

HW1 Applied Statistics/R

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Task

Find the area of a figure bounded by curves given by the equation using the Monte Carlo method.

Equations:

$$y = 2|x| - \pi, x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$$
$$y = |\sin(2x)|, x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$$

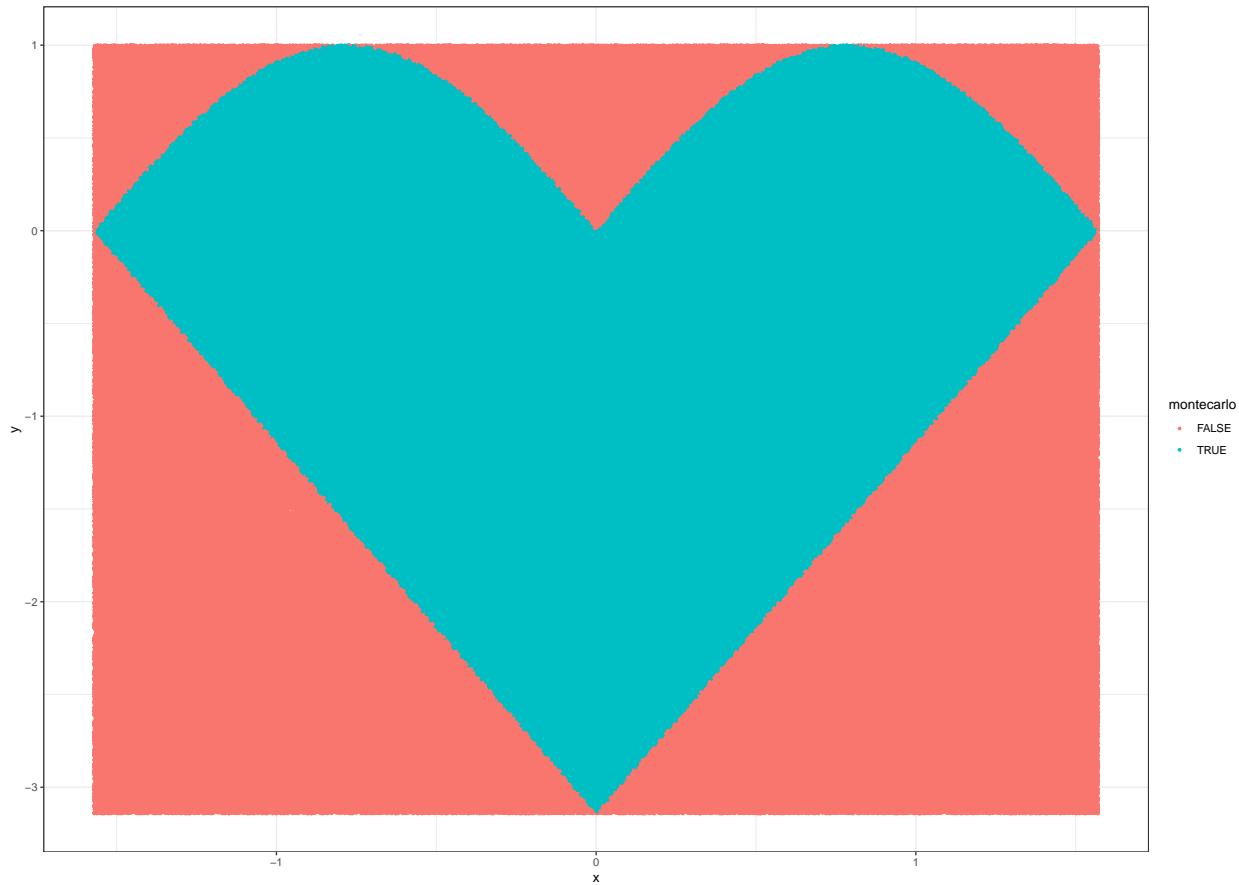
Generation of points

$$x \in [-\frac{\pi}{2}, \frac{\pi}{2}];$$

$$y \in [-\pi, 1]$$

```
trials <- 1000000
x <- runif(trials, min = -pi/2, max = pi/2)
y <- runif(trials, min = -pi, max = 1)
df <- data.frame(x,y)
montecarlo <- (y <= abs(sin(2*x))) & (y >= 2*abs(x) - pi)
```

```
ggplot(df) +
  geom_point(aes(x = x, y = y, color = montecarlo), size = 0.7) +
  theme_bw()
```



Calculation of figure's area

```
ratio <- sum(montecarlo) / trials
total <- (1 + pi) * (pi/2 + pi/2)
area <- ratio * total
cat(c('Area of a figure bounded by curves is equal to:', area))
```

```
## Area of a figure bounded by curves is equal to: 6.93933979235436
```