

Statistics Homework 1

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July 5, 2017

1. Do the first two chapters, “Intro to basics” and “Vectors,” of the Datacamp R tutorial at <https://www.datacamp.com/courses/free-introduction-to-r>. Log in with your Facebook or Gmail.
2. Calculate the probability that the NBA championship series between the Golden State Warriors and the Cleveland Cavaliers lasts 5 games or longer, assuming that the games are independent and the probability that Golden State wins an individual game is $\frac{2}{3}$.
3. In class, we saw an example in which a team is more likely to win a game when they’ve won the previous game, i.e. $P(G_1) = \frac{2}{3}$ but $P(G_2|G_1) = \frac{3}{4}$ and $P(C_1) = \frac{1}{3}$ but $P(C_2|C_1) = \frac{1}{2}$. Now consider a scenario in which a team is *less* likely to win the second game after winning the first (perhaps losing a game makes the loser motivated to come back and play harder in the next game): $P(G_2|G_1) = \frac{1}{2}$ and $P(C_2|C_1) = \frac{1}{4}$. Compute the probability that the first two games end with the teams tied 1-1.
4. **CHALLENGE:** in the previous question, we would say that games are *positively correlated* if winning the first game makes the winner more likely to win the second ($P(G_2|G_1) > P(G_1)$ and $P(C_2|C_1) > P(C_1)$), and *negatively correlated* if winning the first game makes the winner less likely to win the second ($P(G_2|G_1) < P(G_1)$ and $P(C_2|C_1) < P(C_1)$). Prove that when the first two games are positively correlated, the chance of a 1-1 tie is lower than when the games are independent, and that when the first two games are negatively correlated, the chance of a 1-1 tie is higher than when the games are independent.
5. **CHALLENGE:** this problem continues the cooties example from class. The probability of the cooties test coming out positive when the person being tested *does not* have cooties is known as the “false positive rate.” How low does the false positive rate have to be to make the probability of a positive cooties test being correct greater than 50%?