Day 6: The Central Limit Theorem I ★

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Central Limit Theorem

The central limit theorem (CLT) states that, for a large enough sample (n), the distribution of the sample mean will approach normal distribution. This holds for a sample of independent random variables from any distribution with a finite standard deviation.

Let $\{X_1, X_2, X_3, \ldots, X_n\}$ be a random data set of size n, that is, a sequence of independent and identically distributed random variables drawn from distributions of expected values given by μ and finite variances given by σ^2. The sample average is:

$$s_n := \frac{\sum_i X_i}{N}$$

For large n, the distribution of sample sums S_n is close to normal distribution $\mathcal{N}(\mu', \sigma')$ where:

- $\mu' = n \times \mu$
- $\sigma' = \sqrt{n} \times \sigma$