

# Challenge 06 – Solution

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Betrachten Sie dazu die Targets-Datei auf Github.

## 1 Setup

### 1.1 Libs

### 1.2 Other setup

```
source("_common.r")
list.files("funs", full.names = TRUE) |>
  purrr::walk(source)

options(digits = 3)
options(tinytable_tt_digits = 2)
```

### 1.3 Load Targets

```
tar_load(c(
  data_prepped,
  visitduration,
  time_spent,
  time_visit_wday,
  time_visit_wday_fingerprint,
  course_and_uni_per_visit,
  time_spent_w_course_university,
  n_action_w_date
))
```

## 2 Musterlösung

### 2.1 Berechnen Sie die Verweildauer: Wieviel Zeit verbringen die Nutzer pro Visit?

#### 2.1.a Spalte visitduration

Dafür gibt es eine Spalte:

```
visitduration |>
  select(visitduration)
```

```
      visitduration
      <Duration>
1:      282s (~4.7 minutes)
```

```

2: 202s (~3.37 minutes)
3: 12s
4: 33s
5: 805s (~13.42 minutes)
---
2820: 1664s (~27.73 minutes)
2821: 1162s (~19.37 minutes)
2822: 6978s (~1.94 hours)
2823: 23s
2824: 1982s (~33.03 minutes)

```

```

visitduration_desc <-
  visitduration |>
  select(visitduration) |>
  describe_distribution(centrality = c("mean", "median"))

```

Im Standard wird in *Sekunden* gezählt.

```
mean(visitduration$visitduration)
```

```
[1] 1534
```

```

duration_hms <- function(x) {
  s <- round(as.numeric(x))
  sprintf(
    "%02d:%02d:%02d",
    s %/% 3600,
    (s %/% 3600) %/% 60,
    s %/% 60
  )
}

visitduration_desc[c("Mean", "MAD", "Median", "SD")] <-
  lapply(visitduration_desc[c("Mean", "MAD", "Median", "SD")], duration_hms)

visitduration_desc

```

Variable	Median	MAD	Mean	SD	IQR
visitduration	00:10:06	00:14:38	00:25:34	00:36:16	2106.25

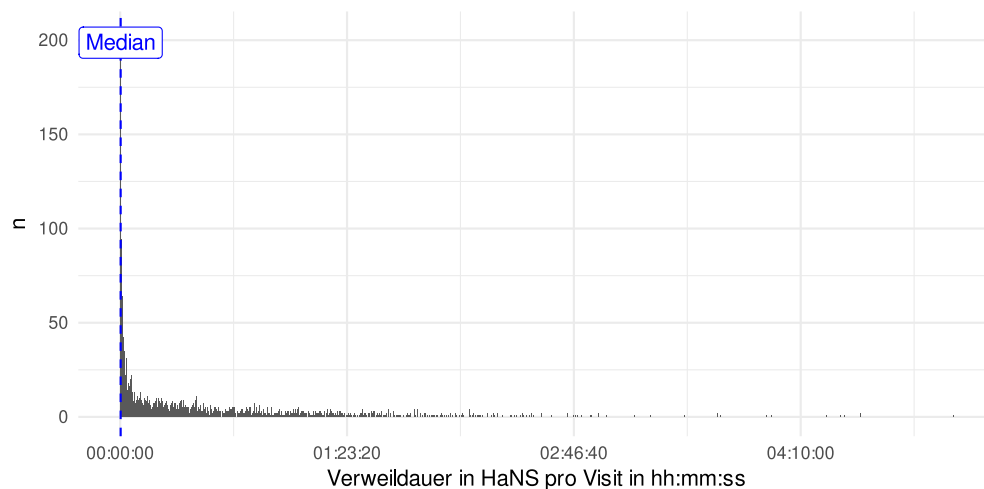
  

Variable	Range	Skewness	Kurtosis	n	n_Missing
visitduration	[1.00, 18358.00]	2.39	8.04	2824	0

```

visitduration |>
  ggplot(aes(x = visitduration)) + # minutes
  geom_histogram(binwidth = 10) +
  #scale_x_time() +
  theme_minimal() +
  labs(y = "n", x = "Verweildauer in HaNS pro Visit in hh:mm:ss") +
  scale_x_time(breaks = pretty_breaks()) +
  geom_vline(xintercept = median(visitduration$visitduration) / 60, color =
"blue", linetype = "dashed") +
  annotate("label", x = median(visitduration$visitduration) / 60,
          y = Inf, label = "Median", vjust = 1.5, color = "blue")

```



## 2.1.b Selbstgebastelt

```

time_spent_summary <-
time_spent |>
  mutate(time_diff_minutes = time_length(time_diff, unit = "minute")) |>
  summarise(
    mean_time_diff = round(mean(time_diff_minutes), 2),
    median_time_diff = round(median(time_diff_minutes, 2)),
    iqr_time_diff = round(IQR(time_diff_minutes, 2)),
    sd_time_diff = sd(time_diff_minutes),
    min_time_diff = min(time_diff_minutes), # shortest duration
    max_time_diff = max(time_diff_minutes) # longest
  )

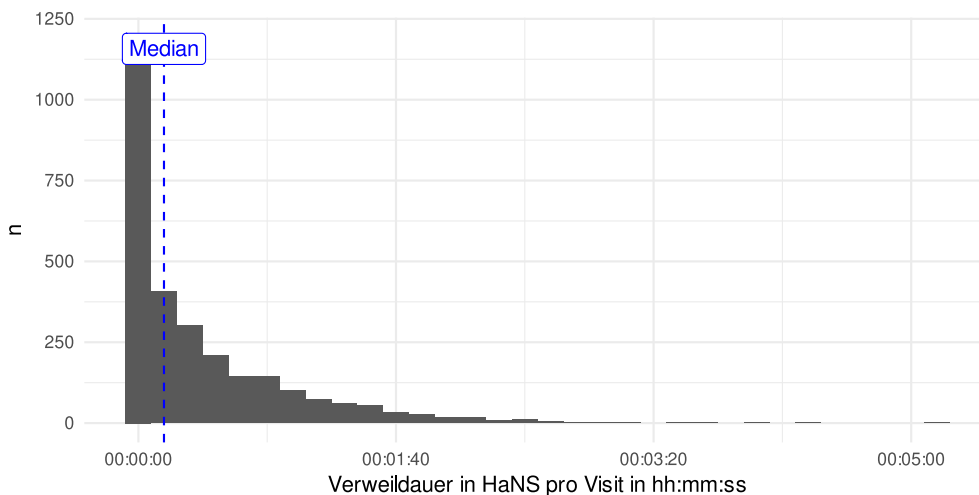
time_spent_summary |>
  gt() |>
  tab_header(title = "Duration statistics per visit (in minutes)")

```

Duration statistics per visit (in minutes)

mean_time_diff	median_time_diff	qr_time_diff	sd_time_diff	min_time_diff	max_time_diff
24.4	10	34	34	0	306

```
time_spent |>
  mutate(time_diff_minutes = time_diff / 60) |>
  ggplot(aes(x = time_diff_minutes)) + # minutes
  geom_histogram(binwidth = 10) +
  #scale_x_time() +
  theme_minimal() +
  labs(y = "n", x = "Verweildauer in HaNS pro Visit in hh:mm:ss") +
  scale_x_time(breaks = pretty_breaks()) +
  geom_vline(xintercept = median(time_spent$time_diff) / 60, color = "blue",
    linetype = "dashed") +
  annotate("label", x = median(time_spent$time_diff) / 60,
    y = Inf, label = "Median", vjust = 1.5, color = "blue")
```



