

ШИНЖЛЭХ УХААН ТЕХНОЛОГИЙН ИХ СУРГУУЛЬ
Мэдээлэл холбооны технологийн сургууль



**ЛАБОРАТОРИЙН АЖЛЫН
ТАЙЛАН**

Компьютерын мөрдөлт ([F.ITM343-24/25A](#))
2023-2024 оны хичээлийн жил
намар

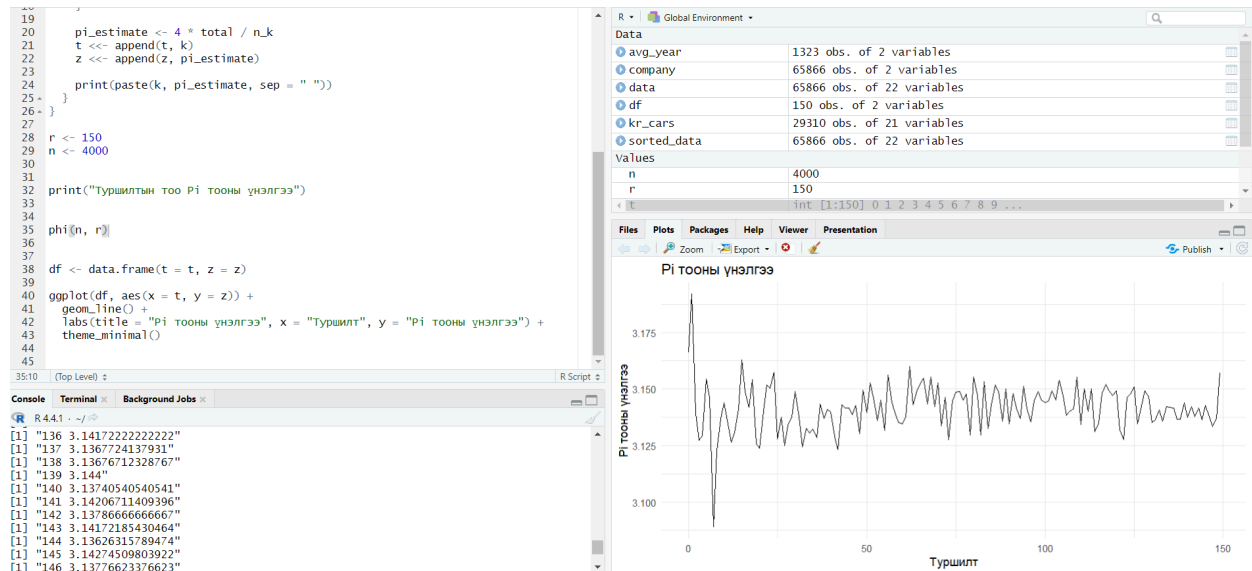
Лабораторийн ажлын дугаар, нэр:
Хичээл заасан багш:
Лабораторийн ажил гүйцэтгэсэн:

Лаб 2
А. Алтангэрэл
Оюутан: С. Тэмүүжин /B221960002/

1. Монте Карло симуляцаар пи тооны үнэлэлтийг харуулах

```
library(ggplot2)
t<-c()
z<-c()
phi<-function(n,r){
  for (k in 0:(r-1)) {
    total <- 0
    n_k <- n + 500 * k
    for (i in 1:n_k) {
      x <- runif(1, 0, 1)
      y <- runif(1, 0, 1)
      dist <- sqrt(x^2 + y^2)
      if (dist < 1) {
        total <- total + 1
      }
    }
    pi_estimate <- 4 * total / n_k
    t <- append(t, k)
    z <- append(z, pi_estimate)
    print(paste(k, pi_estimate, sep = " "))
  }
}
r <- 150
n <- 4000
print("Туршилтын тоо Pi тооны үнэлгээ")
phi(n, r)
df <- data.frame(t = t, z = z)
ggplot(df, aes(x = t, y = z)) +
  geom_line() +
  labs(title = "Pi тооны үнэлгээ", x = "Туршилт", y = "Pi тооны үнэлгээ") +
  theme_minimal()
```

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2. Монте Карло симуляцаар интегралыг бодох

```
library(ggplot2)
```

```
normal_function <- function(x) {  
  return ((1/sqrt(2*pi)) * exp(-(x^2)/2))  
}
```

```
X <- seq(-5, 5, length.out = 1000)
```

```
ggplot(data.frame(X = X, Y = normal_function(X)), aes(x = X, y = Y)) +  
  geom_line() +  
  theme_minimal()
```

```
integrate_function <- function(x1, x2, func = normal_function, n = 1000000) {
```

```
  X <- seq(x1, x2, length.out = n)
```

```
  area <- 0.0
```

```
  for (i in 1:(n - 1)) {
```

```
    u <- runif(1, 0, 1)
```

```
    a <- X[i] + u * (X[i + 1] - X[i])
```

```
    area <- area + func(a)
```

```
  }
```

```
  return ((x2 - x1) / n * area)
```

```
}
```

```
r <- 100
```

```
t <- numeric()
```

```
z <- numeric()
```

```
for (k in 1:r) {
```

```
  count <- 10 + 50 * k
```

```
  s <- integrate_function(-5, 5, n = count)
```

```
  print(paste(k, s, sep = " "))
```

