

confidence_intervals.R

John

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```
# confidence_intervals.R
# Confidence intervals for elytra data

# Load necessary libraries
library(ggplot2)
library(psych)

##
## Attaching package: 'psych'

## The following objects are masked from 'package:ggplot2':
##
##    %+%, alpha

# Function to calculate intervals for  $\sigma^2$ 
cisig2 <- function(y,alpha){
  s2 <- var(y)
  n <- length(y)
  lower <- (n-1)*s2/qchisq(1-alpha/2,n-1)
  upper <- (n-1)*s2/qchisq(alpha/2,n-1)
  return(c(lower,upper))
}

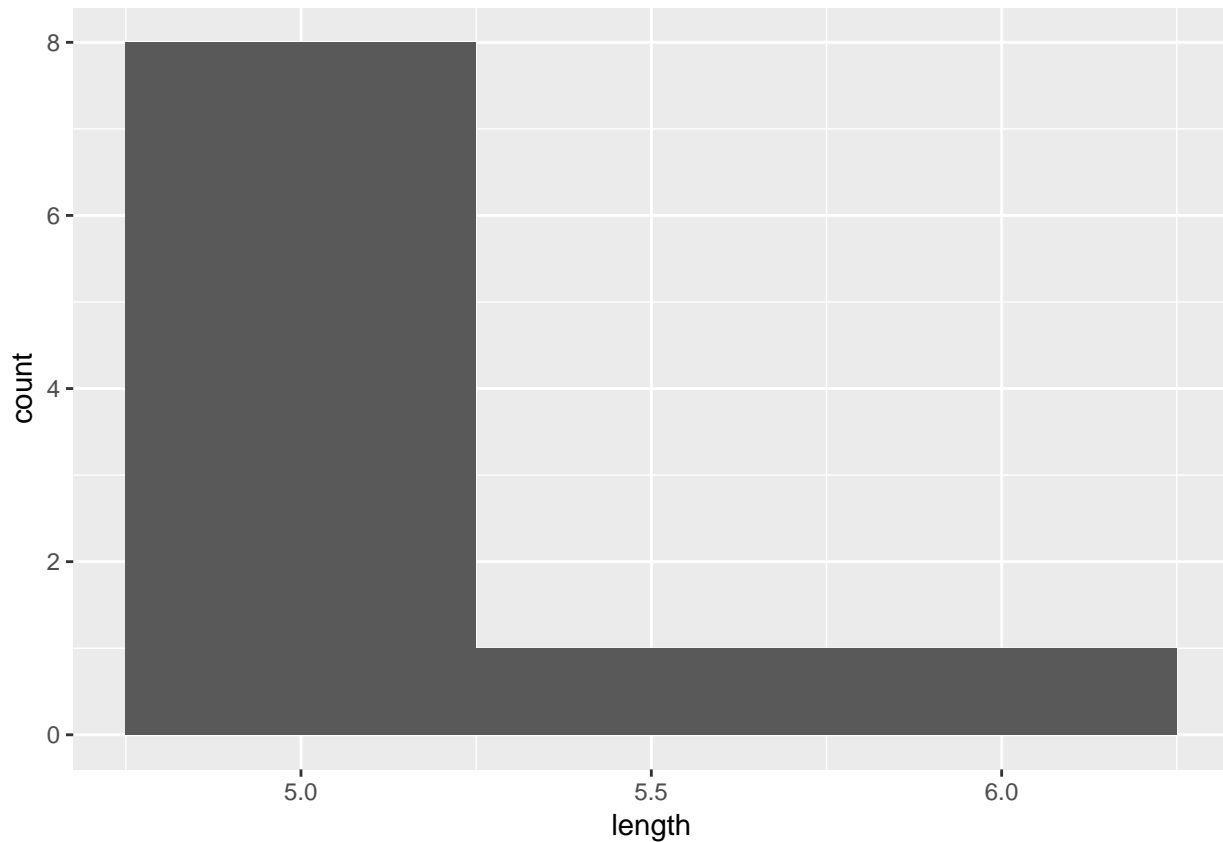
# Read in data set
elytra <- read.table(header=T,colClasses=c("numeric"),text="
length
5.0
5.1
5.2
5.9
4.8
5.5
4.8
5.1
5.0
5.1
")

# Print the data
elytra

##      length
## 1      5.0
## 2      5.1
## 3      5.2
## 4      5.9
## 5      4.8
## 6      5.5
```

```
## 7    4.8
## 8    5.1
## 9    5.0
## 10   5.1
```

```
# Graphics using ggplot2
ggplot(elytra,aes(length))+
geom_histogram(binwidth=0.5)
```



```
# Descriptive statistics
attach(elytra)
describe(length)
```

```
##      vars  n mean   sd median trimmed  mad min max range skew kurtosis  se
## X1      1 10 5.15 0.33   5.1     5.1 0.15 4.8 5.9   1.1 1.03   0.03 0.1
```

```
# Confidence intervals for mu
t.test(length)
```

```
##
##  One Sample t-test
##
## data:  length
## t = 49.228, df = 9, p-value = 2.954e-12
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  4.913343 5.386657
## sample estimates:
```

```

## mean of x
##      5.15
t.test(length,conf.level=0.99)

##
## One Sample t-test
##
## data: length
## t = 49.228, df = 9, p-value = 2.954e-12
## alternative hypothesis: true mean is not equal to 0
## 99 percent confidence interval:
##  4.810016 5.489984
## sample estimates:
## mean of x
##      5.15
# Confidence intervals for sigma^2 and sigma
alpha <- 0.05 # 95% c.i.
cisig2out <- cisig2(length,alpha)
# 95% c.i. for sigma^2
cisig2out

## [1] 0.05178006 0.36476219
# 95% c.i. for sigma
sqrt(cisig2out)

## [1] 0.2275523 0.6039555
alpha <- 0.01 # 99% c.i.
cisig2out <- cisig2(length,alpha)
# 99% c.i. for sigma^2
cisig2out

## [1] 0.04175613 0.56774530
# 99% c.i. for sigma
sqrt(cisig2out)

## [1] 0.2043432 0.7534888
detach(elytra)

```