

Planejamento e Análise de Experimentos (EEE933)

Estudo de Caso 1

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Descrição do Problema

Parte 1: Teste Sobre o Custo Médio

Planejamento dos Experimentos

$$\begin{cases} H_0 : \mu = 50 \\ H_1 : \mu < 50 \end{cases}$$

```
# Define the sample size to be used in this experiment
(params <- power.t.test(delta = delta_star,
  sd = sigma_n,
  sig.level = alpha,
  power = pi,
  type = "one.sample",
  alternative = "one.sided"))
```

```
##
##      One-sample t test power calculation
##
##              n = 65.45847
##            delta = 4
##             sd = 10
##      sig.level = 0.01
##             power = 0.8
##      alternative = one.sided
```

```
# Number of observations
n <- ceiling(params$n)
```

Coleta dos Dados

```
data_generation <- function(n){

  mre <- list(name = "recombination_bin", cr = 0.9)
  mmu <- list(name = "mutation_rand", f = 2)
  mpo <- 100
  mse <- list(name = "selection_standard")
  mst <- list(names = "stop_maxeval", maxevals = 10000)
```

```

mpr <- list(name = "sphere", xmin = -seq(1, 20), xmax = 20 + 5 * seq(5, 24))

sample <- c()
# Generate n observations
for (i in 1:n){
  observation <- ExpDE(mpo, mmu, mre, mse, mst, mpr,
    showpars = list(show.iters = "none"))$Fbest
  sample <- c(sample, observation)
}

return(sample)
}

# Random seed
set.seed(1007)

# Collect the sample with n observations
sample <- data_generation(n = n)

# Saves data to the csv file
write.table(sample, file = 'sample.csv', row.names = FALSE, col.names = FALSE)

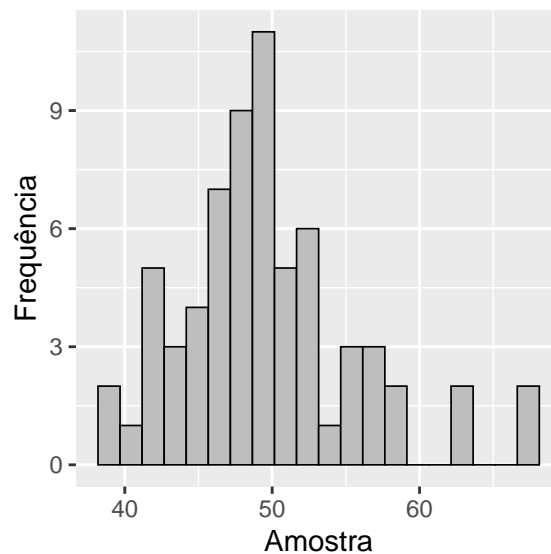
```

Análise Exploratória de Dados

```

# Histogram
histogram <- ggplot(data = as.data.frame(sample), mapping = aes(x = sample))
histogram + geom_histogram(lwd = 0.3, bins = 20, color = 'black', fill = 'gray') +
  scale_x_continuous(name = 'Amostra') +
  scale_y_continuous(name = 'Frequência')

```

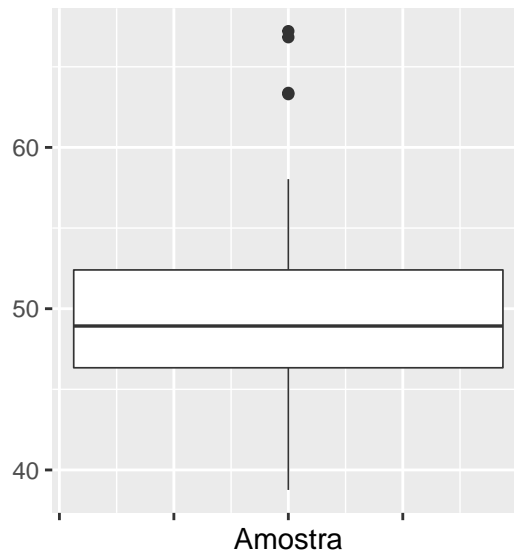


```

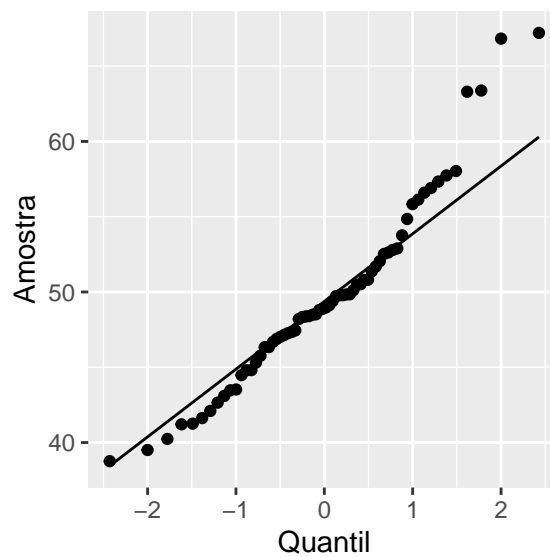
# Boxplot
boxplot <- ggplot(data = as.data.frame(sample), mapping = aes(y = sample))
boxplot + geom_boxplot(lwd = 0.3) +

```

```
scale_x_continuous(name = 'Amostra') +
scale_y_continuous(name = '') +
theme(axis.text.x = element_blank())
```



```
# QQ-Plot
qqplot <- ggplot(data = as.data.frame(sample), mapping = aes(sample = sample))
qqplot + geom_qq_line() +
  geom_qq() +
  scale_y_continuous(name = 'Amostra') +
  scale_x_continuous(name = 'Quantil')
```



Análise Estatística

```
# ----- Hypothesis Testing ----- #
(t_test <- t.test(x = sample,
```

```

mu = mu_c,
alternative = "less",
conf.level = conf_level))

##
## One Sample t-test
##
## data: sample
## t = -0.4853, df = 65, p-value = 0.3145
## alternative hypothesis: true mean is less than 50
## 99 percent confidence interval:
## -Inf 51.4154
## sample estimates:
## mean of x
## 49.63844
# Confidence Interval
CI <- t_test$conf.int[1:2]

```

Validação de Premissas

```

# Wilcoxon Signed-Ranks Test, because it does not assume normality
(wilcoxon_test <- wilcox.test(x = sample,
                             alternative = "less",
                             mu = mu_c,
                             paired = FALSE,
                             exact = NULL,
                             correct = TRUE,
                             conf.int = FALSE,
                             conf.level = conf_level))

##
## Wilcoxon signed rank test with continuity correction
##
## data: sample
## V = 903, p-value = 0.09846
## alternative hypothesis: true location is less than 50

```

Parte 2: Teste Sobre a Variância do Custo

Planejamento dos Experimentos

$$\begin{cases} H_0 : \sigma^2 = 100 \\ H_1 : \sigma^2 < 100 \end{cases}$$

Conclusões