The Riddler Classic - Marathon Problem

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Problem (538 Link). Given $X_1, X_2, \ldots, X_n \overset{i.i.d}{\sim} \mathcal{N}(\mu, \sigma^2)$, estimate the number of n such that the probability of every pair of r.v.s is less than any $s \geq 0$, meaing $|X_i - X_j| \leq s$ for all $i \neq j$, is 0.99.

Solution The problem can be restated as, what is the gap between the order statistics of the $i.i.d$ random variables.

Below is from an numerical experiment that looks at different number of N runners and different values of s, which is denoted as ϵ.