A2 - Das ggmap Paket

Jan-Philipp Kolb

22 Oktober 2018

Inhalt dieses Abschnitts

Arten von räumlichen Daten:

- **Straßenkarten**
- **Satelliten Bilder**
- **Physische Daten und Karten**
- **Abstrakte Karten**
- ...

Das R-paket `ggmap` wird im folgenden genutzt um verschiedene Kartentypen darzustellen.

Mit `qmap` kann man eine schnelle Karte erzeugen.

Installieren des Paketes

- Zur Erstellung der Karten brauchen wir das Paket ggmap:

```
devtools::install_github("dkahle/ggmap")
devtools::install_github("hadley/ggplot2")
install.packages("ggmap")
```

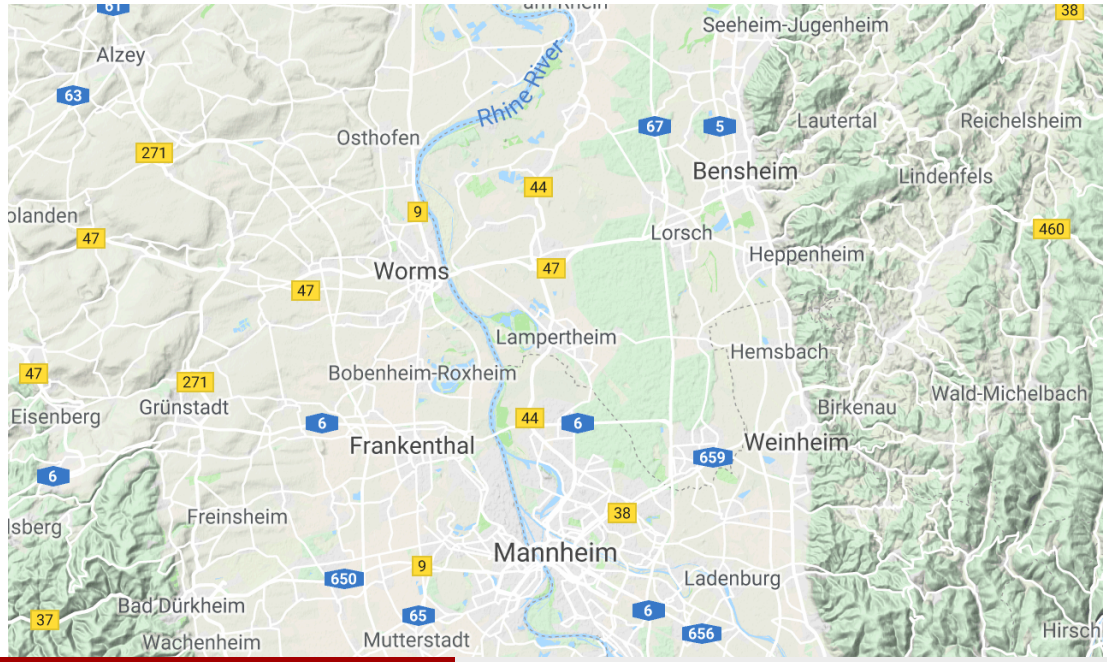
Paket ggmap - Hallo Welt

- Um das Paket zu laden verwenden wir den Befehl `library`

```
library(ggmap)
```