## 2.2 Berechnen Sie die Verweildauer pro Nutzer. Berichten Sie die Verteilung.

```
visitduration_by_fingerprint <-
visitduration |>
  select(fingerprint, visitduration) |>
  group_by(fingerprint) |>
  summarise(visitduration = mean(visitduration, na.rm = TRUE))
```

```
visitduration_by_fingerprint |>
  describe_distribution(select = visitduration)
```

Variable	Mean	SD	IQR	Range	Skewness
visitduration	1422.20	1960.83	1926	[1.00, 16320.00]	2.73

Variable	Kurtosis	n	n_Missing
visitduration	11.26	1279	0

## 2.3 Berechnen Sie die Anzahl der Besuche im Zeitverlauf (pro Woche).

```
time_spent_by_week <-
  time_spent |>
  mutate(week_start = floor_date(time_min, "week")) |>
  mutate(
    week_num = lubridate::week(week_start),
    year = lubridate::year(week_start)
  ) |>
  group_by(week_num, year) |>
  summarise(
    time_spent_week_median = as.numeric(median(time_diff, na.rm = TRUE), units
= "mins"),
    time_spent_week_sd = sd(time_diff, na.rm = TRUE) / 60,
    time_spent_week_iqr = IQR(time_diff, na.rm = TRUE) / 60
  ) |>
  arrange(year, week_num) |>
  ungroup()
```

`summarise()` has grouped output by 'week\_num'. You can override using the `.groups` argument.

```
time_spent_by_week |>
  gt() |>
  fmt_number(columns = c(3,4, 5),
             decimals = 2)
```

week_num	year	time_spent_week_median	time_spent_week_sd	time_spent_week_iqr
9	2025	1.28	3.96	4.17
10	2025	7.18	27.37	11.25
11	2025	7.05	22.61	22.68
12	2025	4.92	31.61	28.31
13	2025	13.13	32.65	39.02
14	2025	14.78	31.03	35.77

week_num	year	time_spent_week_median	time_spent_week_sd	time_spent_week_iqr
15	2025	5.22	29.53	22.01
16	2025	12.33	28.70	28.88
17	2025	18.58	30.94	31.39
18	2025	4.23	29.84	27.58
19	2025	8.95	33.11	38.27
20	2025	11.20	26.54	31.07
21	2025	6.03	35.38	24.60
22	2025	20.62	31.89	49.79
23	2025	19.88	40.94	56.57
24	2025	5.35	33.90	30.80
25	2025	4.62	15.03	17.05
26	2025	7.43	36.36	28.16
27	2025	12.28	43.13	49.60
28	2025	26.58	63.23	96.80

```
time_spent_by_week_start <-
  time_spent |>
  mutate(week_start = lubridate::floor_date(time_min, "week")) |>
  mutate(
    week_num = lubridate::week(week_start),
    year = lubridate::year(week_start)
  ) |>
  group_by(week_start, year) |>
  summarise(
    time_spent_week_avg = mean(time_diff, na.rm = TRUE),
    time_spent_week_median = median(time_diff, na.rm = TRUE),
    time_spent_week_sd = sd(time_diff, na.rm = TRUE)
  )
```

`summarise()` has grouped output by 'week\_start'. You can override using the `.groups` argument.

```
time_spent_by_week_start |>
  ggplot(aes(x = week_start, y = time_spent_week_median)) +
  geom_line(group = 1, color = "grey60") +
  scale_y_time(labels = scales::time_format("%H:%M:%S")) +
  labs(x = "Datum", y = "Durchschnittliche Verweildauer pro Visit (in
```

```

hh:mm:ss)") +
# --- Highlight March–July (approx 1 Mar to 31 Jul) ---
annotate(
  "rect",
  xmin = as.Date("2023-03-01"),
  xmax = as.Date("2023-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

annotate(
  "rect",
  xmin = as.Date("2024-03-01"),
  xmax = as.Date("2024-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

annotate(
  "rect",
  xmin = as.Date("2025-03-01"),
  xmax = as.Date("2025-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

# --- Highlight October–February (semester break or 2nd term) ---
annotate(
  "rect",
  xmin = as.Date("2023-10-01"),
  xmax = as.Date("2024-02-28"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "orange"
) +
# annotate("rect",
#         xmin = as.Date("2024-10-01"), xmax = as.Date("2024-02-28"),
#         ymin = -Inf, ymax = Inf, alpha = 0.2, fill = "orange") +
annotate(
  "rect",
  xmin = as.Date("2024-10-01"),
  xmax = as.Date("2025-02-28"),

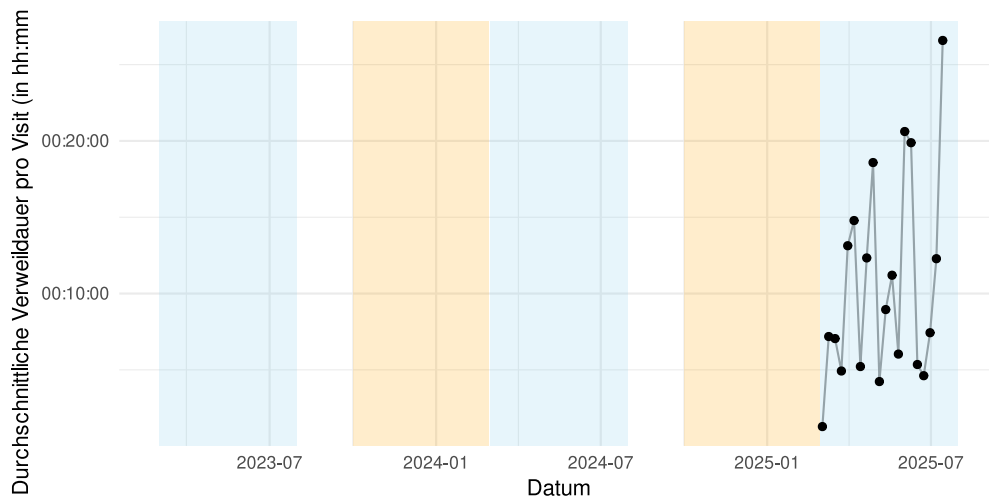
```



```

    ymin = -Inf,
    ymax = Inf,
    alpha = 0.2,
    fill = "orange"
  ) +
  geom_point()

```



## 2.4 An welchen Tagen und zu welcher Zeit kommen die Besucher zu HaNS?

```

# Define a vector with the names of the days of the week
# Note: Adjust the start of the week (Sunday or Monday) as per your
requirement
days_of_week <- c(
  "Monday",
  "Tuesday",
  "Wednesday",
  "Thursday",
  "Friday",
  "Saturday",
  "Sunday"
)

# Replace numbers with day names
time_visit_wday$dow2 <- factor(
  days_of_week[time_visit_wday$dow],
  levels = days_of_week
)

time_visit_wday_fingerprint$dow2 <- factor(

```

```

days_of_week[time_visit_wday_fingerprint$dow],
levels = days_of_week
)

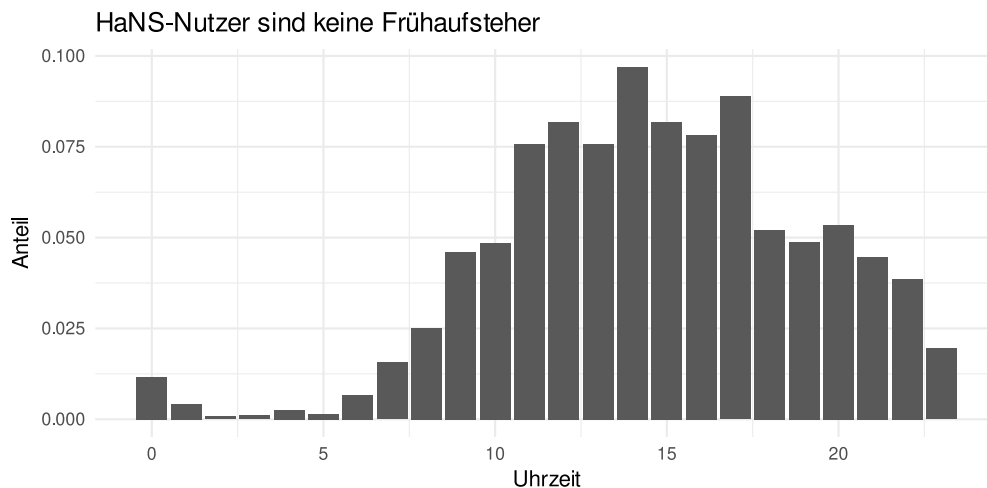
```

