

We consider the integral

$$I = \int_0^{\infty} f[x] \text{Exp}[-x] dx = 1$$

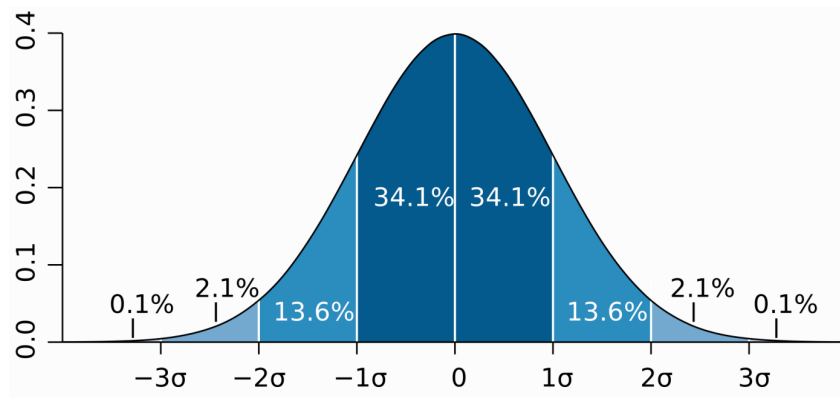
Q1

Generate ~100 'configurations'  $x_i$  according to the exponential distribution and make a Monte-Carlo estimate of the integral together with the statistical uncertainty defined as the standard deviation of the mean

answer

Q2

Assuming the Gaussian limit, estimate the 68% Confidence Level interval for the value of the integral



answer

Q3

Repeat Q1 for a large (~10000) number of configuration samples and construct the distribution of the integral estimate. Compare its dispersion with the uncertainty computed in Q1

answer

Q4

Coverage test: what is the frequency at which the 68% CL interval contains the true value of the integral ?

answer

Q5

We now consider the quantity

$$J = \left( \int_0^{\infty} f[x] \text{Exp}[-x] dx \right)^3 = 1$$

Repeat Q1-Q4 with non parametric bootstrap

answer