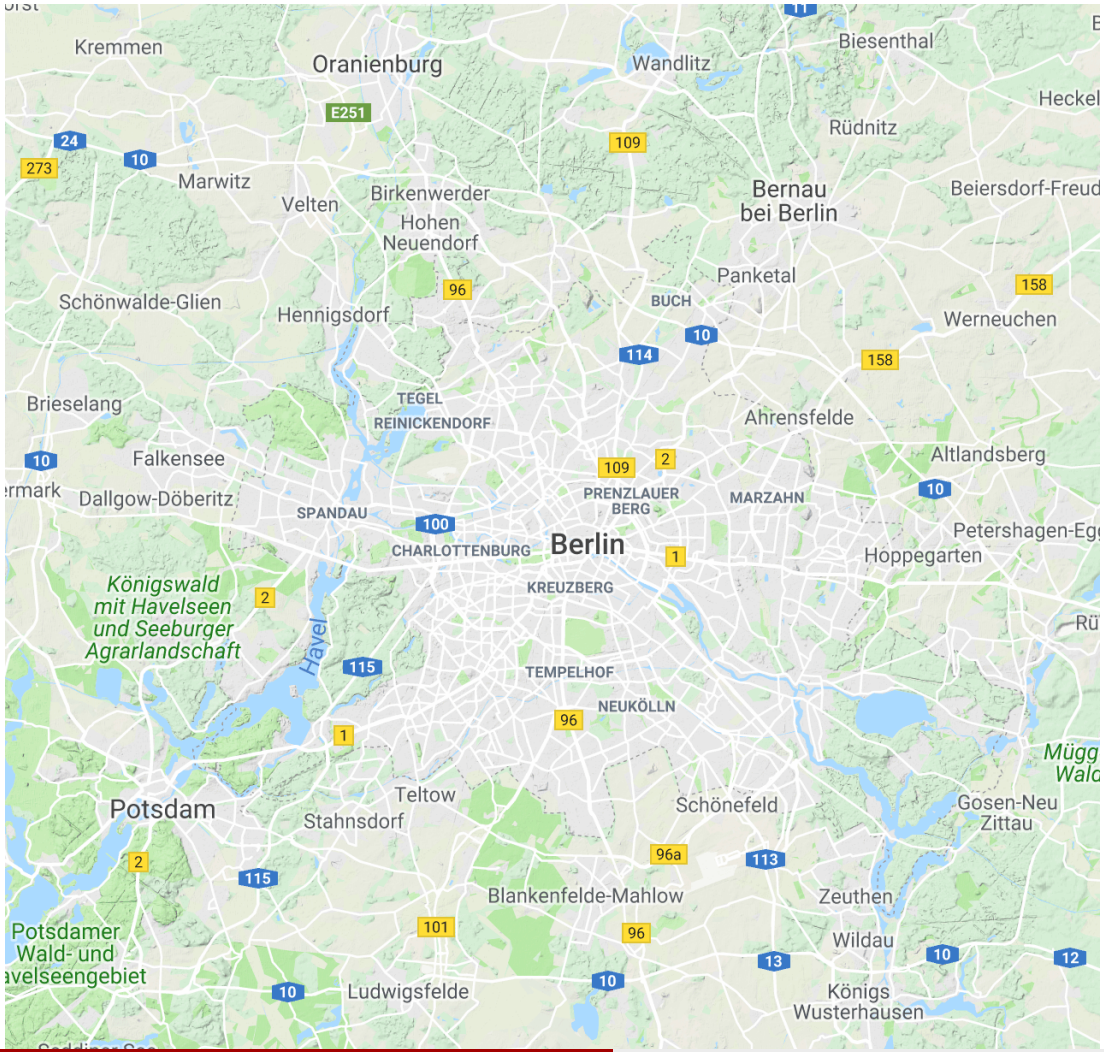
Und schon kann die erste Karte erstellt werden:

```
qmap("Mannheim")
```



