

# Challenge 08 – Solution Report

## Analyse der Matoma-HaNS-Daten

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## 1 Setup

### 1.1 R-Pakete starten

```
library(targets)
library(tidyverse)
library(ggokabeito) # Farben
library(easystats)
library(gt) # Tabellen
library(ggfittext)
library(scales)
library(visdat)
```

```
theme_set(theme_minimal())
```

### 1.2 Daten importieren und inspizieren

#### 1.2.a Targets-Objekte laden

```
tar_load(action_types, store = "mastersolution")
tar_load(data_users_only, store = "mastersolution")
tar_load(actions_per_visit, store = "mastersolution")
tar_load(time_minmax, store = "mastersolution")
tar_load(time_since_last_visit, store = "mastersolution")
tar_load(numeric_id, store = "mastersolution")
tar_load(time_spent, store = "mastersolution")
```

```
tar_load(time_duration, store = "mastersolution")
tar_load(time_visit_wday, store = "mastersolution")
tar_load(ai_transcript_clicks_per_month, store = "mastersolution") # challenge
08
tar_load(llm_per_visit, store = "mastersolution") # challenge 08
tar_load(ai_llm_per_months, store = "mastersolution") # challenge 08
tar_load(idvisit_has_llm, store = "mastersolution") # challenge 08
```

## 1.2.b Dimension

Der Roh-Datensatz verfügt über

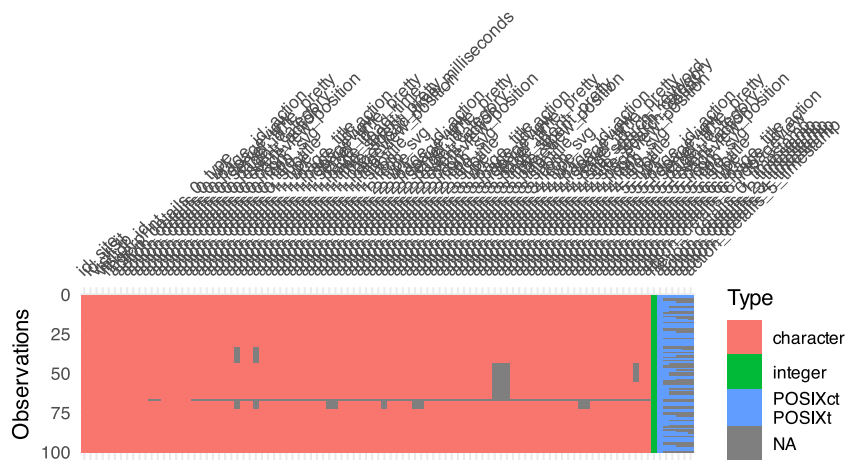
- 2351 Zeilen
- 9247 Spalten (Dubletten und Spalten mit Bildern bereits entfernt)

Jede Zeile entspricht einem „Visit“.

## 1.2.c Erster Blick

```
data_users_only_head100 <-
data_users_only %>%
  select(1:100) %>%
  slice_head(n = 100)
```

```
data_users_only_head100 %>%
  visdat::vis_dat()
```



