

# R Markdown

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Use **bookdown** or **rmarkdown** to produce a report for the following task. Consider approximation of the distribution function of  $N(0, 1)$

$$\Phi(t) = \int_{-\infty}^t \frac{1}{\sqrt{2\pi}} e^{-y^2/2} dy, (\#eq : cdf)$$

by the Monte Carlo methods:

$$\hat{\Phi}(t) = \frac{1}{n} \sum_{i=1}^n I(X_i \leq t)$$

where  $X_i$ 's are a random sample from  $N(0, 1)$ , and  $I(\cdot)$  is the indicator function. Experiment with the approximation at  $n \in \{10^2, 10^3, 10^4\}$  at  $t \in \{0.0, 0.67, 0.84, 1.28, 1.65, 2.32, 2.58, 3.09, 3.72\}$  to form a table.

The table should include the true value for comparison. Further, repeat the experiment 100 times. Draw box plots of the 100 approximation errors at each  $t$  using **ggplot2** [R-ggplot2] for each  $n$ . The report should look like a manuscript, with a title, an abstract, and multiple sections. It should contain at least one math equation, one table, one figure, and one chunk of R code. The template of our Data Science Lab can be helpful: <https://statds.org/template/>, the source of which is <https://github.com/statds/dslab-templates>.