probability of the casino winning is 0.51. Suppose you play 400 games, and let L denote the number of times you lose. Use whichever approximations to the binomial you feel are appropriate to calculate the following:

(a) $P(190 \leq L \leq 210)$

(b) $P(210 \leq L \leq 230)$

Problem 2. Let X be the sum of 20 i.i.d. Poisson random variables $X_1, \ldots, X_{20}$ with $\mathrm{E}[X_i] = 1$. Use Markov's inequality, Chebyshev's inequality, and Chernoff Bound to find an upper bound of $P(X \geq 26)$. Use CLT to estimate $P(X \geq 26)$.

Problem 3. (Adapted from Midterm 2 Fall 2015) A customer wants to watch the latest James Bond movie that has 420 packets. You, the CEO of Netflix, have two transmission choices. One option is to use a channel having a "moderate" quality, while the other option involves a channel that is either "good" or "bad". For the good-or-bad channel, it is equally likely to be in the good state or the bad state for **all packets**. (Each transmission involves a single packet). The moderate channel drops packets independently with probability 1/2. If the good-or-bad channel is in good state, it drops packets independently with probability 1/3, while if the good-or-bad channel is in bad state, it drops packets independently with probability 2/3. Since the movie must be streamed fast, you can only send 900 packets. As long as at least 420 packets are received by the customer, the transmission succeeds.

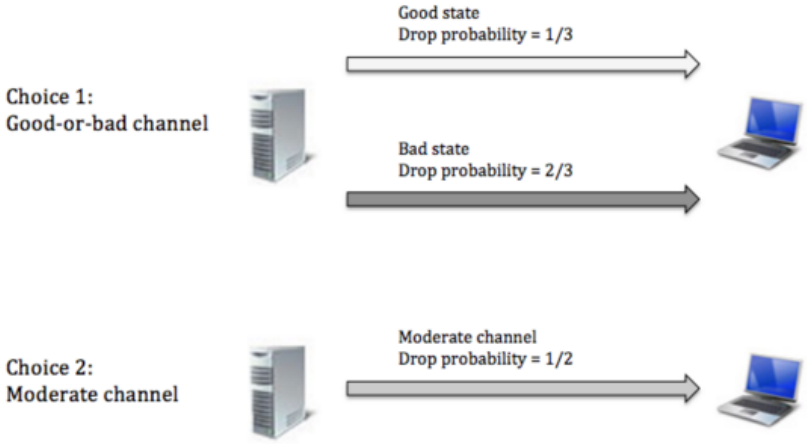

Figure 1: Channel model

(a) What is the expected number of packets that the customer will receive if the moderate channel is used? What is the expected number of packets that the customer will receive if the good-or-bad channel is used?

(b) What is the (approximate) probability that the transmission succeeds if the good-or-bad channel is used? What is the (approximate) probability that the transmission succeeds if the moderate channel is used? Which option should you pick?