Karte für eine Sehenswürdigkeit

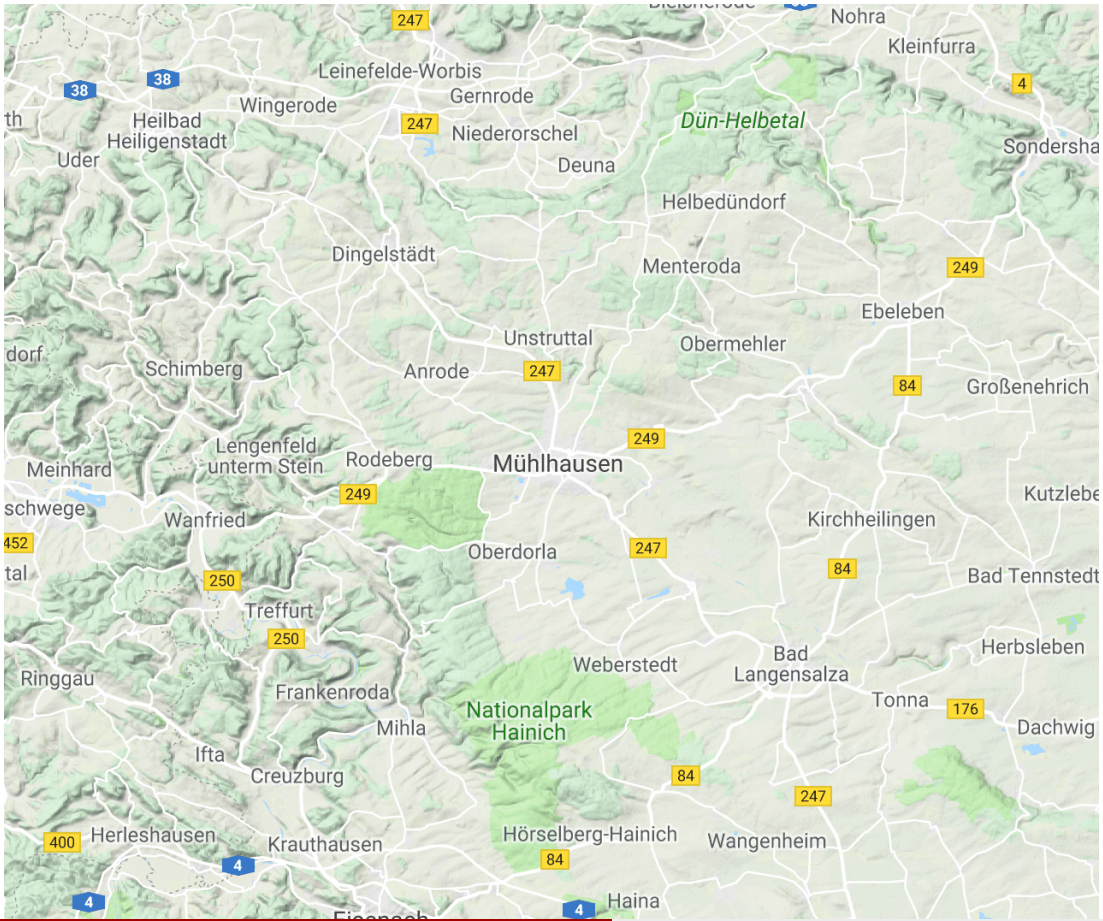
```
qmap("Berlin Brandenburger Tor")
```