## 2.5 Zu welchen Uhrzeiten wird die Seite bevorzugt besucht?

```

time_visit_wday |>
  as_tibble() |>
  count(hour) |>
  mutate(prop = n / sum(n)) |>
  ggplot(aes(x = hour, y = prop)) +
  geom_col() +
  theme_minimal() +
  labs(
    title = "HaNS-Nutzer sind keine Frühaufsteher",
    x = "Uhrzeit",
    y = "Anteil"
  )

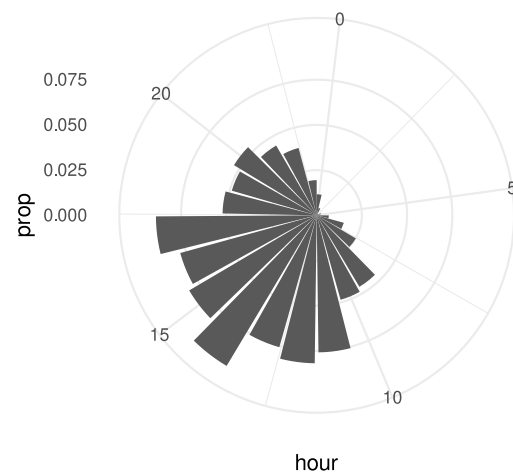
```



```

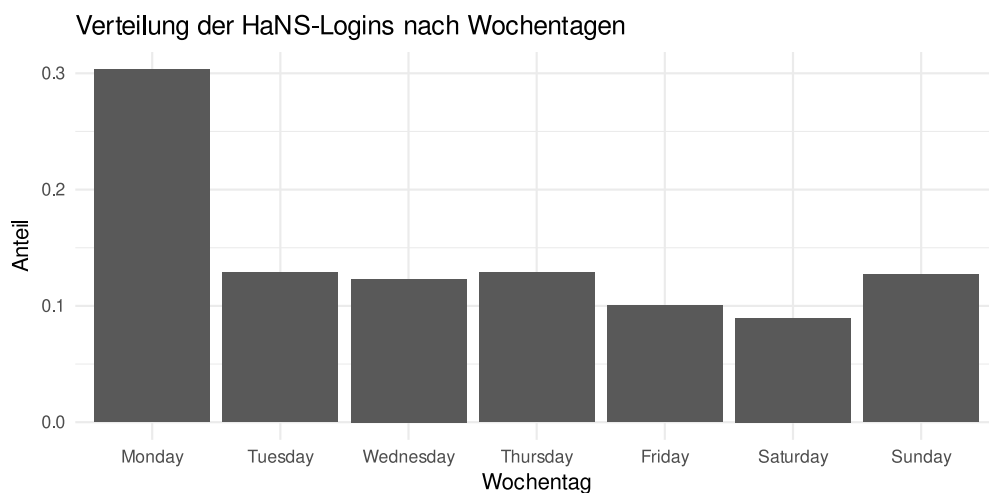
time_visit_wday |>
  as_tibble() |>
  count(hour) |>
  mutate(prop = n / sum(n)) |>
  ggplot(aes(x = hour, y = prop)) +
  geom_col() +
  theme_minimal() +
  coord_polar()

```

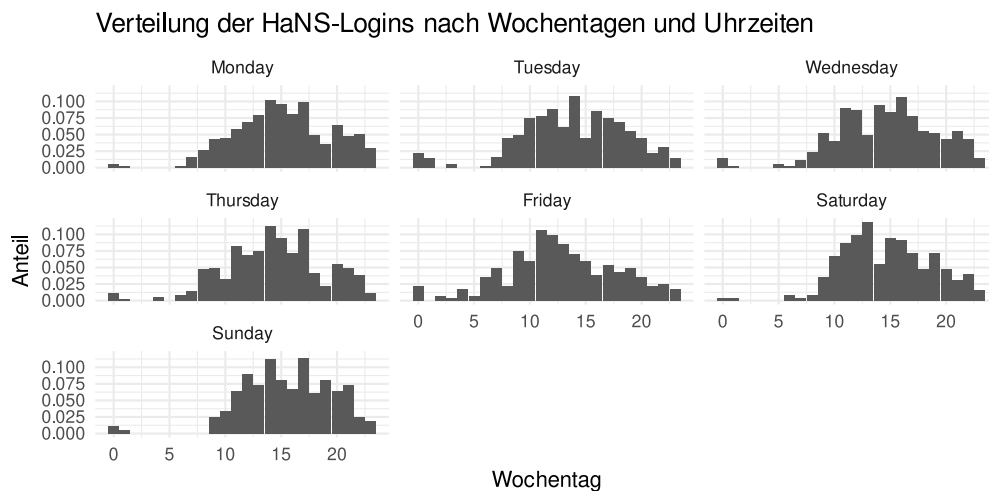


## 2.6 An welchen Tagen und zu welcher Zeit kommen die Besucher zu HaNS?

```
time_visit_wday |>
  as_tibble() |>
  count(dow2) |>
  mutate(prop = n / sum(n)) |>
  ggplot(aes(x = dow2, y = prop)) +
  geom_col() +
  theme_minimal() +
  labs(
    title = "Verteilung der HaNS-Logins nach Wochentagen",
    x = "Wochentag",
    y = "Anteil"
  )
```



```
time_visit_wday |>
  as_tibble() |>
  count(dow2, hour) |>
  group_by(dow2) |>
  mutate(prop = n / sum(n)) |>
  ggplot(aes(x = hour, y = prop)) +
  geom_col() +
  facet_wrap(~dow2) +
  theme_minimal() +
  labs(
    title = "Verteilung der HaNS-Logins nach Wochentagen und Uhrzeiten",
    x = "Wochentag",
    y = "Anteil"
  )
```



## 2.7 Wie ist die Verteilung der Visits?

```
time2 <-
  time_visit_wday |>
  ungroup() |>
  mutate(date = as.Date(date_time)) |>
  mutate(month_start = floor_date(date_time, "month"))

time2 |>
  ggplot(aes(x = date, y = hour)) +
  geom_bin2d(binwidth = c(1, 1)) + # (1 day, 1 hour)
  scale_x_date(date_breaks = "1 month") +
  theme(legend.position = "bottom") +
  scale_fill_viridis_c() +
  labs(caption = "Each x-bin maps to one week") +
  scale_x_date(breaks = breaks_pretty()) +
```

```

labs(
  caption = "Vertical dashed lines shows the median.",
  title = "Most users to only a few actions, but some do many.",
  x = "Number of actions per visit",
  y = "Number of visits"
) +

# --- Highlight March–July (approx 1 Mar to 31 Jul) ---
annotate(
  "rect",
  xmin = as.Date("2023-03-01"),
  xmax = as.Date("2023-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

annotate(
  "rect",
  xmin = as.Date("2024-03-01"),
  xmax = as.Date("2024-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

annotate(
  "rect",
  xmin = as.Date("2025-03-01"),
  xmax = as.Date("2025-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

# --- Highlight October–February (semester break or 2nd term) ---
annotate(
  "rect",
  xmin = as.Date("2023-10-01"),
  xmax = as.Date("2024-02-28"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "orange"
) +
# annotate("rect",

