# Confidence Intervals

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# 1 Overview

In this project, you will experiment with confidence intervals.

You are given a set of functions that *allegedly* compute confidence intervals. However:

- Some of these functions may not return correct confidence intervals. You do not know which.

- For the ones that are correct, you do not know the level of the confidence interval.

- Even for the ones that are valid, you do not know if they are always valid, or only asymptotically.

Your basic task will be to generate synthetic datasets, and input them into the functions. You must determine, for each function:

- Is it valid?

- If so, at what level?

- Is it valid only asymptotically, or for all dataset sizes.

Along with the correctness of your responses, we will consider the quality of your reasoning. (A correct answer, with invalid reasoning will have no value.)

*Do not* use the source code to determine the validity of the functions. It is deliberately obfuscated, and designed to lead readers to invalid conclusions. Moreover, you will recieve no credit for any explanations based on the provided source code. So, take out advice: don't look at it– the intention is that you check the validity of the confidence intervals *experimentally*.

# 2 Calling the Function

For simplicity, the data that you input to the functions should all be from the $[0, 1]$ interval. The first argument to the function is your dataset, and the second is the confidence

interval function to evaluate. For example, to evaluate the 3rd function of the dataset $\{.1, .9, .25\}$ you would call

```
[a b] = ci([.1 .9 .25],3);
```

The function returns the interval $[a, b]$.

# 3   Deliverables

1. Code. Please submit all code for this project, along with a very brief
   `README.txt` which explains to us how to use it. We should be able to use your code
   and test the confidence intervals using our test set.

2. Report. Two page maximum, single column. Please be clear and concise. You
   should discuss the following topics:

   (a) At the top of your report, give a table. For each reported confidence interval,
       provide

       i. Is it valid? (yes or no.)
       ii. If valid, at what level is it valid?
       iii. If valid, is it valid at all datasizes, or only asymptotically

   (b) How did you design the data to input to the test functions?

   (c) How did you design your testing procedure?

3. Presentation. Give a 8 minute presentation, describing your experiences, what you
   tried, what worked, what didn't work, what your predictions are for each function.

# 4   Grading:

- Content: 50%

- Report: 20%

- Presentation 30% (including Q&A)