## 1.2.d Namen (1-100)

```
data_users_only_head100 %>%
  names()
##      [1] "file"
```

```
## [2] "id_site"
## [3] "id_visit"
## [4] "visit_ip"
## [5] "visitor_id"
## [6] "fingerprint"
## [7] "action_details_0_type"
## [8] "action_details_0_url"
## [9] "action_details_0_page_id_action"
## [10] "action_details_0_idpageview"
## [11] "action_details_0_server_time_pretty"
## [12] "action_details_0_page_id"
## [13] "action_details_0_event_category"
## [14] "action_details_0_event_action"
## [15] "action_details_0_pageview_position"
## [16] "action_details_0_timestamp"
## [17] "action_details_0_icon"
## [18] "action_details_0_icon_svg"
## [19] "action_details_0_title"
## [20] "action_details_0_subtitle"
## [21] "action_details_1_type"
## [22] "action_details_1_url"
## [23] "action_details_1_page_title"
## [24] "action_details_1_page_id_action"
## [25] "action_details_1_idpageview"
## [26] "action_details_1_server_time_pretty"
## [27] "action_details_1_page_id"
## [28] "action_details_1_page_load_time"
## [29] "action_details_1_time_spent"
## [30] "action_details_1_time_spent_pretty"
## [31] "action_details_1_page_load_time_milliseconds"
## [32] "action_details_1_pageview_position"
## [33] "action_details_1_title"
## [34] "action_details_1_subtitle"
## [35] "action_details_1_icon"
## [36] "action_details_1_icon_svg"
## [37] "action_details_1_timestamp"
## [38] "action_details_2_type"
## [39] "action_details_2_url"
## [40] "action_details_2_page_id_action"
## [41] "action_details_2_idpageview"
## [42] "action_details_2_server_time_pretty"
## [43] "action_details_2_page_id"
## [44] "action_details_2_event_category"
## [45] "action_details_2_event_action"
## [46] "action_details_2_pageview_position"
## [47] "action_details_2_timestamp"
## [48] "action_details_2_icon"
## [49] "action_details_2_icon_svg"
```

```
## [50] "action_details_2_title"
## [51] "action_details_2_subtitle"
## [52] "action_details_3_type"
## [53] "action_details_3_url"
## [54] "action_details_3_page_title"
## [55] "action_details_3_page_id_action"
## [56] "action_details_3_idpageview"
## [57] "action_details_3_server_time_pretty"
## [58] "action_details_3_page_id"
## [59] "action_details_3_time_spent"
## [60] "action_details_3_time_spent_pretty"
## [61] "action_details_3_pageview_position"
## [62] "action_details_3_title"
## [63] "action_details_3_subtitle"
## [64] "action_details_3_icon"
## [65] "action_details_3_icon_svg"
## [66] "action_details_3_timestamp"
## [67] "action_details_4_type"
## [68] "action_details_4_url"
## [69] "action_details_4_page_id_action"
## [70] "action_details_4_idpageview"
## [71] "action_details_4_server_time_pretty"
## [72] "action_details_4_page_id"
## [73] "action_details_4_site_search_keyword"
## [74] "action_details_4_site_search_category"
## [75] "action_details_4_site_search_count"
## [76] "action_details_4_pageview_position"
## [77] "action_details_4_icon"
## [78] "action_details_4_icon_svg"
## [79] "action_details_4_title"
## [80] "action_details_4_subtitle"
## [81] "action_details_4_timestamp"
## [82] "action_details_5_type"
## [83] "action_details_5_url"
## [84] "action_details_5_page_id_action"
## [85] "action_details_5_idpageview"
## [86] "action_details_5_server_time_pretty"
## [87] "action_details_5_page_id"
## [88] "action_details_5_event_category"
## [89] "action_details_5_event_action"
## [90] "action_details_5_pageview_position"
## [91] "action_details_5_timestamp"
## [92] "action_details_5_icon"
## [93] "action_details_5_icon_svg"
## [94] "action_details_5_title"
## [95] "action_details_5_subtitle"
## [96] "action_details_6_type"
## [97] "action_details_6_url"
```

```
## [98] "action_details_6_page_title"
## [99] "action_details_6_page_id_action"
## [100] "action_details_6_idpageview"
```