```

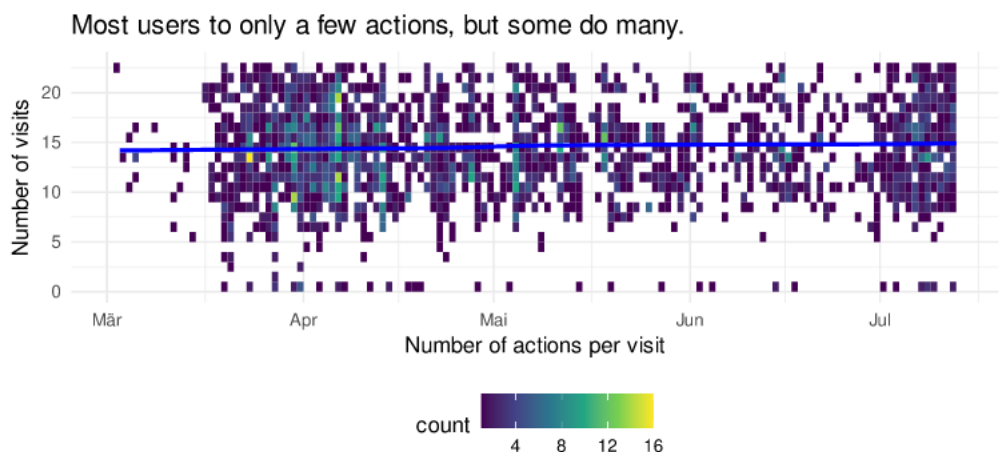
```
#       xmin = as.Date("2024-10-01"), xmax = as.Date("2024-02-28"),
#       ymin = -Inf, ymax = Inf, alpha = 0.2, fill = "orange") +
annotate(
  "rect",
  xmin = as.Date("2024-10-01"),
  xmax = as.Date("2025-02-28"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "orange"
) +
geom_smooth(method = "loess", se = FALSE, color = "blue") +
scale_x_date(limits = as.Date(c("2025-03-02", "2025-07-13")))
```

Scale for x is already present.  
 Adding another scale for x, which will replace the existing scale.  
 Scale for x is already present.  
 Adding another scale for x, which will replace the existing scale.

Warning: Removed 59 rows containing non-finite outside the scale range  
 (`stat\_bin2d()`).

`geom\_smooth()` using formula = 'y ~ x'

Warning: Removed 59 rows containing non-finite outside the scale range  
 (`stat\_smooth()`).



Vertical dashed lines shows the median.

**2.8 Geben Sie den Zeitraum der Nutzung an (von bis ). Hier geht es um insgesamt erste (bzw. letzte) Nutzung über alle User hinweg. Gefragt ist der älteste und neueste Time Stamp, den der Server insgesamt/ überhaupt protokolliert hat.**

```
min_max_time <-
  n_action_w_date |>
  summarise(
    time_min = min(date_time_start, na.rm = T),
    time_max = max(date_time_start, na.rm = T)
  )

min_max_time |>
  gt()
```

time_min	time_max
2025-03-03 23:04:49	2025-07-14 23:40:45

## 2.9 Wie ist die Verteilung der Visits?

Hier im Zeitverlauf

```
time_visit_wday_summary_week <-
  time_visit_wday |>
  ungroup() |>
  mutate(week_start = floor_date(date_time, "week")) |>
  mutate(week_num = week(date_time), year_num = year(date_time))
```

```
time_visit_wday_summary_week_summarized_dateformat <-
  time_visit_wday_summary_week |>
  group_by(week_start) |>
  summarise(n = n())
```

```
time_visit_wday_summary_week_summarized_dateformat_plot <-
time_visit_wday_summary_week_summarized_dateformat |>
  ggplot(aes(x = week_start, y = n)) +
  geom_line(group = 1, color = "grey60") +
  geom_point() +
  geom_smooth(method = "gam", se = FALSE, color = "blue") +
  labs(
    title = "The number of visits is increasing and reflects the teaching
periods of the semesters.",
    x = "week number/year"
  ) +
```

```

# --- Highlight March–July (approx 1 Mar to 31 Jul) ---
annotate(
  "rect",
  xmin = as.Date("2023-03-01"),
  xmax = as.Date("2023-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

annotate(
  "rect",
  xmin = as.Date("2024-03-01"),
  xmax = as.Date("2024-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

annotate(
  "rect",
  xmin = as.Date("2025-03-01"),
  xmax = as.Date("2025-07-31"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "skyblue"
) +

# --- Highlight October–February (semester break or 2nd term) ---
annotate(
  "rect",
  xmin = as.Date("2023-10-01"),
  xmax = as.Date("2024-02-28"),
  ymin = -Inf,
  ymax = Inf,
  alpha = 0.2,
  fill = "orange"
) +
# annotate("rect",
#         xmin = as.Date("2024-10-01"), xmax = as.Date("2024-02-28"),
#         ymin = -Inf, ymax = Inf, alpha = 0.2, fill = "orange") +
annotate(
  "rect",
  xmin = as.Date("2024-10-01"),
  xmax = as.Date("2025-02-28"),

```



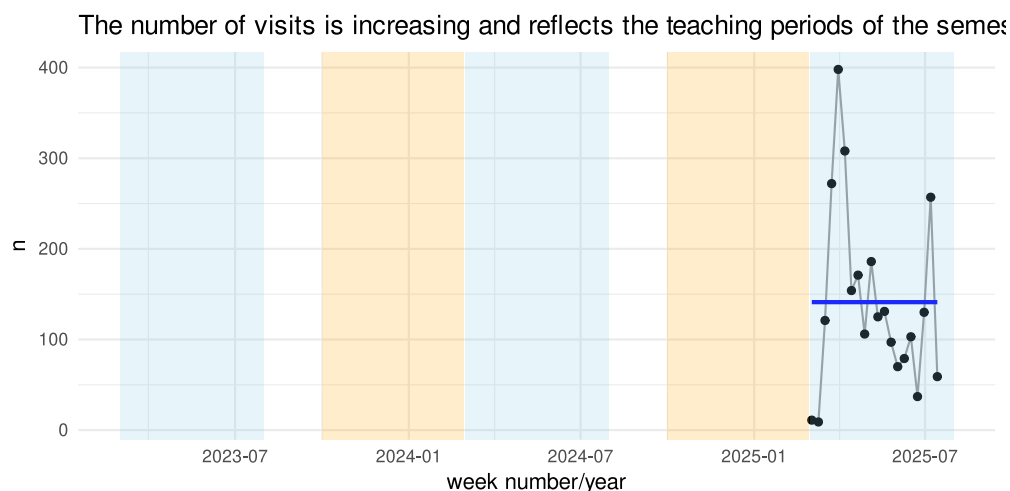
```

    ymin = -Inf,
    ymax = Inf,
    alpha = 0.2,
    fill = "orange"
  )

