

# Einführung in R und RStudio

## [Termine 7 & 8]

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28. & 30. März 2023

**▶ Termin 1 & 2**

- ▶ Grundlagen
- ▶ Datentypen

**▶ Termin 3 & 4**

- ▶ Objekten
- ▶ Lesen und Schreiben

**▶ Termin 5 & 6**

- ▶ Statistiken
- ▶ Grafiken

**▶ Termin 7 & 8**

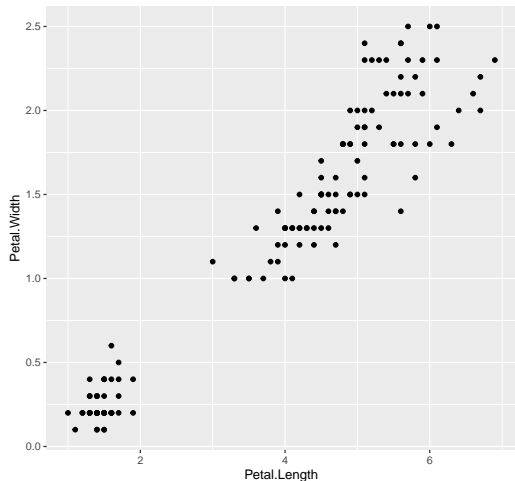
- ▶ Fortgeschrittenes Programmieren
- ▶ Erstellen von Dokumenten
- ▶ Abschluss

## ggplot

### Paket ggplot2

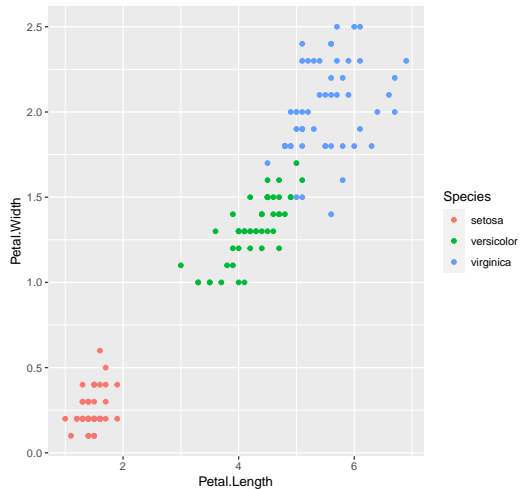
```
library(ggplot2)

ggplot(iris,
       aes(x = Petal.Length,
           y = Petal.Width)) +
  geom_point()
```



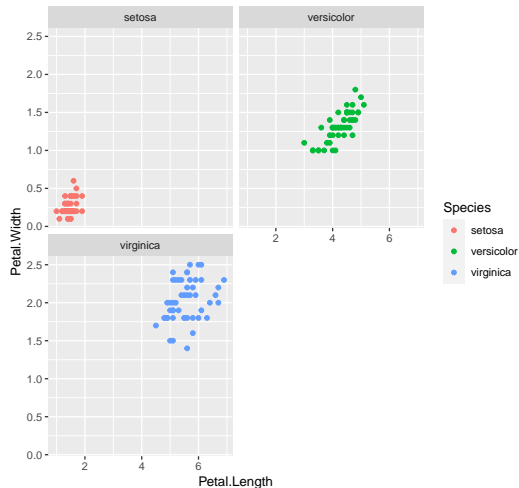
## scatterplot

```
ggplot(iris,
       aes(x = Petal.Length,
           y = Petal.Width,
           color = Species)) +
  geom_point()
```



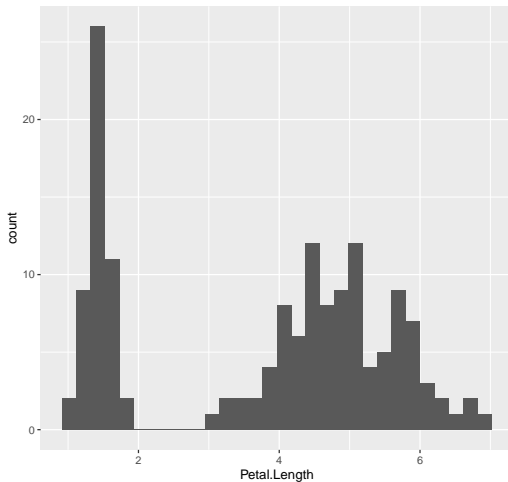
## scatterplot

```
ggplot(iris,
       aes(x = Petal.Length,
           y = Petal.Width,
           color = Species)) +
  geom_point() +
  facet_wrap(~ Species, ncol = 2)
```



