Likelihood and MLE

Grinnell College

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Question 1

Using `dbinom` with $n = 5$ and $\pi = 0.5$, find values y_1 and y_2 such that

$$P(y_1 < Y < y_2) = 0.8$$

- What kind of object does this interval represent?
- Are you able to find values so that this holds?
- Why or why not?

Question 2

Using the likelihood function we wrote in class with $n = 5$. Create plots to answer each of the questions

- Where does the likelihood function appear to be at its maximum when $y = 3$?
- Check for all values $y = 0 : 5$. Can you determine a general formula for the maximum?

Question 3

Using the same likelihood function as before, set $n = 5$ and $y = 3$

- What is the value of the likelihood for $\pi = 0.6$? What about for $\pi = 4$? How do these values compare? Try comparing the difference and the ratio of these values
- Plot the likelihood function again, this time for $n = 50$ and $y = 30$. How do $\pi = 0.6$ and $\pi = 0.4$ compare now, again looking at the difference and ratio of values.
- How did the number of observations in our sample impact the behavior of our likelihood? What impact does this have for our confidence in our estimate of $\hat{\pi}$? Explain in 2-3 sentences what is going on
- Does the difference or ratio of likelihoods seem more appropriate?