```

```
time_visit_wday_summary_week_summarized_dateformat_plot
```

```
`geom_smooth()` using formula = 'y ~ s(x, bs = "cs")'
```



```
time_visit_wday_summary_week_summarized_dateformat_plot +
  scale_x_date(limits = as.Date(c("2025-03-02", "2025-07-13")))

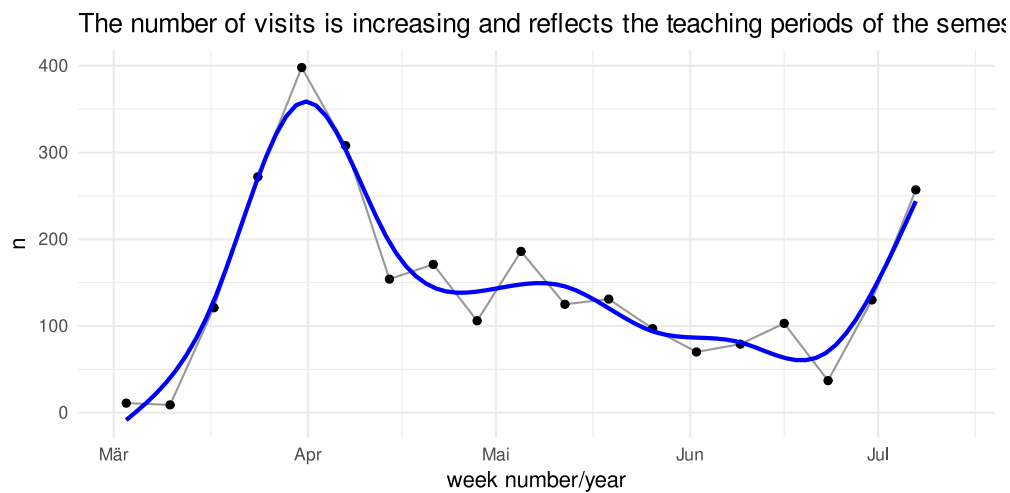
```

```
`geom_smooth()` using formula = 'y ~ s(x, bs = "cs")'
```

Warning: Removed 1 row containing non-finite outside the scale range  
(`stat\_smooth()`).

Warning: Removed 1 row containing missing values or values outside the scale range  
(`geom\_line()`).

Warning: Removed 1 row containing missing values or values outside the scale range  
(`geom\_point()`).



## 2.10 Brechen Sie die Verteilung der Visits auf nach folgenden Untergruppen: Module und Hochschule.

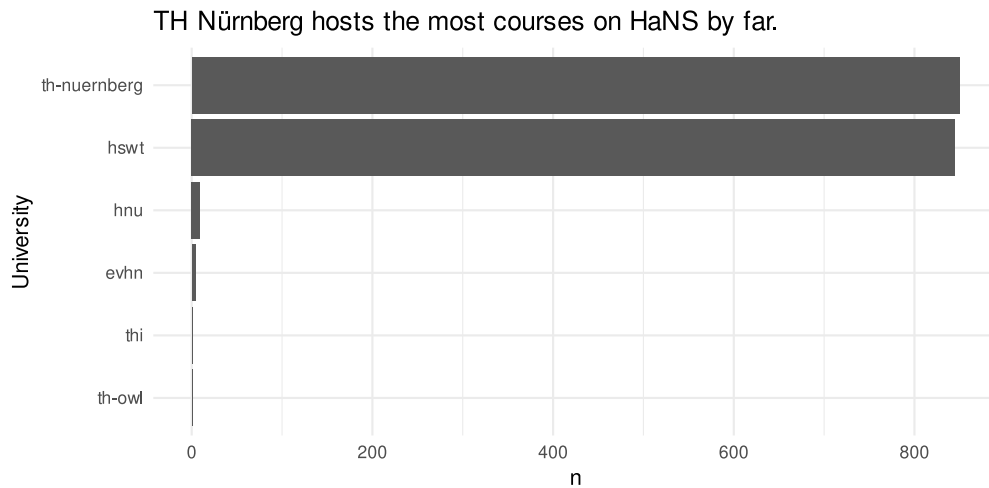
### 2.10.a Hochschule

```
course_and_uni_per_visit |>
  count(university, sort = TRUE) |>
  gt()
```

university	n
NA	1114
th-nuernberg	850
hswt	845
hnu	9
evhn	4
th-owl	1
thi	1

```
course_and_uni_per_visit |>
  count(university) |>
  drop_na() |>
  ggplot(aes(y = reorder(university, n), x = n)) +
  geom_col() +
  theme_minimal() +
  labs(
    title = "TH Nürnberg hosts the most courses on HaNS by far.",
```

```
y = "University"
)
```



## 2.10.b Module

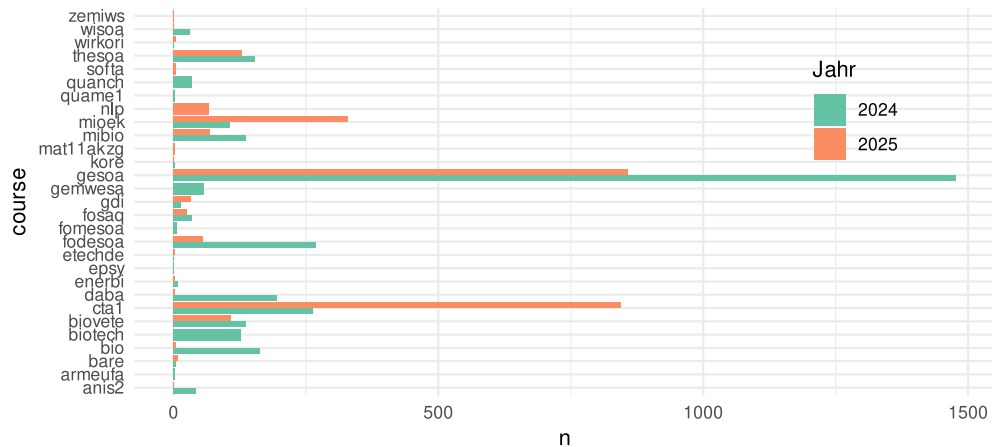
```
time_spent_w_course_university |>
  count(course, sort = TRUE) |>
  gt()
```

course	n
NA	8379
gesoa	2336
cta1	1109
mioek	437
fodesoa	325
thesoa	283
biovete	244
mibio	206
daba	198
bio	168
biotech	127
nlp	67
fosaq	60

course	n
gemwesa	57
gdi	48
anis2	43
quanch	34
wisoa	33
bare	13
enerbi	10
fomesoa	6
wirkori	5
softa	4
etechde	3
kore	3
quame1	3
armeufa	2
mat11akzg	2
epsy	1
zemiws	1

```
time_spent_w_course_university |>
  count(year, course) |>
  drop_na() |>
  ggplot(aes(x = n, y = course, fill = factor(year), )) +
  geom_col(position = "dodge") +
  labs(title = "The course 'GeSOA' is the most active course on HaNS.",
       fill = "Jahr") +
  theme(legend.position = c(.9, .9),
       legend.justification = c("right", "top"))
```

The course 'GeSOA' is the most active course on HaNS.



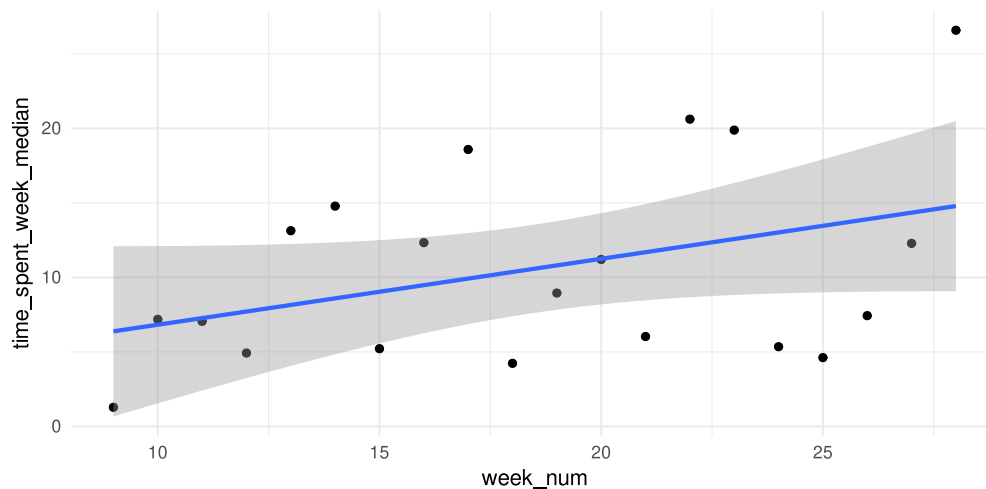
## 2.11 Unterscheiden sich die Anzahl der Visits zwischen Vorlesungszeit und Semesterferien?

