Contents

MC Inference: Estimating MSE for Median of Normal Distribution (Example 6.2 from the book)

```
library(SimDesign)

# Example 6.2 from Book
n = 20
m = 1000
tmean = numeric(m)
for (i in 1:m) {
  x = sort(rnorm(n))
  tmean[i] = median(x)
}

mse = mean(tmean^2)

# =====================
# Using SimDesign:

Design = data.frame(N = c(10, 20, 30, 40, 50, 60, 70))   # Different N values

Generate = function(condition, fixed_objects=NULL) {
  dat = sort(rnorm(condition$N))    # Preprocess data
  dat
}

Analyse <- function(condition, dat, fixed_objects = NULL) {
  ret = median(dat)    # Thetahat is the median of the data
  ret
}

Summarise <- function(condition, results, fixed_objects = NULL) {
  ret = c(MSE=mean(results^2), SE=sqrt(sum((results - mean(results))^2)) / 1000)
  ret # Calculates MSE and SE using MC Inference
}

# Run runSimulation method from SimDesign
runSimulation(design=Design, replications=1000, generate=Generate, analyse=Analyse, summarise=Summarise)
```

```
##
##
Design row: 1/7;   Started: Fri Dec 13 14:02:14 2019;   Total elapsed time: 0.00s
##
##
Design row: 2/7;   Started: Fri Dec 13 14:02:14 2019;   Total elapsed time: 0.22s
##
##
Design row: 3/7;   Started: Fri Dec 13 14:02:15 2019;   Total elapsed time: 0.47s
##
```

```
##
Design row: 4/7;   Started: Fri Dec 13 14:02:15 2019;   Total elapsed time: 0.69s
##
##
Design row: 5/7;   Started: Fri Dec 13 14:02:15 2019;   Total elapsed time: 0.91s
##
##
Design row: 6/7;   Started: Fri Dec 13 14:02:15 2019;   Total elapsed time: 1.19s
##
##
Design row: 7/7;   Started: Fri Dec 13 14:02:16 2019;   Total elapsed time: 1.40s
```

```
##    N        MSE          SE REPLICATIONS SIM_TIME               COMPLETED
## 1 10 0.13618509 0.011664822         1000    0.22s Fri Dec 13 14:02:14 2019
## 2 20 0.07305926 0.008546162         1000    0.25s Fri Dec 13 14:02:15 2019
## 3 30 0.05329417 0.007299325         1000    0.22s Fri Dec 13 14:02:15 2019
## 4 40 0.04232475 0.006504906         1000    0.22s Fri Dec 13 14:02:15 2019
## 5 50 0.02849525 0.005332803         1000    0.27s Fri Dec 13 14:02:15 2019
## 6 60 0.02663138 0.005159596         1000    0.21s Fri Dec 13 14:02:16 2019
## 7 70 0.02040715 0.004517343         1000    0.21s Fri Dec 13 14:02:16 2019
##         SEED
## 1 1307701324
## 2 1423060180
## 3  258809258
## 4 1464419511
## 5 1086691060
## 6  833151841
## 7 1743983660
```

```
# Sources Consulted:
# https://cran.r-project.org/web/packages/SimDesign/SimDesign.pdf
# http://philchalmers.github.io/SimDesign/pres.pdf
```