Simulation of

Central Limit Theorem

It states that under certain conditions, the sum or average of a large number of independent and identically distributed random variables will be approximately normally distributed, regardless of the shape of the original distribution.

As the sample size increases, the distribution of the sample mean or sum will converge to a normal distribution.

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Experiment Setup

Rolling a fair six-sided die (1-6) multiple times.

Sampling Strategy:

- Generate N total observations, starting with 10000 and increasing gradually.
- Create 50 samples of 30 rolls each, then progressively increase both the number of samples and sample size.
- Compute the sample means and analyze their distribution to observe the effects of the Central Limit Theorem.

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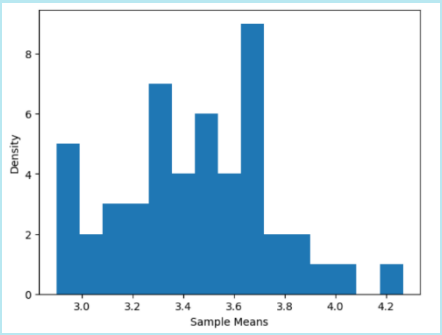
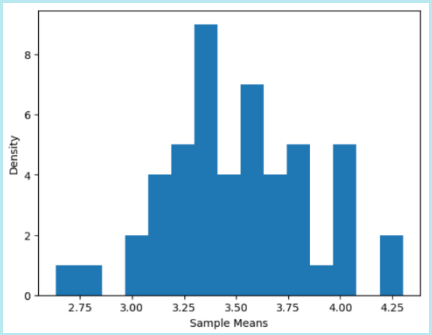
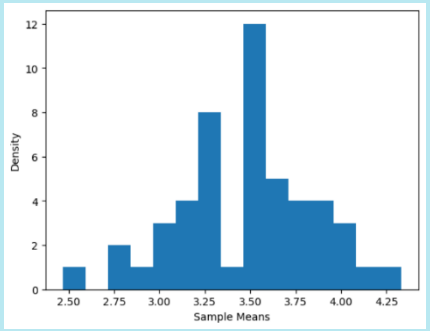
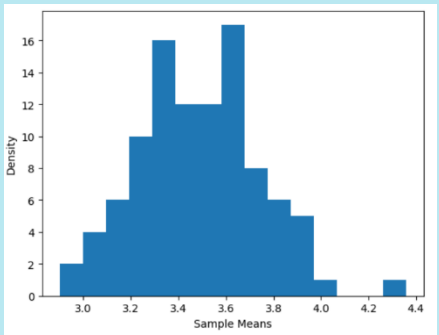
Sample size = 30, Number of samples = 50

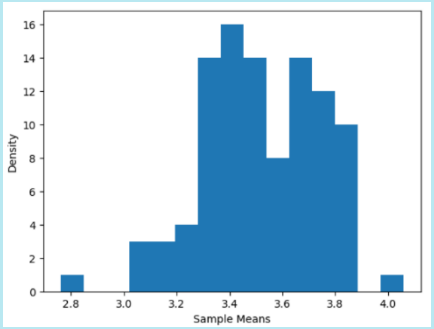


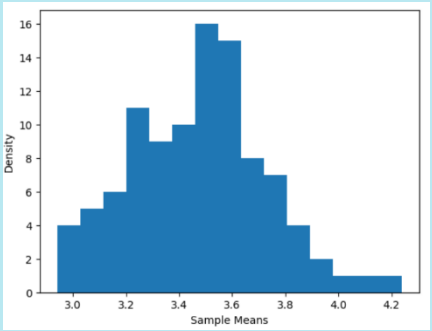




Sample size = 50, Number of samples = 100







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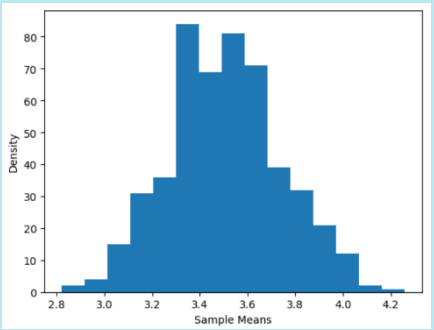
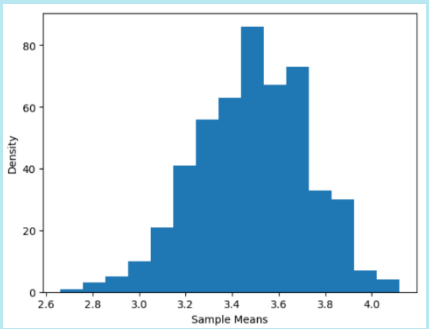
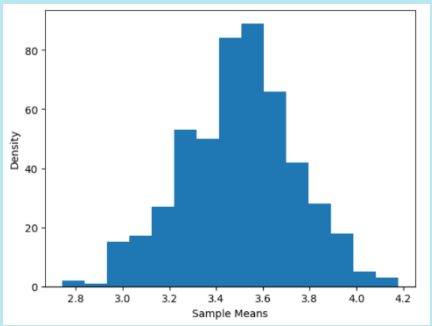
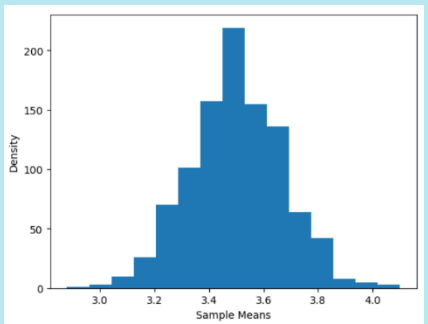
Sample size = 50, Number of samples = 500