Keine Vorlesungszeit in den Daten enthalten

## 2.12 Verändert sich die Verweildauer im Zeitverlauf (nimmt sie zu oder ab)? Analysebasis: Woche. Berechnen Sie eine Regression dazu.

```
time_spent_by_week |>
  ggplot(aes(x = week_num, y = time_spent_week_median)) +
  geom_point() +
  geom_smooth(method = "lm")
```

```
`geom_smooth()` using formula = 'y ~ x'
```



```
lm_visitduration_by_week <-  
  lm(time_spent_week_median ~ week_num, data = time_spent_by_week)  
  
parameters(lm_visitduration_by_week) |>  
  print_md()
```

Parameter	Coefficient	SE	95% CI	t(18)	p
(Intercept)	2.40	4.74	(-7.55, 12.35)	0.51	0.618
week num	0.44	0.24	(-0.07, 0.96)	1.81	0.087

## 2.13 Gibt es einen statistischen Zusammenhang von Modul/Lehrveranstaltung und Verweildauer?

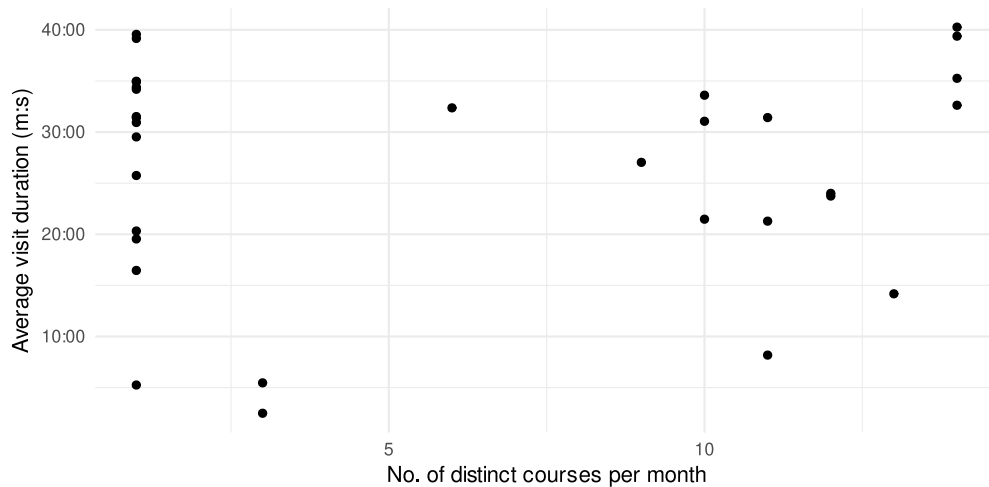
```
time_spent_w_course_university_summary <-  
  time_spent_w_course_university |>  
  group_by(floor_date_month) |>  
  summarise(  
    distinct_courses_n = n_distinct(course),  
    diff_time_mean = round(mean(time_diff, na.rm = TRUE), 2),  
    n = n()  
  )  
  
time_spent_w_course_university_summary |>  
  gt() |>  
  fmt_number(columns = where(is.numeric),  
             decimals = 2)
```

floor_date_month	distinct_courses_n	diff_time_mean	n
2022-12-01	1.00	1771.4	329.00
2023-01-01	1.00	2063.35	455.00
2023-02-01	1.00	2098.29	561.00
2023-03-01	1.00	987.73	149.00
2023-04-01	1.00	1172.55	253.00
2023-05-01	1.00	2051.09	391.00
2023-06-01	1.00	2349.46	292.00
2023-07-01	1.00	1884.18	441.00
2023-08-01	1.00	1219.23	26.00
2023-09-01	1.00	315.18	39.00
2023-10-01	1.00	1545	614.00

floor_date_month	distinct_courses_n	diff_time_mean	n
2023-11-01	1.00	1856	660.00
2023-12-01	1.00	2094.81	519.00
2024-01-01	1.00	1890.99	783.00
2024-02-01	1.00	2373.31	85.00
2024-03-01	11.00	490.81	138.00
2024-04-01	13.00	850.54	329.00
2024-05-01	14.00	2362.88	413.00
2024-06-01	14.00	2115.43	593.00
2024-07-01	14.00	2415.87	743.00
2024-08-01	3.00	149.5	16.00
2024-09-01	3.00	327.96	23.00
2024-10-01	12.00	1440.25	731.00
2024-11-01	10.00	1863.21	918.00
2024-12-01	10.00	2016.26	765.00
2025-01-01	14.00	1957.38	959.00
2025-02-01	6.00	1942.01	155.00
2025-03-01	11.00	1277.06	507.00
2025-04-01	12.00	1424.26	1,011.00
2025-05-01	10.00	1288.53	557.00
2025-06-01	9.00	1622.21	321.00
2025-07-01	11.00	1884.97	430.00
NA	1.00	NaN	1.00

```
time_spent_w_course_university_summary |>
  ggplot(aes(x = distinct_courses_n, y = diff_time_mean)) +
  geom_point() +
  scale_y_time(labels = scales::time_format("%M:%S")) +
  labs(
    y = "Average visit duration (m:s)",
    x = "No. of distinct courses per month"
  )
```

Warning: Removed 1 row containing missing values or values outside the scale range (``geom_point()``).



```
time_spent_w_course_university_summary |>
  mutate(diff_time_mean_num = as.numeric(diff_time_mean)) |>
  correlation()
```

# Correlation Matrix (pearson-method)

Parameter1	Parameter2	r	95% CI	t	df
distinct_courses_n	n	0.47	[ 0.16, 0.70]	2.99	31
distinct_courses_n	diff_time_mean_num	0.07	[-0.28, 0.41]	0.41	30
n	diff_time_mean_num	0.49	[ 0.17, 0.72]	3.09	30

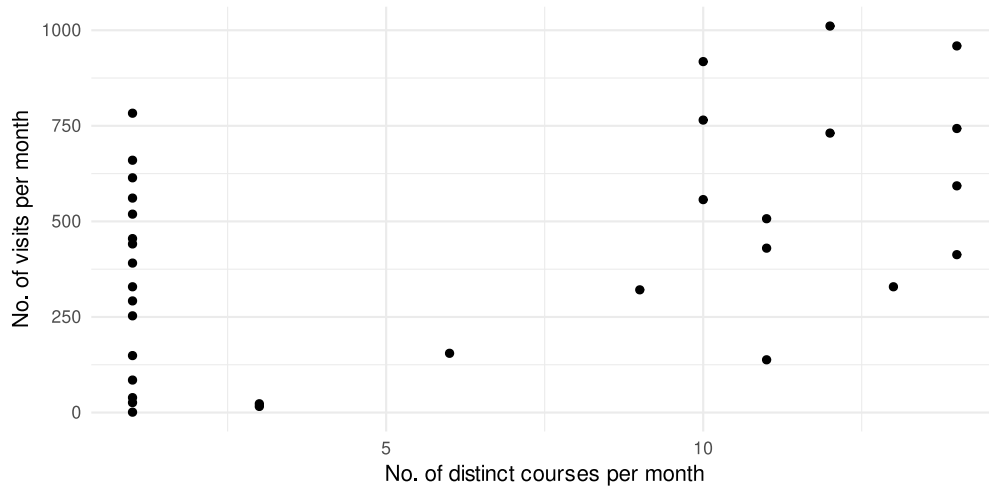
p-value adjustment method: Holm (1979)  
Observations: 32-33

