

Central limit theorem in action

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1 Explanation

This python code simulates coin flips. Assume heads = 1 and tails = 0, or vice versa. Flip the coin n times and compute the sum. Repeat the experiment m times. Therefore there are m sums. Create a histogram recording the frequency of each sum (and divide by m for normalization purposes). The central limit theorem predicts a probability distribution of the sums in the form of a Gaussian:

$$P(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left[-\frac{0.5(x - \mu)^2}{\sigma^2}\right] \quad (1)$$

Here x is the value of the sum, μ is the theoretical mean ($\frac{n}{2}$), and σ^2 is the variance ($\frac{n}{4}$). The python code simply plots this distribution on top of the histogram as a comparison. The resulting plot should look similar to this:

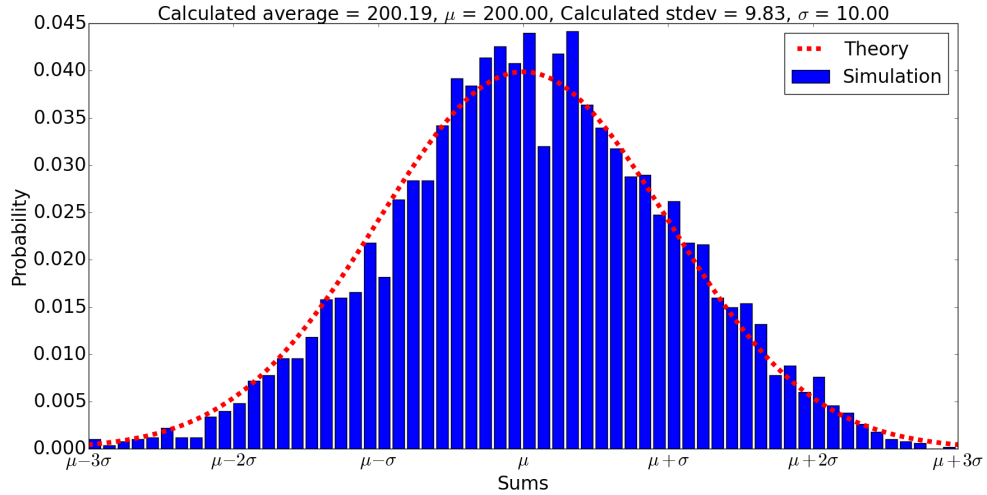


Figure 1: $n = 400$, $m = 5000$