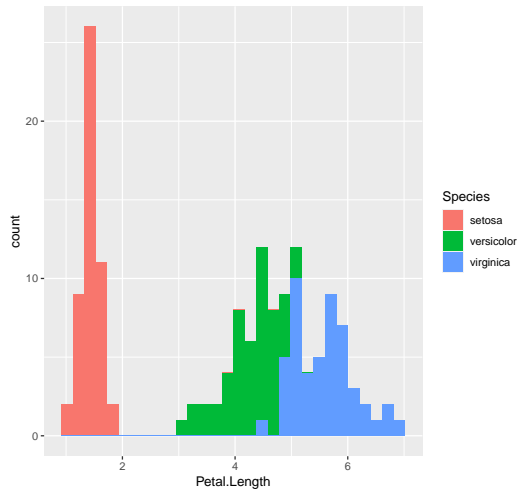
## histogram

```
ggplot(iris,  
  aes(x = Petal.Length)) +  
  geom_histogram()
```



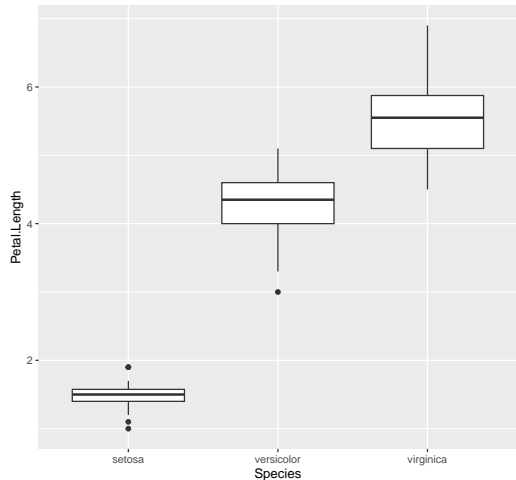
## histogram

```
ggplot(iris,  
  aes(x = Petal.Length,  
      fill = Species)) +  
  geom_histogram()
```



## boxplot

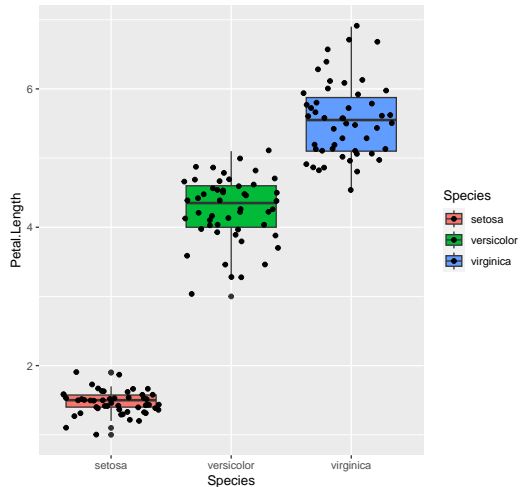
```
ggplot(iris,
       aes(x = Species,
           y = Petal.Length)) +
  geom_boxplot()
```





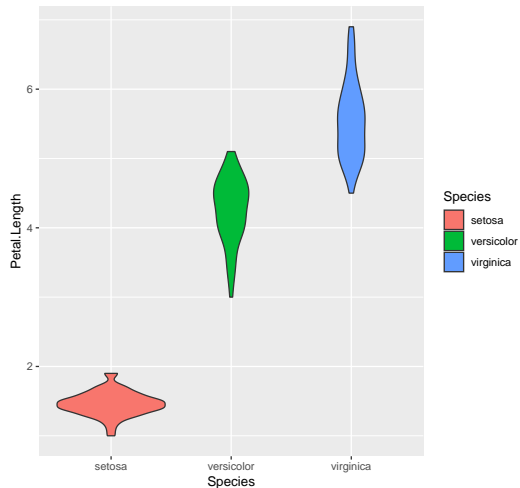
## boxplot

```
ggplot(iris,
       aes(x = Species,
           y = Petal.Length,
           fill = Species)) +
  geom_boxplot() +
  geom_jitter()
```



