SI 301
Assignment 10
Due in class on Tue November 21ᵗʰ

Reading: Sections 15.1-15.5, 16.1-16.7 of textbook.

1. Problem 4 in section 15.10 of textbook.

2. Sandra has two exams on the same day. She doesn't have enough time to study for both exams, so she chooses to study for only one uniformly at random. If she studies for Exam 1, the probability that she gets an A on it is 0.85. If she studies for Exam 2, the probability that she gets an A on it is 0.70. Sandra got an A on the exam she studied for. What's the probability that she studied for Exam 1?

3. The 2018 FIFA World Cup is around the corner! You work at Facebook and you are tasked with helping decide which users should be served an ad about the upcoming World Cup. You would like to serve the ad only to those users who are truly interested in the World Cup. To help you get started, you manager gives you a few hints.

   i.   83% of users worldwide who are interested in the World Cup visit the FIFA Facebook page some time before the tournament starts (probably because they are interested in the outcome of the qualifying games).
   ii. 10% of users worldwide who are not really interested in the World Cup visit the FIFA Facebook page (probably because they are bored or just by accident)
   iii. The percentage of users who are interested in the World Cup varies dramatically by country.

   Your manager wants you to work on the problem using data from a single country in order to test your approach before allowing you to make decisions on the whole site (she wants to make sure she can trust you). Hence, she gives a full data set from users in Colombia that contains all users who recently visited FIFA Facebook page. Then she asks you: is there at least a 0.9 probability that these users are interested in the World Cup? You realize that without knowing the percentage of Colombian users who are interested in the World Cup, you can't give a very confident answer. In order for your answer to be "yes", what is the smallest possible value for the percentage of Colombian users who are interested in the World Cup? Explain your reasoning.

4. Problem 5 in section 16.8 of textbook

5. Consider the "cupcake experiment" we did in class, where students sequentially pulled a cupcake from a hat and guessed the color of the majority of cupcakes in the hat. Assume you are the 15ᵗʰ person and all 14 people before you guessed "pink". Additionally, assume that instead of pulling a random cupcake from the

hat once like all the previous volunteers, you are allowed to do so 3 times. That is, you pull a cupcake, look at its color, put it back in the hat, shuffle, and repeat twice. Assuming all students before were acting rationally, if you pull a brown cupcake in every one of the three random draws, would it be more rational for you to guess "pink-majority" or "brown-majority"? Explain your reasoning using Bayes' Rule.