## 1.2.e Werte der erst 100 Spalten

```
data_users_only_head100 %>%
  glimpse()
## Rows: 100
## Columns: 100
## $ file                                <int> 1, 1, 1, 1, 1, 1, 1, 1,
1...
## $ id_site                             <chr> "1", "1", "1", "1", "1",
...
## $ id_visit                             <chr> "19", "18", "17", "14",
"..."
## $ visit_ip                             <chr> "172.30.0.0", "172.30.0.0...
## $ visitor_id                           <chr> "01357ce636fa78c2",
"a0fe..."
## $ fingerprint                         <chr> "9ffcf86ca880ddaa",
"4524..."
## $ action_details_0_type                 <chr> "event", "action",
"event..."
## $ action_details_0_url                  <chr> "https://hans.th-nuernber...
## $ action_details_0_page_id_action       <chr> "17", "2", "17", "192",
"..."
## $ action_details_0_idpageview           <chr> "1YNiVr", "DNNr9n",
"Vfj7..."
## $ action_details_0_server_time_pretty   <chr> "Mar 4, 2024 22:58:30",
"..."
## $ action_details_0_page_id              <chr> "6509", "5632", "5621",
"..."
## $ action_details_0_event_category       <chr> "click_button", "",
"click..."
## $ action_details_0_event_action         <chr> "Kanäle", "", "Kanäle",
"..."
## $ action_details_0_pageview_position    <chr> "", "1", "", "1", "1",
"1..."
## $ action_details_0_timestamp            <dtm> 2024-03-04 22:58:30,
202...
## $ action_details_0_icon                 <chr> "plugins/Morpheus/
images/..."
## $ action_details_0_icon_svg             <chr> "plugins/Morpheus/
images/..."
## $ action_details_0_title                 <chr> "Event", "HAnS", "Event",...
## $ action_details_0_subtitle             <chr> "Category: \"\\\"click_butt...
## $ action_details_1_type                 <chr> "action", "event", "",
"..."
```

```

## $ action_details_1_url <chr> "https://hans.th-nuernber...
## $ action_details_1_page_title <chr> "HAnS", "", "", "", "",
"..."
## $ action_details_1_page_id_action <chr> "32", "3", "", "", "",
"..."
## $ action_details_1_idpageview <chr> "HKiQ62", "DNNr9n", "",
"..."
## $ action_details_1_server_time_pretty <chr> "Mar 4, 2024 23:16:59",
"..."
## $ action_details_1_page_id <chr> "6511", "5633", "", "",
"..."
## $ action_details_1_page_load_time <chr> "0.94s", "", "", "", "",
"..."
## $ action_details_1_time_spent <chr> "21", "", "", "", "",
"...",...
## $ action_details_1_time_spent_pretty <chr> "21s", "", "", "", "",
"..."
## $ action_details_1_page_load_time_milliseconds <chr> "940", "", "", "", "",
"..."
## $ action_details_1_pageview_position <chr> "1", "1", "", "", "2",
"2..."
## $ action_details_1_title <chr> "HAnS", "Event", "", "",
"..."
## $ action_details_1_subtitle <chr> "https://hans.th-nuernber...
## $ action_details_1_icon <chr> "", "plugins/Morpheus/
ima...
## $ action_details_1_icon_svg <chr> "plugins/Morpheus/
images/..."
## $ action_details_1_timestamp <dtm> 2024-03-04 23:16:59,
202...
## $ action_details_2_type <chr> "event", "action", "",
"..."
## $ action_details_2_url <chr> "https://hans.th-nuernber...
## $ action_details_2_page_id_action <chr> "33", "147", "", "",
"147..."
## $ action_details_2_idpageview <chr> "HKiQ62", "1wrpn1", "",
"..."
## $ action_details_2_server_time_pretty <chr> "Mar 4, 2024 23:17:20",
"..."
## $ action_details_2_page_id <chr> "6512", "5634", "", "",
"..."
## $ action_details_2_event_category <chr> "click_channelcard", "",
"..."
## $ action_details_2_event_action <chr> "ZELLKU", "", "", "",
"...",...
## $ action_details_2_pageview_position <chr> "1", "2", "", "", "2",
"2..."
## $ action_details_2_timestamp <dtm> 2024-03-04 23:17:20,

```

```

202...
## $ action_details_2_icon          <chr> "plugins/Morpheus/
images/...
## $ action_details_2_icon_svg      <chr> "plugins/Morpheus/
images/...
## $ action_details_2_title         <chr> "Event", "HAnS", "", "",
...
## $ action_details_2_subtitle      <chr> "Category: \"\"click_chan...
## $ action_details_3_type          <chr> "action", "search", "",
"..."
## $ action_details_3_url           <chr> "https://hans.th-nuernber...
## $ action_details_3_page_title    <chr> "HAnS", "", "", "", "",
"..."
## $ action_details_3_page_id_action <chr> "36", "", "", "", "",
"95..."
## $ action_details_3_idpageview    <chr> "E8FkLA", "lwrpnl", "",
"..."
## $ action_details_3_server_time_pretty <chr> "Mar 4, 2024 23:17:20",
"..."
## $ action_details_3_page_id       <chr> "6513", "5635", "", "",
"..."
## $ action_details_3_time_spent     <chr> "10", "", "", "", "",
"11..."
## $ action_details_3_time_spent_pretty <chr> "10s", "", "", "", "",
"1..."
## $ action_details_3_pageview_position <chr> "2", "2", "", "", "",
"4"..."
## $ action_details_3_title         <chr> "HAnS", "Site Search",
"..."
## $ action_details_3_subtitle      <chr> "https://hans.th-nuernber...
## $ action_details_3_icon          <chr> "", "plugins/Morpheus/
ima...
## $ action_details_3_icon_svg      <chr> "plugins/Morpheus/
images/...
## $ action_details_3_timestamp     <dtm> 2024-03-04 23:17:20,
202...
## $ action_details_4_type          <chr> "search", "event", "",
"..."
## $ action_details_4_url           <chr> "", "https://hans.th-
nuer...
## $ action_details_4_page_id_action <chr> "", "246", "", "", "",
"1..."
## $ action_details_4_idpageview    <chr> "E8FkLA", "lwrpnl", "",
"..."
## $ action_details_4_server_time_pretty <chr> "Mar 4, 2024 23:17:20",
"..."
## $ action_details_4_page_id       <chr> "6514", "5637", "", "",
"..."