Karte für einen ganzen Staat

```
qmap("Germany")
```

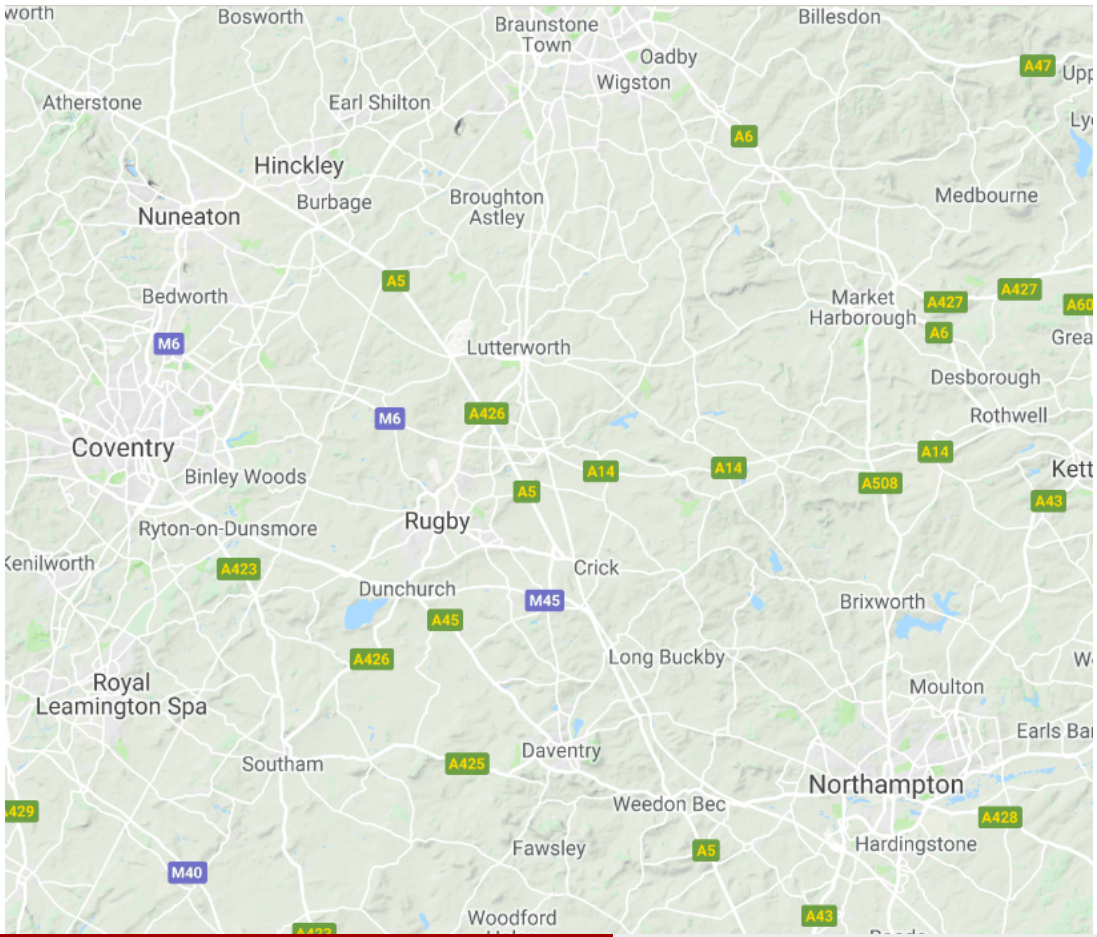
- Wir brauchen ein anderes *zoom level*



Ein anderes *zoom level*

- level 3 - Kontinent / level 10 - Stadt / level 21 - Gebäude

```
qmap("England", zoom = 6)
```



Hilfe bekommen wir mit dem Fragezeichen

```
?qmap
```

Verschiedene Abschnitte in der Hilfe:

- Description
- Usage
- Arguments
- Value
- Author(s)
- See Also
- Examples

Ganz nah dran

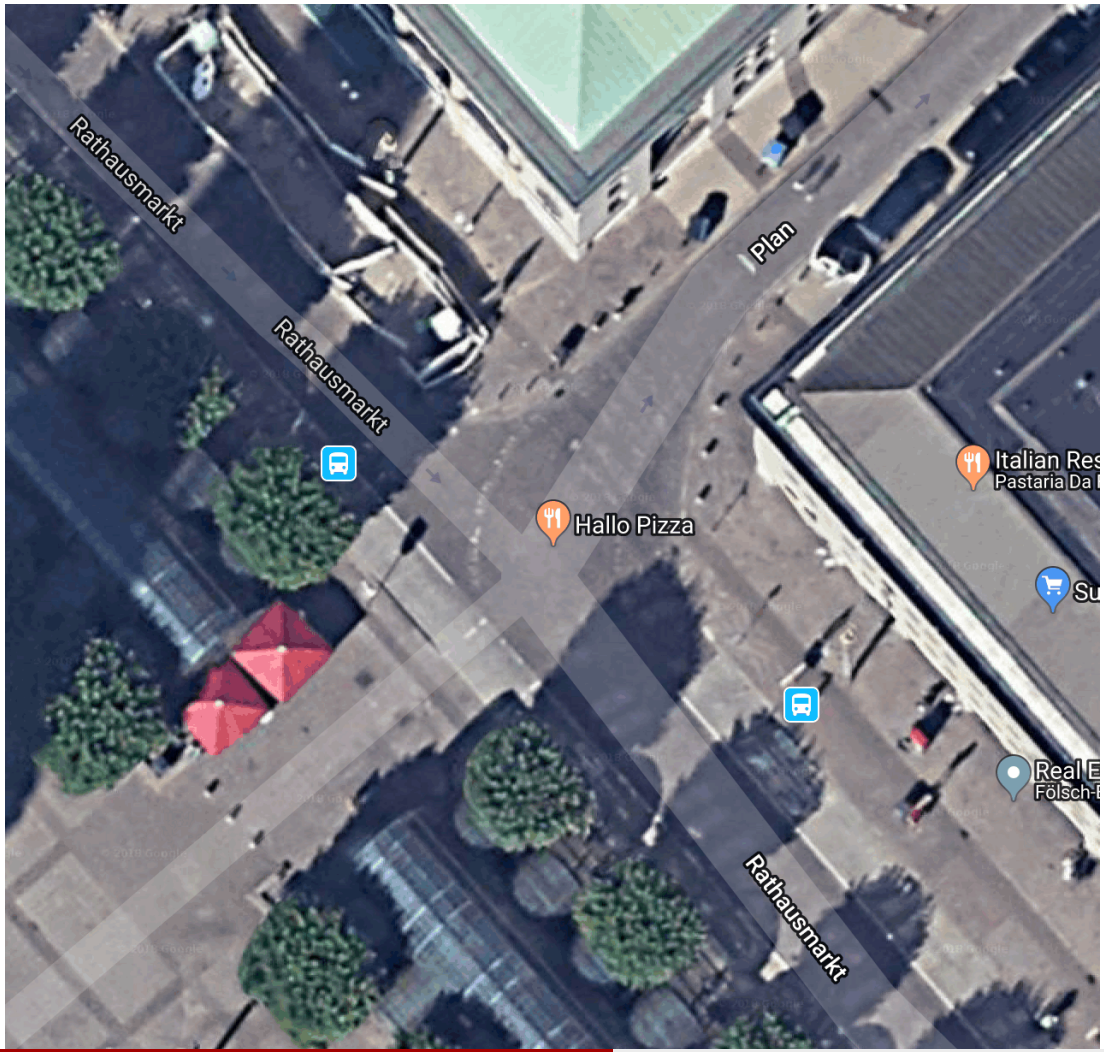
```
qmap('Mannheim', zoom = 20)
```

ggmap - maptype satellite

```
qmap('Hamburg', zoom = 14, maptype="satellite")
```

ggmap - maptype satellite zoom 20

```
qmap('Hamburg', zoom = 20, maptype="hybrid")
```



