LAB11 activity

Yingtong Lyu

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1. Write a function that generates numbers from binomial(n, p) distribution using runif() function. Hint: binomial(n, p) random variable can be defined as a sum of n independent Bernoulli(p) random variables.

```
#use runif to generate s numbers from binomial(n,p)
set.seed(123)
n <- 10
p <- 0.5
s <- 10
x <- 0
newbinom <- function(s, n, p){
  rbi <- vector(length = s)
  for (i in 1: s) {
    rb <- as.numeric(runif(n) < p)
    rbi[i] <- sum(rb)
  }
    return(rbi)
}



newbinom(s,n,p)
```

```
##  [1] 4 5 2 5 9 6 5 6 5 6
```

```
rbinom(s,n,p)
```

```
##  [1] 5 4 5 8 5 7 7 5 5 3
```

2. Compare performance of your function with rbinom() using microbenchmark() function.

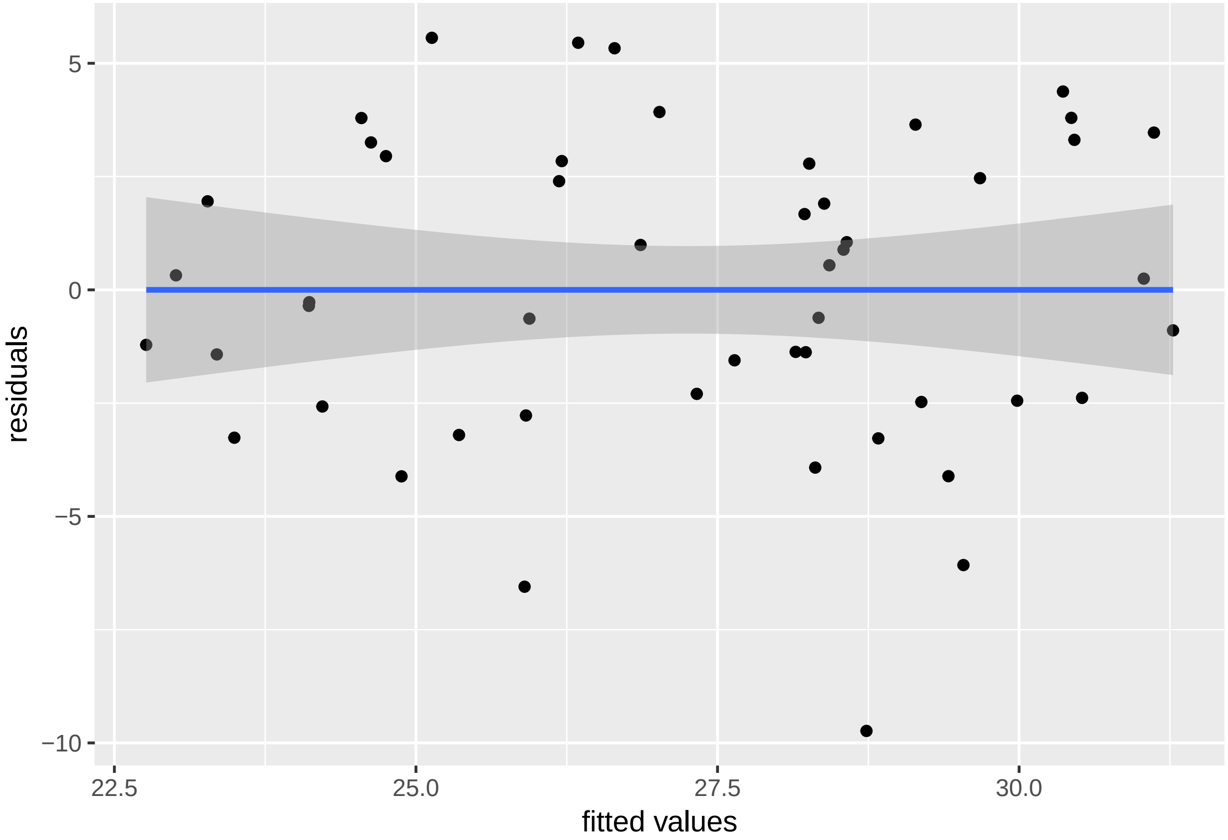
```
library(microbenchmark)
microbenchmark(rbinom(s,n,p),newbinom(s,n,p))
```

```
## Unit: microseconds
##               expr    min     lq     mean median     uq    max neval
##    rbinom(s, n, p)  2.570  3.085  3.75789  3.598  3.599  8.739   100
##  newbinom(s, n, p) 37.012 38.040 42.18857 39.582 41.638 73.510   100
```

