

# Project 1

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## About

This is the project for the statistical inference class. In it, you will use simulation to explore inference and do some simple inferential data analysis. The project consists of two parts:

1. Simulation exercises.
2. Basic inferential data analysis.

The exponential distribution can be simulated in R with `rexp(n, lambda)` where `lambda` is the rate parameter. The mean of exponential distribution is  $1/\lambda$  and the standard deviation is also  $1/\lambda$ . Set  $\lambda = 0.2$  for all of the simulations. In this simulation, you will investigate the distribution of averages of 40 exponential(0.2)s. Note that you will need to do a thousand or so simulated averages of 40 exponentials.

Illustrate via simulation and associated explanatory text the properties of the distribution of the mean of 40 exponential(0.2)s. You should 1. Show where the distribution is centered at and compare it to the theoretical center of the distribution. 2. Show how variable it is and compare it to the theoretical variance of the distribution. 3. Show that the distribution is approximately normal. 4. Evaluate the coverage of the confidence interval for  $1/\lambda$ :  $\bar{X} \pm 1.96 S/\sqrt{n}$ .

## Simulation

### Inferential Data Analysis

#### Center of Distribution

#### Variance

#### Normality

#### Confidence Interval