

Statistics and hypothesis testing

Week 1

Question 1

You're about to get on a plane to Seattle. You want to know if you should bring an umbrella. You call 3 random friends of yours who live there and ask each independently if it's raining. Each of your friends has a $2/3$ chance of telling you the truth and a $1/3$ chance of messing with you by lying. All 3 friends tell you that "Yes" it is raining. What is the probability that it's actually raining in Seattle?

Question 2

You have two coins. One of is fair and the other is biased and comes up heads with probability $3/4$. You randomly pick coin and flip it twice, and get heads both times. What is the probability that you picked the fair coin?

Question 3

Provide a simple example of how an experimental design can help answer a question about behavior. How does experimental data contrast with observational data?

Question 4

In a study of emergency room waiting times, investigators consider a new and the standard triage systems. To test the systems, administrators selected 20 nights and randomly assigned the new triage system to be used on 10 nights and the standard system on the remaining 10 nights. They calculated the nightly median waiting time (MWT) to see a physician. The average MWT for the new system was 3 hours with a variance of 0.60 while the average MWT for the old system was 5 hours with a variance of 0.68. Consider the 95% confidence interval estimate for the differences of the mean MWT associated with the new system. Assume a constant variance. What is the interval? Subtract in this order (New System - Old System).

Question 5

Using lending club dataset, examine relationship between each feature and response (interest rate). Pick 5 categorical and 5 numeric features, which you think are the most predictive with reasoning.