3.

```
library(ggplot2)
set.seed(123)
dist <- vector(length = 50)
```

```
x <- vector(length = 50)
for (i in 1:50){
 x[i]<- runif(1,20,40)
 dist[i] <- 15 + 0.4*x[i] + rnorm(1,0,3)}
fit <- lm(dist ~ x)
ggplot(mapping = aes(fit$fitted.values, fit$residuals))+
  geom_point() +
  geom_smooth(method='lm')+
  labs(x="fitted values", y= "residuals")
```



4.

```
creatrnorm <- function (n)
    {
        U1 <- runif(n/2, 0, 1)
        U2 <- runif(n/2, 0, 1)
        x <- sqrt(-2 * log(U1)) * cos(2 * pi * U2)
        y <- sqrt(-2 * log(U1)) * sin(2 * pi * U2)
        z <- c(x, y)
        z
}

y1 <- creatrnorm(6000)
y2 <- rnorm(6000)
Y <- data.frame(y1, y2)
```

```r
ggplot(data=Y, aes(x= y1, fill = "1")) +
    geom_histogram(alpha = 0.3) +
    geom_histogram(aes(x= y2, fill = "2"), alpha = 0.3) +
    labs(x="X", y="Frequency",
         title = "Comparison between Box-Muller algorithm and Normal distribution ") +
    scale_fill_discrete(name = "Method",
                        labels=c("Box-Muller Algorithm","Normal Distribution"))
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
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```

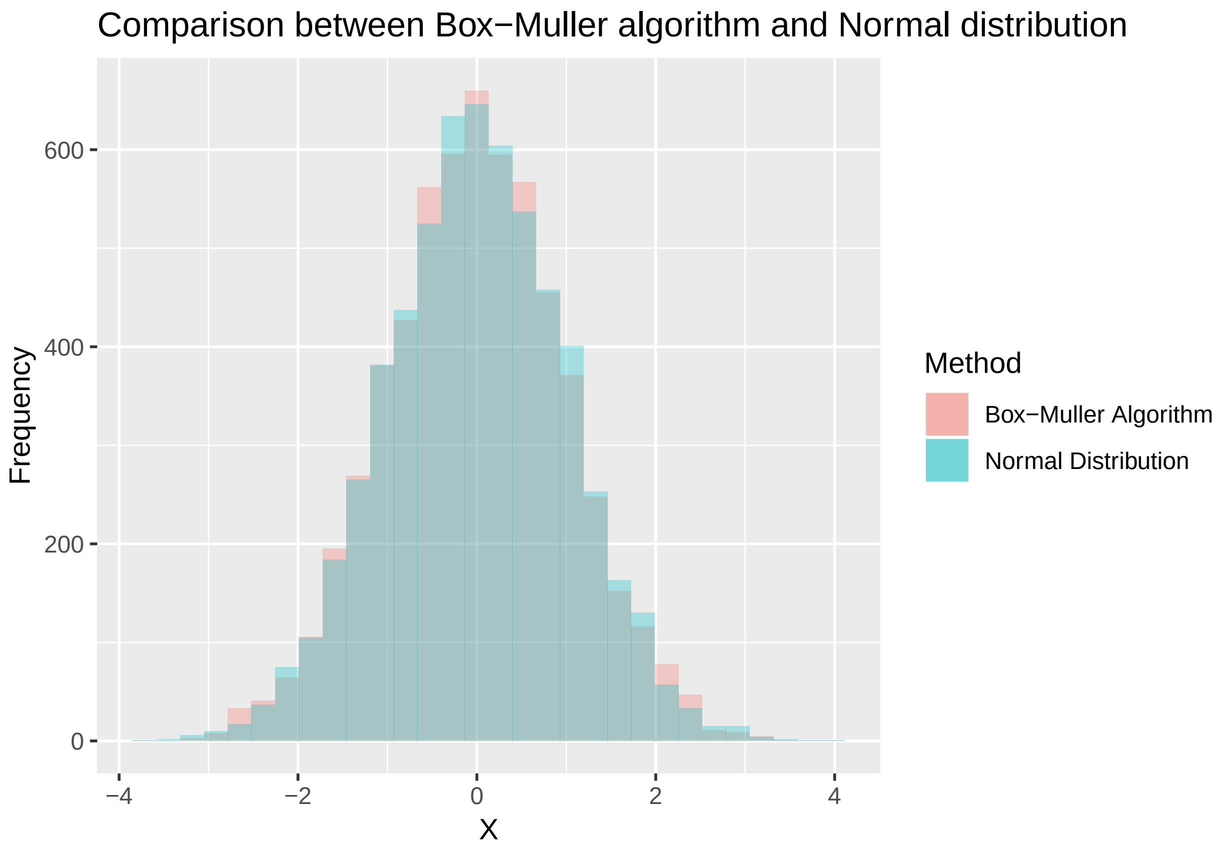
Comparison between Box−Muller algorithm and Normal distribution
Frequency
X
Method
Box−Muller Algorithm
Normal Distribution