

# Statistical Inference Peer Assessment

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## Purpose of the app

The app shows a Monte Carlo simulation which estimates  $\pi$ .

## Model

The software creates two sequence of independent random variables  $X_1, \dots, X_n$  and  $Y_1, \dots, Y_n$  with uniform distribution in  $[-1, 1]$ , then counts the number  $N$  of points of the form  $(X_i, Y_i)$  which are inside the circle, i.e. such that  $X_i^2 + Y_i^2 < 1$ .

For the law of large numbers, the ratio of the number of points that fall inside the circle,  $N$ , to the total number of points generated,  $n$ , tends towards the ratio of the area of the circle,  $\pi$ , to the ratio of the area of the square, 4. Thus

$$\frac{N}{n} \approx \frac{\pi}{4}$$

The software gives therefore the number

$$4 \times \frac{N}{n}$$

as an estimate of  $\pi$ .

## Use of the App

To use the app,

- ▶ type a number between 10 and 10000 and press the button “Submit”.

The graph will show the points randomly generated in red if they are inside the circle and in black if they are outside the circle, and the approximation of  $\pi$  found with the simulation.