## 2.14 Gibt es einen statistischen Zusammenhang von Modul/Lehrveranstaltung und der Anzahl der Visits?

```
time_spent_w_course_university_summary |>
  ggplot(aes(x = distinct_courses_n, y = n)) +
```



```
geom_point() +  
labs(y = "No. of visits per month", x = "No. of distinct courses per month")
```



## 3 Debrief

### 3.1 Targets-Objekte

```
targets::tar_manifest() |>  
  select(name) |>  
  #print(n = Inf) |>  
  knitr::kable()
```

name
config_file
config
data_files_list
data_files_dupes_excluded
data_imported
data_prepped
data_all_fct
test_unique_idvisit
visitduration
data_long
data_wide_slim

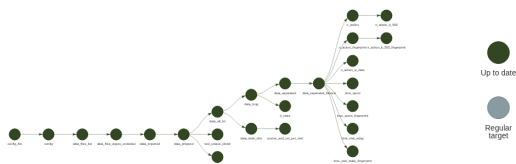
name
data_separated
n_visits
course_and_uni_per_visit
data_separated_filtered
n_action_fingerprint
time_spent
time_visit_wday_fingerprint
n_action
n_action_w_date
time_spent_fingerprint
time_visit_wday
n_action_lt_500_fingerprint
n_action_lt_500

## 3.2 Pipeline-Graph

```
tar_visnetwork(targets_only = TRUE,
               outdated = TRUE)
```

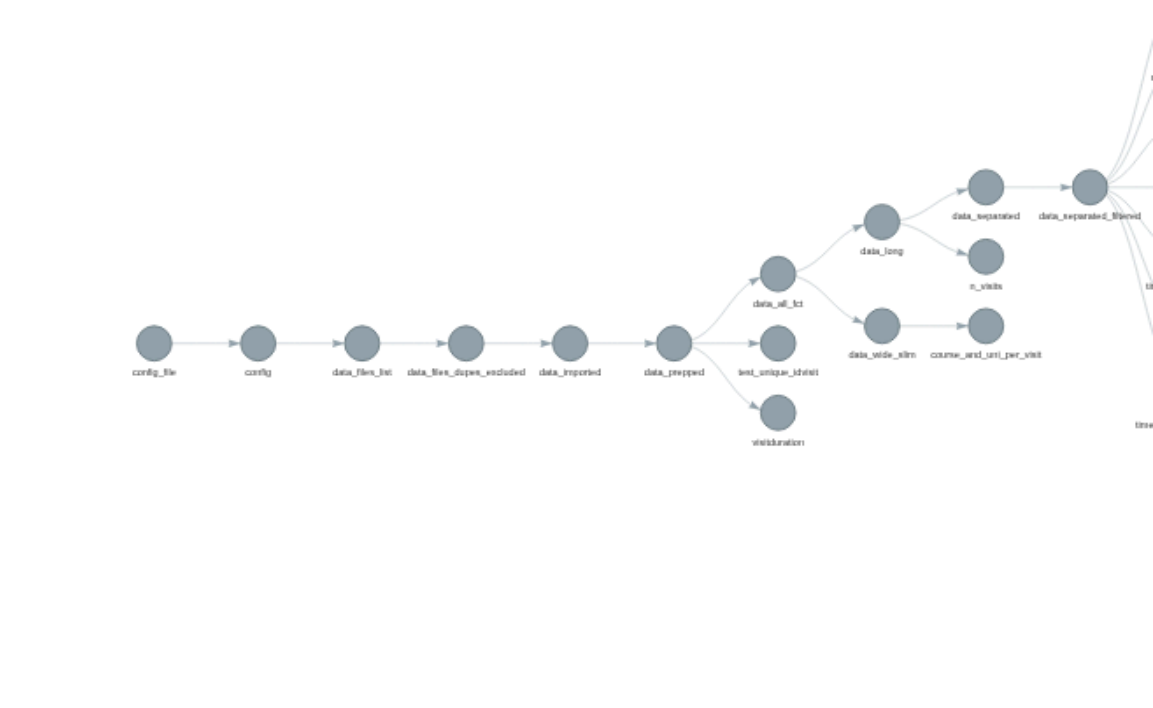
PhantomJS not found. You can install it with `webshot::install_phantomjs()`. If it is installed, please make sure the phantomjs executable can be found via the PATH variable.

file:///tmp/Rtmpso4Z0Z/file7f20556e2a925/widget7f2057f784d46.html screenshot completed



```
tar_glimpse()
```

```
file:///tmp/Rtmpso4Z0Z/file7f2056848da3a/widget7f2051af50706.html screenshot
completed
```



### 3.3 sessionInfo

```
sessioninfo::session_info()
```

```

- Session info -----
setting  value
version  R version 4.5.1 (2025-06-13)
os       Ubuntu 25.10
system   x86_64, linux-gnu

```

```

ui      X11
language (EN)
collate de_DE.UTF-8
ctype   de_DE.UTF-8
tz       Europe/Berlin
date     2025-12-13
pandoc   3.6.3 @ /snap/rstudio/25/resources/app/bin/quarto/bin/tools/x86_64/
(via rmarkdown)
quarto   1.7.32 @ /snap/rstudio/25/resources/app/bin/quarto/bin/quarto

```

#### — Packages —

package	* version	date (UTC)	lib	source
abind	1.4-8	2024-09-12	[3]	CRAN (R 4.4.1)
backports	1.5.0	2024-05-23	[3]	CRAN (R 4.4.1)
base64url	1.4	2018-05-14	[3]	CRAN (R 4.0.1)
bayestestR	* 0.17.0	2025-08-29	[1]	RSPM (R 4.5.1)
broom	1.0.10	2025-09-13	[1]	RSPM
callr	3.7.6	2024-03-25	[3]	CRAN (R 4.4.0)
car	3.1-3	2024-09-27	[3]	CRAN (R 4.4.1)
carData	3.0-5	2022-01-06	[3]	CRAN (R 4.1.2)
chromote	0.5.1	2025-04-24	[1]	CRAN (R 4.5.1)
cli	3.6.5	2025-04-23	[1]	CRAN (R 4.5.1)
coda	0.19-4.1	2024-01-31	[1]	RSPM
codetools	0.2-20	2024-03-31	[4]	CRAN (R 4.3.3)
correlation	* 0.8.8	2025-07-08	[1]	RSPM (R 4.5.1)
data.table	1.17.8	2025-07-10	[1]	RSPM (R 4.5.1)
datawizard	* 1.3.0	2025-10-11	[1]	RSPM (R 4.5.1)
dichromat	2.0-0.1	2022-05-02	[3]	CRAN (R 4.2.0)
digest	0.6.39	2025-11-19	[1]	CRAN (R 4.5.1)
dplyr	* 1.1.4	2023-11-17	[3]	CRAN (R 4.4.2)
easystats	* 0.7.5	2025-07-11	[1]	RSPM (R 4.5.1)
effectsize	* 1.0.1	2025-05-27	[1]	RSPM (R 4.5.1)
emmeans	1.10.7	2025-01-31	[3]	CRAN (R 4.4.2)
estimability	1.5.1	2024-05-12	[3]	CRAN (R 4.4.2)
evaluate	1.0.5	2025-08-27	[1]	CRAN (R 4.5.1)
farver	2.1.2	2024-05-13	[3]	CRAN (R 4.4.1)
fastmap	1.2.0	2024-05-15	[3]	CRAN (R 4.4.1)
forcats	* 1.0.0	2023-01-29	[3]	CRAN (R 4.2.2)
Formula	1.2-5	2023-02-24	[3]	CRAN (R 4.2.2)
fs	1.6.6	2025-04-12	[1]	CRAN (R 4.5.1)
generics	0.1.4	2025-05-09	[1]	CRAN (R 4.5.1)
ggplot2	* 4.0.1	2025-11-14	[1]	RSPM (R 4.5.1)
ggpubr	* 0.6.2	2025-10-17	[1]	RSPM
ggsignif	0.6.4	2022-10-13	[3]	CRAN (R 4.2.2)
ggstatsplot	* 0.13.3	2025-10-05	[1]	RSPM
glue	1.8.0	2024-09-30	[3]	CRAN (R 4.4.2)
gt	* 1.1.0	2025-09-23	[1]	RSPM (R 4.5.1)
gtable	0.3.6	2024-10-25	[3]	CRAN (R 4.4.2)

