INFSCI 1091: Winning in Sports with Data

Homework 1

1. Your team scored a touchdown 10 seconds before the end of regulation to cut the opponent's lead to 1 point. You are contemplating whether to take the extra point kick or go for the two-point conversion. What would you advice your team to do and why? (20 points)

2. Two of the biggest comebacks in the history of sports have been (i) the Cleveland Cavaliers 2016 NBA title coming back from a 3-1 NBA finals series and (ii) the Super Bowl 2017 comeback win of the Patriots against the Falcons. Which of the two comebacks was most impressive, i.e., more improbable to happen? (20 points)
    a. The lowest win probability for the Patriots during the super bowl was 2.1%
    b. Golden State Warriors were favored over Cleveland Cavaliers for games 5, 6 and 7 by the betting market by 8, 2.5 and 5 points respectively.
    c. For an NBA matchup where the favorite is favored by x points, the actual win margin has been shown to follow a normal distribution with mean equal to x and a standard deviation of 12.

3. Alice and Bob arrive at the Rec Center at times uniformly distributed between 6pm and 8pm independently from each other, that is, their arrival time has a probability density function:

$$f(t) = \begin{cases} \frac{1}{8-6}, & if\ 6 \le t \le 8 \\ 0, & otherwise \end{cases}$$

    Using Monte Carlo simulation find the probability that they will get there within 20 minutes from each other? Provide a brief description of your code. (25 points)

4. Download and analyze the appropriate data from pro-football-reference.com to answer the question: “Who of the two arguably best QBs in Steelers’ history, Terry Bradshaw and Ben Roethlisberger, is better?”. Explain your answer. (35 points)