Week 6 - Discussion

Problem 1. Novak Djokovic is my favorite tennis player. We assume that each his 1st serve speed is independent and normally distributed. In his career, his average 1st serve speed is 114mph and the corresponding standard deviation is 7.

- a. Explain two reasons why the assumption in the question is not perfect.
- b. When a player hits a 1st serve with high speed, the commentator will mention this serve. Assume the commentator mentions Novak's 1st serve after around his 80 1st serves. Find the threshold speed value which is mentioned by the commentator. [Table, R]
- c. Novak won the 2021 Australian Open. Due to the time conflict, I did not see this game. My friend told me that Novak hit a 1st serve with 137 mph in this game. May I doubt his words if I think a strange event is something that happens less than 1 in a 100 times? [R]
- d. My friend also provided 5 1st serves speed: 116, 112, 128, 118, 115. Then, he claimed that Novak had greater 1st serve speed than his average level in this game. Is his conclusion reasonable based on the same belief of strange event with part (c)? [R, PH of PHANTOM]

Problem 2. Novak's team designs a one-month special training for him to improve his 1st serve performance. After this training, his team would like to ask your help to analyze his 1st serve skills.

- a. You are told that the standard deviation of his single 1st serve speed is 4 now, but the average speed μ is unknown. Assume the speed of his 1st serve is still normally distributed. Novaks' coach wants μ to be within $[\overline{X} - 1.6, \overline{X} + 1.6]$, where \overline{X} is the average speed of 25 single 1st serves. Can you give the confidence level of this interval. [Memorized areas not tables or tech]
- b. After analysis, you figure out that his average 1st serve speed is 115mph now. Apply R to double check your answer of the confidence level in part (a) (Hint: replicate 10000 average speed of his 25 1st serves, and then analyze these simulated data).