Terrain/physical maps

- Aus Physischen Karten kann man Informationen über Berge, Flüsse und Seen ablesen.
- Farben werden oft genutzt um Höhenunterschiede zu visualisieren

```
qmap('Arequipa', maptype="terrain")
```

Eine physische Karte von Arequipa

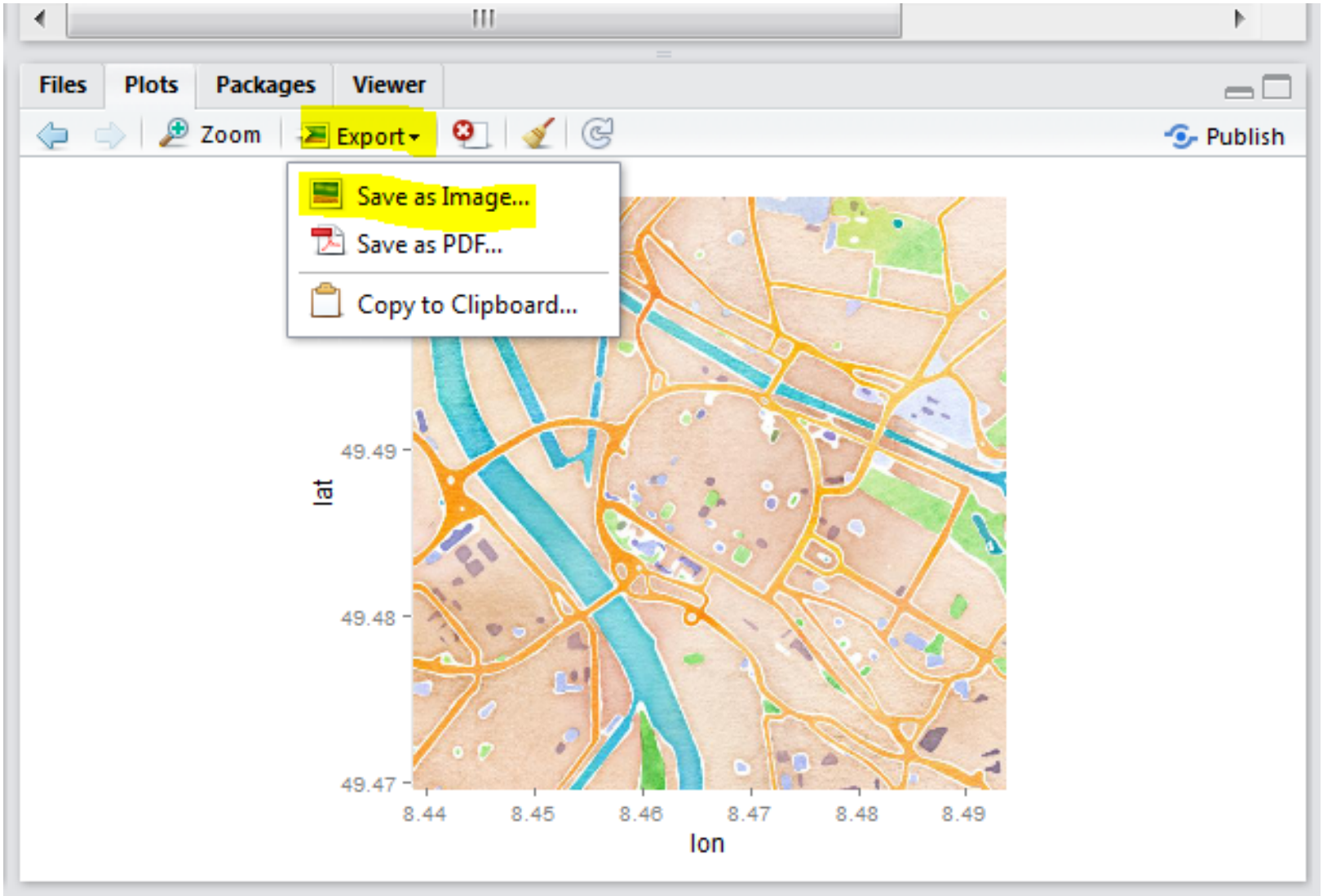
Abstrahierte Karten (http://www.designfaves.com)

