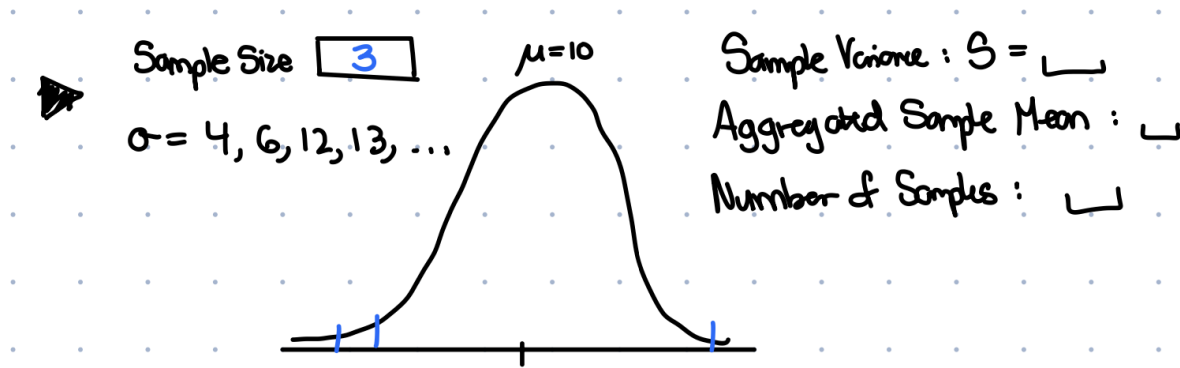


CSE 442 Final Project Outline

Premise of the Central Limit Theorem:

Visualization



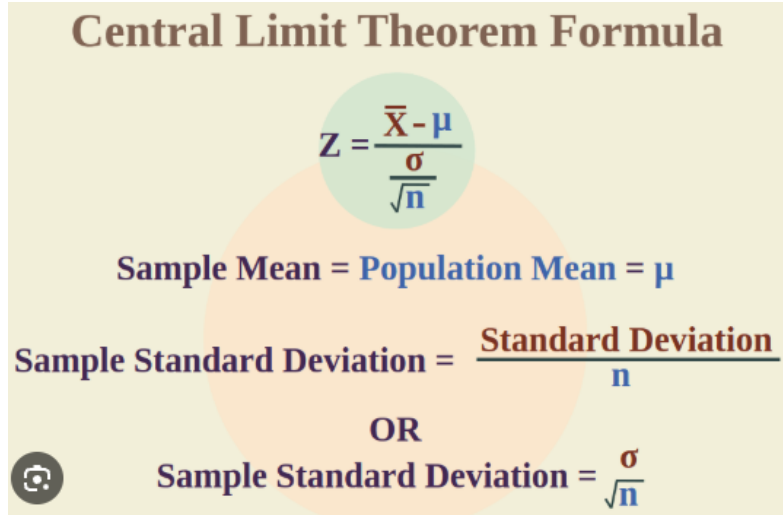
- The user can pick a sample size and start the animation
- We will then sample from the distribution, compute the sample mean, and display them to the user
- As we take more samples, the sample variance, aggregated sample mean, and number of samples will increase
- Users should see that **a higher sample size leads to more accurate sample means, a smaller sample variance, and that it takes fewer # samples to get the aggregates sample mean ~ actual population mean**

Three Rules for the Central Limit Theorem:

- All X_i 's are **independent** from each other
- Each X_i 's is drawn from the same distribution
- $0 < \text{Var}(X_i) < \infty$
- Idea: Have buttons that allows the user to turn each one off, and see that the distribution is not normal

- If possible, would be cool to have them turn them off, and dynamically draw a graph that breaks the central limit theorem

Equation of the Central Limit Theorem:



The graphic features a light yellow background with a large, faint orange circle in the center. At the top, the title "Central Limit Theorem Formula" is written in a brown, serif font. Below the title, the Z-score formula is displayed in a green circle:
$$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$$
 The text "Sample Mean = Population Mean = μ " is written in blue below the formula. Further down, the relationship between sample standard deviation and standard deviation is shown: "Sample Standard Deviation = $\frac{\text{Standard Deviation}}{n}$ ". Below this, the word "OR" is centered, followed by another equation: "Sample Standard Deviation = $\frac{\sigma}{\sqrt{n}}$ ". A small circular icon with a camera symbol is located in the bottom left corner of the graphic.

- User highlights a symbol, there is a definition of what the symbol represents

Actual Simulation of the CLT

- Give the user some choice in creating a distribution
- Can maybe choose from some non-normal distributions (think like Poisson or Uniform or something)
- And then have them press play, let the animation play, and construct the graph
 - Like sample, get the means, and plot them
 - Will show that over time, will look more normalized

Summary

Citation/Sources:

- <https://pmc.ncbi.nlm.nih.gov/articles/PMC5370305/>
- [3Blue1Brown](#)