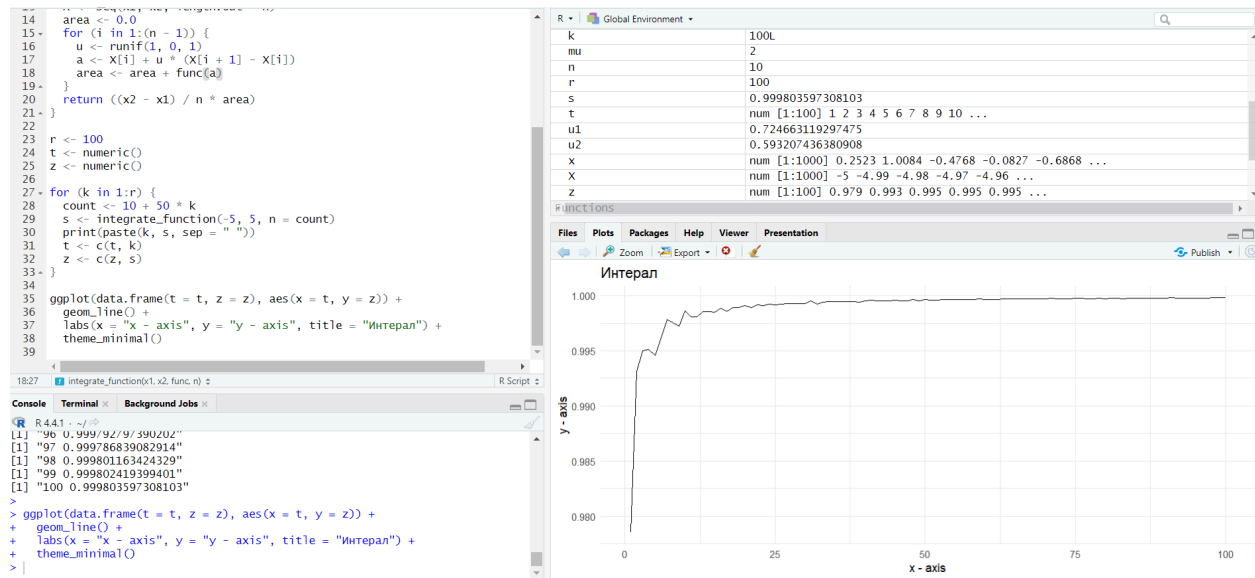
```
  t <- c(t, k)
```

```
  z <- c(z, s)
```

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```
}  
ggplot(data.frame(t = t, z = z), aes(x = t, y = z)) +  
  geom_line() +  
  labs(x = "x - axis", y = "y - axis", title = "Интерал") +  
  theme_minimal()
```

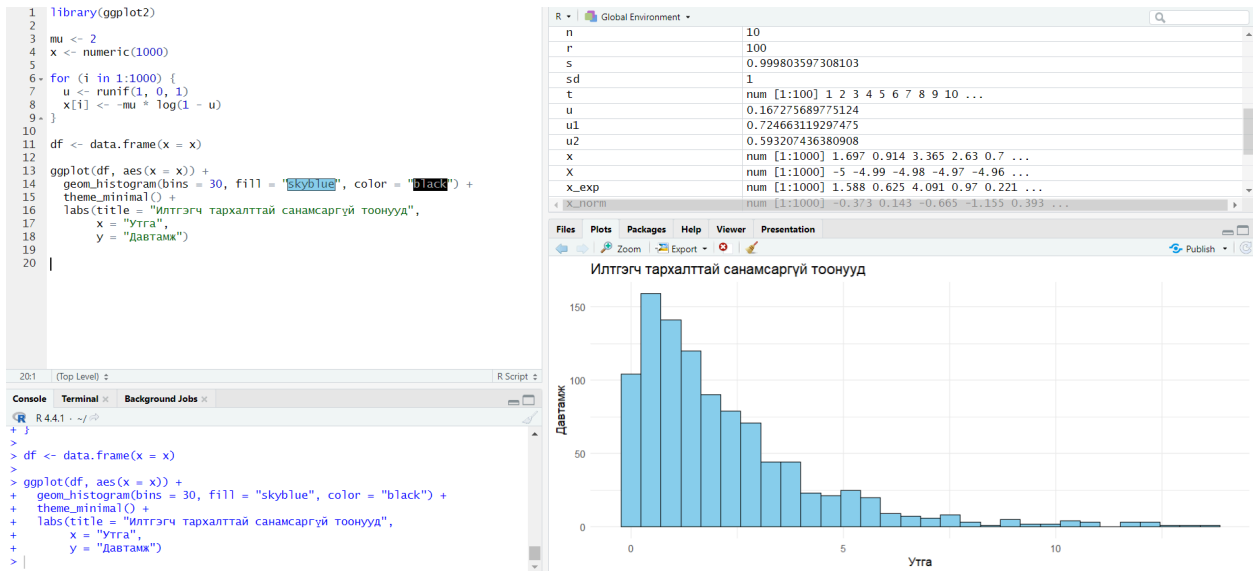


3. Илтгэгч, нормал тархалттай санамсаргүй тоонуудыг үүсгэж гистограммыг нь байгуул.
μ дундажтай илтгэгч тархалт