- Abstraktion wird genutzt um nur die essentiellen Informationen einer Karte zu zeigen.
- Bsp. U-Bahn Karten - wichtig sind Richtungen und wenig Infos zur Orientierung

ggmap - maptype watercolor

```
qmap('Los Angeles', zoom = 14,
 maptype="watercolor",source="stamen")
```

Graphiken speichern



ggmap - ein Objekt erzeugen

- <- ist der Zuweisungspfeil um ein Objekt zu erzeugen
- Dieses Vorgehen macht bspw. Sinn, wenn mehrere Karten nebeneinander gebraucht werden.

```
MA_map <- qmap('Mannheim',
               zoom = 14,
               maptype="toner",
               source="stamen")
```

Eine Karte für die USA

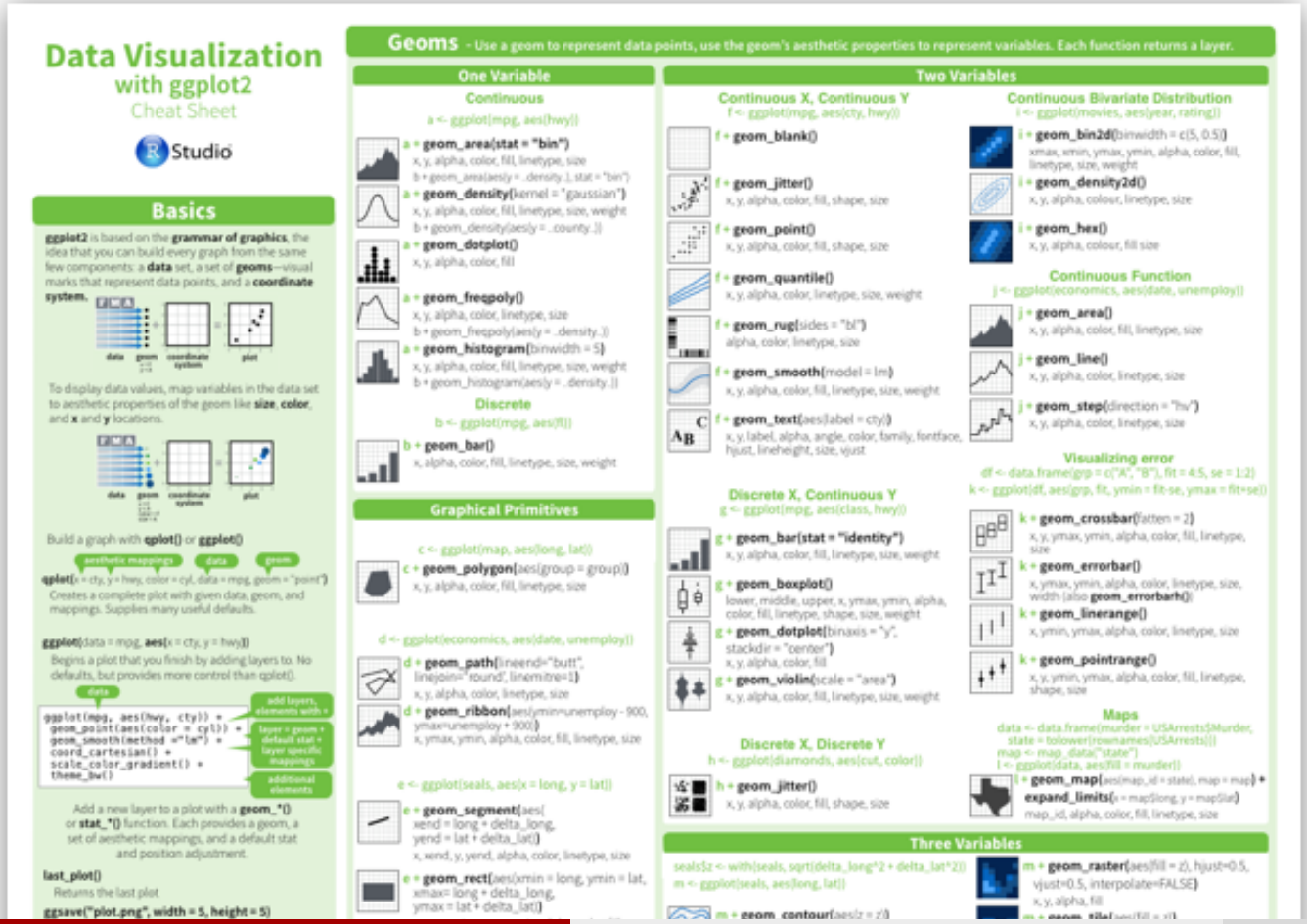
- Mit dem Befehl `OSM_scale_lookup` bekommt man heraus, welchen Wert man für `scale` angeben muss.

```
OSM_scale_lookup(zoom = 10)
qmap(location = "Trier", zoom = 10, source = "osm",
     scale=575000)
```

Cheatsheet

- Cheatsheet zu data visualisation

https://www.rstudio.com/



Data Visualization with ggplot2 Cheat Sheet

RStudio

Basics

ggplot2 is based on the grammar of graphics, the idea that you can build every graph from the same few components: a data set, a set of geoms—visual marks that represent data points, and a coordinate system.

To display data values, map variables in the data set to aesthetic properties of the geom like size, color, and x and y locations.

Build a graph with qplot() or ggplot()

```
qplot(cty, hwy, color = cyl, data = mpg, geom = "point")
```

Creates a complete plot with given data, geom, and mappings. Supplies many useful defaults.

```
ggplot(data = mpg, aes(x = cty, y = hwy))
```

Begins a plot that you finish by adding layers to. No defaults, but provides more control than qplot().

```
ggplot(mpg, aes(hwy, cty)) +
  geom_point(aes(color = cyl)) +
  geom_smooth(method ="lm") +
  coord_cartesian() +
  scale_color_gradient() +
  theme_bw()
```

Add a new layer to a plot with a geom_*() or stat_*() function. Each provides a geom, a set of aesthetic mappings, and a default stat and position adjustment.

last_plot()
Returns the last plot

ggsave("plot.png", width = 5, height = 5)

Geoms - Use a geom to represent data points, use the geom's aesthetic properties to represent variables. Each function returns a layer.

One Variable

Continuous

a <- ggplot(mpg, aes(hwy))

a + geom_area(stat = "bin")
x, y, alpha, color, fill, linetype, size
b + geom_area(aes(y = ..density..), stat = "bin")

a + geom_density(kernel = "gaussian")
x, y, alpha, color, fill, linetype, size, weight
b + geom_density(aes(y = ..county..))

a + geom_dotplot()
x, y, alpha, color, fill

a + geom_freqpoly()
x, y, alpha, color, linetype, size
b + geom_freqpoly(aes(y = ..density..))

a + geom_histogram(binwidth = 5)
x, y, alpha, color, fill, linetype, size, weight
b + geom_histogram(aes(y = ..density..))