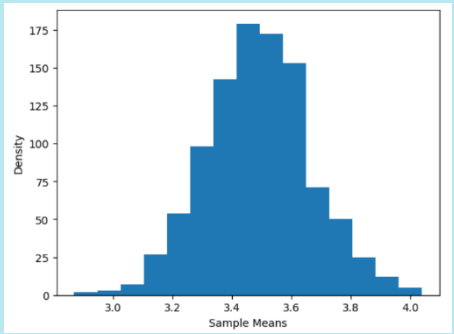


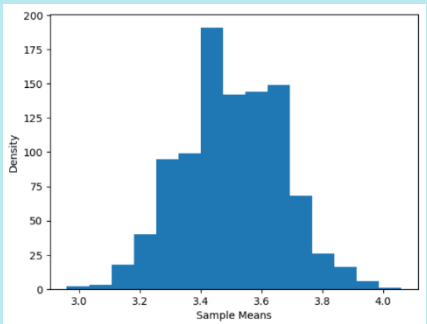




Sample size = 100, Number of samples = 1000







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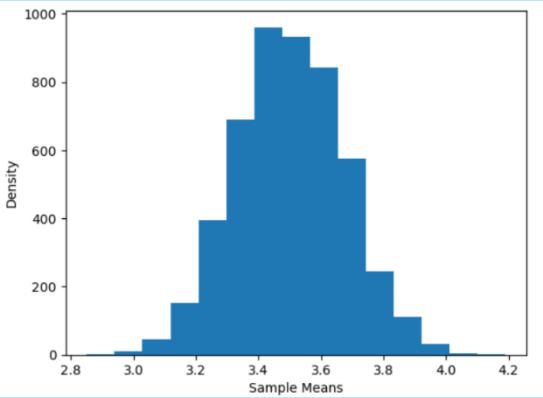
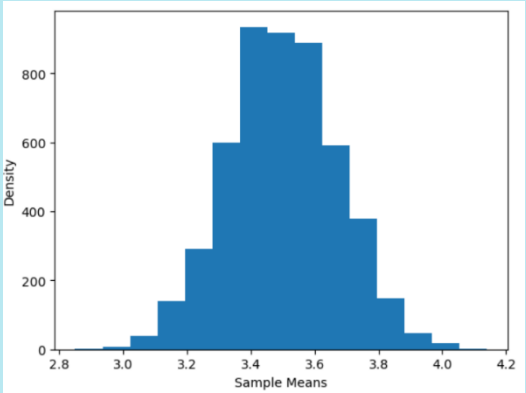
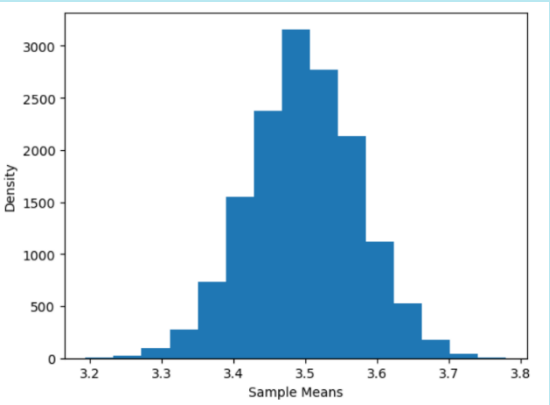
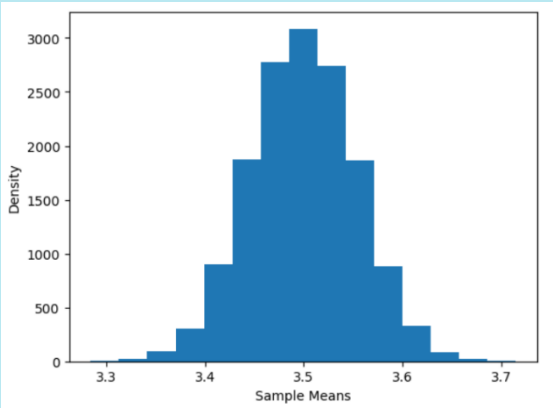
Sample size = 100, Number of samples = 5000





Sample size = 500, Number of samples = 15000





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Conclusion

- ✓ CLT holds even when sampling from a uniform distribution. (or any distribution)
- ✓ With larger samples, the sample mean distribution approaches normality.

Next?

I will experiment on,

“Does the Central Limit Theorem still hold when sampling bias creeps in?” 🤔

stay connected…

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