hms	1.1.3	2023-03-21	[3]	CRAN	(R 4.3.1)
htmltools	0.5.8.1	2024-04-04	[3]	CRAN	(R 4.4.0)
htmlwidgets	1.6.4	2023-12-06	[3]	CRAN	(R 4.3.2)
igraph	2.1.4	2025-01-23	[3]	CRAN	(R 4.5.0)
insight	* 1.4.2	2025-09-02	[1]	RSPM	(R 4.5.1)
jsonlite	2.0.0	2025-03-27	[1]	CRAN	(R 4.5.1)
knitr	1.50	2025-03-16	[3]	CRAN	(R 4.4.3)
labeling	0.4.3	2023-08-29	[3]	CRAN	(R 4.3.1)
later	1.4.4	2025-08-27	[1]	RSPM	(R 4.5.1)
lattice	0.22-7	2025-04-02	[4]	CRAN	(R 4.4.3)
lifecycle	1.0.4	2023-11-07	[3]	CRAN	(R 4.3.2)
lubridate	* 1.9.4	2024-12-08	[3]	CRAN	(R 4.4.2)
magrittr	2.0.4	2025-09-12	[1]	CRAN	(R 4.5.1)
MASS	7.3-65	2025-02-28	[4]	CRAN	(R 4.4.3)
Matrix	1.7-3	2025-03-11	[4]	CRAN	(R 4.4.3)
mgcv	1.9-3	2025-04-04	[4]	CRAN	(R 4.4.3)
modelbased	* 0.13.0	2025-08-30	[1]	RSPM	(R 4.5.1)
multcomp	1.4-28	2025-01-29	[3]	CRAN	(R 4.4.2)
mvtnorm	1.3-3	2025-01-10	[1]	RSPM	
nlme	3.1-168	2025-03-31	[4]	CRAN	(R 4.4.3)
otel	0.2.0	2025-08-29	[1]	RSPM	(R 4.5.1)
paletteer	1.6.0	2024-01-21	[1]	RSPM	
parameters	* 0.28.2	2025-09-10	[1]	RSPM	(R 4.5.1)
patchwork	1.3.2	2025-08-25	[1]	RSPM	(R 4.5.1)
performance	* 0.15.2	2025-10-06	[1]	RSPM	(R 4.5.1)
pillar	1.11.1	2025-09-17	[1]	CRAN	(R 4.5.1)
pkgconfig	2.0.3	2019-09-22	[3]	CRAN	(R 4.0.1)
prettyunits	1.2.0	2023-09-24	[3]	CRAN	(R 4.3.1)
processx	3.8.6	2025-02-21	[3]	CRAN	(R 4.4.3)
promises	1.5.0	2025-11-01	[1]	RSPM	(R 4.5.1)
ps	1.9.0	2025-02-18	[3]	CRAN	(R 4.4.3)
purrr	* 1.2.0	2025-11-04	[1]	RSPM	(R 4.5.1)
R6	2.6.1	2025-02-15	[3]	CRAN	(R 4.4.3)
RColorBrewer	1.1-3	2022-04-03	[3]	CRAN	(R 4.2.0)
Rcpp	1.1.0	2025-07-02	[3]	CRAN	(R 4.5.1)
RcppParallel	5.1.7	2023-02-27	[3]	CRAN	(R 4.5.0)
readr	* 2.1.6	2025-11-14	[1]	RSPM	
rematch2	2.1.2	2020-05-01	[3]	CRAN	(R 4.0.1)
report	* 0.6.2	2025-11-03	[1]	RSPM	(R 4.5.1)
rlang	1.1.6	2025-04-11	[1]	CRAN	(R 4.5.1)
rmarkdown	2.30	2025-09-28	[1]	RSPM	(R 4.5.1)
rstantools	2.4.0	2024-01-31	[3]	CRAN	(R 4.3.2)
rstatix	0.7.2	2023-02-01	[3]	CRAN	(R 4.2.2)
rstudioapi	0.17.1	2024-10-22	[3]	CRAN	(R 4.4.1)
S7	0.2.1	2025-11-14	[1]	RSPM	(R 4.5.1)
sandwich	3.1-1	2024-09-15	[3]	CRAN	(R 4.4.1)
sass	0.4.10	2025-04-11	[1]	RSPM	(R 4.5.1)
scales	* 1.4.0	2025-04-24	[1]	RSPM	(R 4.5.1)

secretbase	1.0.5	2025-03-04	[1]	RSPM
see	* 0.12.0	2025-09-14	[1]	RSPM (R 4.5.1)
sessioninfo	1.2.3	2025-02-05	[3]	CRAN (R 4.4.3)
statsExpressions	1.7.1	2025-07-27	[1]	RSPM
stringi	1.8.7	2025-03-27	[1]	CRAN (R 4.5.1)
stringr	* 1.6.0	2025-11-04	[1]	CRAN (R 4.5.1)
survival	3.8-3	2024-12-17	[4]	CRAN (R 4.4.2)
targets	* 1.11.4	2025-09-13	[1]	RSPM
TH.data	1.1-3	2025-01-17	[3]	CRAN (R 4.4.2)
tibble	* 3.3.0	2025-06-08	[1]	CRAN (R 4.5.1)
tidyr	* 1.3.1	2024-01-24	[3]	CRAN (R 4.3.2)
tidyselect	1.2.1	2024-03-11	[3]	CRAN (R 4.4.0)
tidyverse	* 2.0.0	2023-02-22	[3]	CRAN (R 4.4.2)
timechange	0.3.0	2024-01-18	[3]	CRAN (R 4.4.3)
tzdb	0.5.0	2025-03-15	[3]	CRAN (R 4.4.3)
vctrs	0.6.5	2023-12-01	[3]	CRAN (R 4.3.2)
viridisLite	0.4.2	2023-05-02	[3]	CRAN (R 4.3.1)
visdat	* 0.6.0	2023-02-02	[1]	CRAN (R 4.5.1)
visNetwork	2.1.2	2022-09-29	[3]	CRAN (R 4.4.1)
webshot	0.5.5	2023-06-26	[3]	CRAN (R 4.3.1)
webshot2	0.1.2	2025-04-23	[1]	CRAN (R 4.5.1)
websocket	1.4.4	2025-04-10	[1]	CRAN (R 4.5.1)
withr	3.0.2	2024-10-28	[3]	CRAN (R 4.4.1)
xfun	0.54	2025-10-30	[1]	CRAN (R 4.5.1)
xml2	1.5.0	2025-11-17	[1]	CRAN (R 4.5.1)
xtable	1.8-4	2019-04-21	[3]	CRAN (R 4.0.1)
yaml	2.3.10	2024-07-26	[3]	CRAN (R 4.4.1)
zeallot	0.2.0	2025-05-27	[1]	RSPM
zoo	1.8-14	2025-04-10	[3]	CRAN (R 4.4.3)

[1] /home/sebastian-sauer/R/x86\_64-pc-linux-gnu-library/4.5

[2] /usr/local/lib/R/site-library

[3] /usr/lib/R/site-library

[4] /usr/lib/R/library

\* — Packages attached to the search path.