## violin plot

```
ggplot(iris,
       aes(x = Species,
           y = Petal.Length,
           fill = Species)) +
  geom_violin()
```



- ▶ Iterationen (Schleifen)
- ▶ Funktionen
- ▶ Quellcode
- ▶ Pakete

```
for (i in 1:5)  
  print(paste("Da wert von i ist", i))
```

```
## [1] "Da wert von i ist 1"  
## [1] "Da wert von i ist 2"  
## [1] "Da wert von i ist 3"  
## [1] "Da wert von i ist 4"  
## [1] "Da wert von i ist 5"
```

```
add_one <- function(x) {  
  return(x + 1)  
}
```

```
add_one(c(1:5))  
## [1] 2 3 4 5 6
```

## Iterationen (Schleifen)

```
repeat {Ausdruck}  
while (Bedingung) {Ausdruck}  
for (i in M) {Ausdruck}  
  
next  
break
```

```
for (i in names(Bonn)) {  
  if (is.numeric(Bonn[[i]])) {  
    print(paste(i, mean(Bonn[[i]])))  
  }  
}  
  
## [1] "BezirkNr 250.258064516129"  
## [1] "Jahr 2020"  
## [1] "Gesamt 5389.98924731183"  
## [1] "DichteKm2 4162.48924731183"  
## [1] "Maenner 2606.31182795699"  
## [1] "Frauen 2783.60752688172"  
## [1] "Zuwanderer 1627.06989247312"  
## [1] "Auslaender 947.693548387097"  
## [1] "FlaecheKm2 2.1936729876851"  
## [1] "X 2578524.77378713"  
## [1] "Y 5620621.4448268"
```

## Funktionen

```
foo <- function(Argumente) {Ausdruck}
```

- ▶ Definition
- ▶ Parameter (Argumente)
- ▶ Argumente mit Voreinstellungen
- ▶ ...

```
mean_sd <- function(x) {  
  y <- c(mean(x), sd(x))  
  names(y) <- c("Mittelwert",  
                "Standardabweichung")  
  return(y)  
}
```

```
mean_sd(Bonn$Gesamt)
```

```
##           Mittelwert Standardabweichung  
##           5389.989           2491.407
```

## Quellcode

```
source("Pfad")
```

```
source("MeineFunktionen.R", echo = TRUE)
```

```
##
```

```
## > BonnStats <- function(x, ...) {
```

```
## +   if (!is.numeric(x))
```

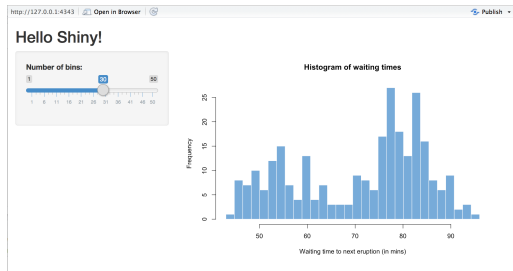
```
## +       stop("Der Wert 'x' muss numerisch sein
```

```
## +   out <- c(mean(x, ...), sd(x, ...))
```

```
## +   n .... [TRUNCATED]
```

## Weitere Themen

- ▶ Interaktive Dokumente
  - ▶ *shiny* Apps
  - ▶ *leaflet* widgets
- ▶ Räumliche Daten (GIS)
- ▶ Text Analyse
- ▶ Bild Animation
- ▶ R Pakete
- ▶ Internet Seiten





Louis, I think this is the beginning of a  
beautiful friendship.



# Vielen Dank!

```
library(fortunes)
fortune(43)
```

```
##
## My preference goes with the numbering scheme attributed to a tribe on some
## island in the Pacific which consists of a 'factor' with four levels: 'one',
## 'two', 'three', and 'lots'. Hence, I'd go with 'lots of R users'.
## -- Dirk Eddelbuettel (in a discussion about trying to estimate the number of
##      R users)
##      R-help (April 2004)
```