Discrete

b <- ggplot(mpg, aes(fl))

b + geom_bar()
x, alpha, color, fill, linetype, size, weight

Graphical Primitives

c <- ggplot(map, aes(long, lat))

c + geom_polygon(aes(group = group))
x, y, alpha, color, fill, linetype, size

d <- ggplot(economics, aes(date, unemploy))

d + geom_path(lineend="butt", linejoin="round", linemitre=1)
x, y, alpha, color, linetype, size

d + geom_ribbon(aes(ymin=unemploy - 900, ymax=unemploy + 900))
x, ymax, ymin, alpha, color, fill, linetype, size

e <- ggplot(seals, aes(x = long, y = lat))

e + geom_segment(aes(xend = long + delta_long, yend = lat + delta_lat))
x, xend, y, yend, alpha, color, linetype, size

e + geom_rect(aes(xmin = long, ymin = lat, xmax= long + delta_long, ymax = lat + delta_lat))

Two Variables

Continuous X, Continuous Y

f <- ggplot(mpg, aes(cty, hwy))

f + geom_blank()

f + geom_jitter()
x, y, alpha, color, fill, shape, size

f + geom_point()
x, y, alpha, color, fill, shape, size

f + geom_quantile()
x, y, alpha, color, linetype, size, weight

f + geom_rug(sides = "bl")
alpha, color, linetype, size

f + geom_smooth(model = lm)
x, y, alpha, color, fill, linetype, size, weight

f + geom_text(aes(label = cty))
x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

Discrete X, Continuous Y

g <- ggplot(mpg, aes(class, hwy))

g + geom_bar(stat = "identity")
x, y, alpha, color, fill, linetype, size, weight

g + geom_boxplot()
lower, middle, upper, x, ymax, ymin, alpha, color, fill, linetype, shape, size, weight

g + geom_dotplot(binaxis = "y", stackdir = "center")
x, y, alpha, color, fill

g + geom_violin(scale = "area")
x, y, alpha, color, fill, linetype, size, weight

Discrete X, Discrete Y

h <- ggplot(diamonds, aes(cut, color))

h + geom_jitter()
x, y, alpha, color, fill, shape, size

Continuous Bivariate Distribution

i <- ggplot(movies, aes(year, rating))

i + geom_bin2d(binwidth = c(5, 0.5))
xmax, xmin, ymax, ymin, alpha, color, fill, linetype, size, weight

i + geom_density2d()
x, y, alpha, colour, linetype, size

i + geom_hex()
x, y, alpha, colour, fill size

Continuous Function

j <- ggplot(economics, aes(date, unemploy))

j + geom_area()
x, y, alpha, color, fill, linetype, size

j + geom_line()
x, y, alpha, color, linetype, size

j + geom_step(direction = "hv")
x, y, alpha, color, linetype, size

Visualizing error

df <- data.frame(grp = c("A", "B"), fit = 4:5, se = 1:2)

k <- ggplot(df, aes(grp, fit, ymin = fit-se, ymax = fit+se))

k + geom_crossbar(fatten = 2)
x, y, ymax, ymin, alpha, color, fill, linetype, size

k + geom_errorbar()
x, ymax, ymin, alpha, color, linetype, size, width (also geom_errorbarh())

k + geom_linerange()
x, ymin, ymax, alpha, color, linetype, size

k + geom_pointrange()
x, y, ymin, ymax, alpha, color, fill, linetype, shape, size

Maps

data <- data.frame(murder = USArrests$Murder, state = tolower(rownames(USArrests)))

map <- map_data("state")

l <- ggplot(data, aes(fill = murder))

l + geom_map(aes(map_id = state), map = map) + expand_limits(x = map$long, y = map$lat)
map_id, alpha, color, fill, linetype, size

Three Variables

seals$z <- with(seals, sqrt(delta_long^2 + delta_lat^2))

m <- ggplot(seals, aes(long, lat))

m + geom_raster(aes(fill = z), hjust=0.5, vjust=0.5, interpolate=FALSE)
x, y, alpha, fill

m + geom_contour(aes(z = z))

Resourcen und Literatur

- Artikel von **David Kahle und Hadley Wickham** zur Nutzung von ggmap.
- **Schnell eine Karte bekommen**
- **Karten machen mit R**