Math 10A with Professor Stankova
Worksheet, Discussion #39; Friday, 12/1/2017
GSI name: Roy Zhao

Maximum Likelihood Estimation (MLE)

Examples

1. You assume that the lifespan of lightbulbs are exponentially distributed (PDF is $\lambda e^{-\lambda t}$ for $t \geq 0$) and notice that your three light bulbs go out in 1, 2, and 3 years. What is the maximum likelihood estimator for λ?

2. I have a bag with 5 red and blue balls. I pull out a ball and it is red. I put it back and I add 3 blue balls and pull out another ball, which is blue. What is the maximum likelihood for the original number of blue balls.

Problems

3. True False In MLE, you calculate the probability that your parameter θ is a given value.
4. True False In the ball example from above, the solutions is always found by setting the derivative to 0.
5. There is a bag with 12 balls colored red and blue. You pull out three balls (with replacement) and get BBR. What is the maximum likelihood for the number of blue balls in bag?

6. You have a coin that you think is biased. you flip it 4 times and get the sequence $HHHT$. What is the maximum likelihood estimate for the probability of getting heads?

7. You know that baby weights are normally distributed with mean μ and standard deviation σ. You have three babies weighing $7, 8, 9$ ounces. What is the maximum likelihood for μ?

8. There is a bag with 10 balls colored red and blue. You pull out two balls (with replacement) and get BR. What is the maximum likelihood for the number of blue balls in bag?

9. You have a coin that you think is biased. you flip it 3 times and get the sequence HTH. What is the maximum likelihood estimate for the probability of getting heads?

10. You know that baby weights are normally distributed with mean μ and standard deviation σ. You have three babies weighing $6, 8, 10$ ounces. What is the maximum likelihood for μ?

Hypothesis Testing

Example

11. In patients with lung cancer, about 90% of them die within three years. They undergo an experimental treatment that claims to reduce their likelihood of dying. Out of 400 patients who underwent this treatment, 348 of them still die. Can we say that this treatment is successful? Use a significance level of 0.05.

Problems

12. True False Accusing a student of cheating when they didn't is a Type I error.

13. True False We usually want to show that the null hypothesis is true.