```
library(ggplot2)  
mu <- 2  
x <- numeric(1000)  
for (i in 1:1000) {  
  u <- runif(1, 0, 1)  
  x[i] <- -mu * log(1 - u)  
}  
df <- data.frame(x = x)  
ggplot(df, aes(x = x)) +  
  geom_histogram(bins = 30, fill = "skyblue", color = "black") +  
  theme_minimal() +  
  labs(title = "Илтгэгч тархалттай санамсаргүй тоонууд",  
        x = "Утга",  
        y = "Давтамж")
```

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Нормал тархалт

```
library(ggplot2)
```

```
mu <- 2
```

```
x <- numeric(1000)
```

```
for (i in 1:1000) {
```

```
  u1 <- runif(1)
```

```
  u2 <- runif(1)
```

```
  x[i] <- sqrt(-2 * log(u1)) * cos(2 * pi * u2)
```

```
}
```

```
df <- data.frame(x = x)
```

```
ggplot(df, aes(x = x)) +
```

```
  geom_histogram(bins = 30, fill = "skyblue", color = "black") +
```

```
  theme_minimal() +
```

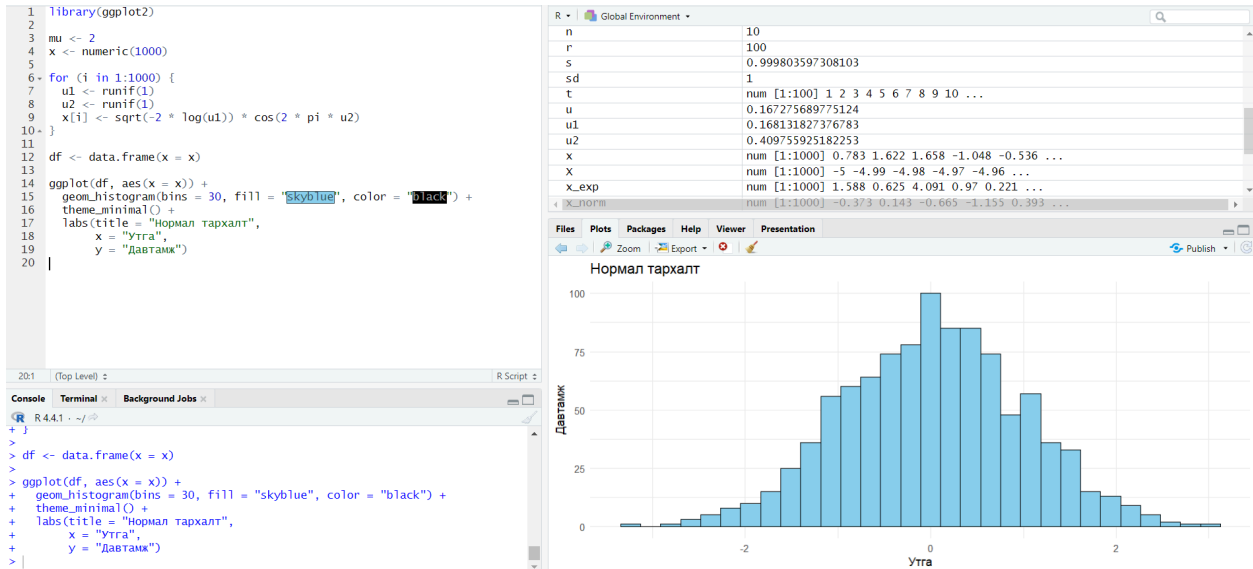
```
  labs(title = "Нормал тархалт",
```

```
       x = "Утга",
```

```
       y = "Давтамж")
```

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