```



## \$ action_details_4_site_search_keyword "..."	<chr> "ZELLKU", "", "", "",
## \$ action_details_4_site_search_category "..."	<chr> "", "", "", "", "", "",
## \$ action_details_4_site_search_count "..."	<chr> "0", "", "", "", "", "",
## \$ action_details_4_pageview_position "5"...	<chr> "2", "3", "", "", "",
## \$ action_details_4_icon images/...	<chr> "plugins/Morpheus/
## \$ action_details_4_icon_svg images/...	<chr> "plugins/Morpheus/
## \$ action_details_4_title "..."	<chr> "Site Search", "Event",
## \$ action_details_4_subtitle "\\"...	<chr> "ZELLKU", "Category:
## \$ action_details_4_timestamp 202...	<dtm> 2024-03-04 23:17:20,
## \$ action_details_5_type "..."	<chr> "event", "action", "",
## \$ action_details_5_url	<chr> "https://hans.th-nuernber...
## \$ action_details_5_page_id_action "..."	<chr> "38", "95", "", "", "",
## \$ action_details_5_idpageview "..."	<chr> "E8FkLA", "wZEbOS", "",
## \$ action_details_5_server_time_pretty "..."	<chr> "Mar 4, 2024 23:17:30",
## \$ action_details_5_page_id "..."	<chr> "6515", "5638", "", "",
## \$ action_details_5_event_category "..."	<chr> "click_videocard", "",
## \$ action_details_5_event_action "..."	<chr> "2-ELISA", "", "", "",
## \$ action_details_5_pageview_position "5"...	<chr> "3", "4", "", "", "",
## \$ action_details_5_timestamp 202...	<dtm> 2024-03-04 23:17:30,
## \$ action_details_5_icon images/...	<chr> "plugins/Morpheus/
## \$ action_details_5_icon_svg images/...	<chr> "plugins/Morpheus/
## \$ action_details_5_title "..."	<chr> "Event", "HAnS", "", "",
## \$ action_details_5_subtitle	<chr> "Category: "\\"click_vide...
## \$ action_details_6_type "..."	<chr> "action", "event", "",
## \$ action_details_6_url	<chr> "https://hans.th-nuernber...
## \$ action_details_6_page_title	<chr> "HAnS", "", "", "", "",

```

"
...
## $ action_details_6_page_id_action          <chr> "274", "247", "", "",
" "
, ...
## $ action_details_6_idpageview              <chr> "DXTmIN", "wZEb0S",
" "
, " "

```

## 1.2.f Datensatz im Lang-Format, Zeilen 1-100

```

numeric_id %>%
  slice(1:100) |>
  gt()

```

id_visit	name	value	action_count
19	action_details_0_type	event	0
19	action_details_0_url	https://hans.th-nuernberg.de/?evalId=none&role=developer	0
19	action_details_0_page_id_action	17	0
19	action_details_0_idpageview	1YNiVr	0
19	action_details_0_server_time_pretty	Mar 4, 2024 22:58:30	0
19	action_details_0_page_id	6509	0
19	action_details_0_event_category	click_button	0
19	action_details_0_event_action	Kanäle	0
19	action_details_0_timestamp	2024-03-04 22:58:30	0
19	action_details_0_icon	plugins/Morpheus/images/event.png	0
19	action_details_0_icon_svg	plugins/Morpheus/images/event.svg	0
19	action_details_0_title	Event	0
19	action_details_0_subtitle	Category: "'click_button', Action: "'Kanäle'"	0
19	action_details_1_type	action	1

id_visit	name	value	action_count
19	action_details_1_url	<a href="https://hans.th-nuernberg.de/channels?evalld=none&amp;role=-developer">https://hans.th-nuernberg.de/channels?evalld=none&amp;role=-developer</a>	1
19	action_details_1_page_title	HAnS	1
19	action_details_1_page_id_action	32	1
19	action_details_1_idpageview	HKiQ62	1
19	action_details_1_server_time_pretty	Mar 4, 2024 23:16:59	1
19	action_details_1_page_id	6511	1
19	action_details_1_page_load_time	0.94s	1
19	action_details_1_time_spent	21	1
19	action_details_1_time_spent_pretty	21s	1
19	action_details_1_page_load_time_milliseconds	940	1
19	action_details_1_pageview_position	1	1
19	action_details_1_title	HAnS	1
19	action_details_1_subtitle	<a href="https://hans.th-nuernberg.de/channels?evalld=none&amp;role=-developer">https://hans.th-nuernberg.de/channels?evalld=none&amp;role=-developer</a>	1
19	action_details_1_icon_svg	plugins/Morpheus/images/action.svg	1
19	action_details_1_timestamp	2024-03-04 23:16:59	1
19	action_details_2_type	event	2
19	action_details_2_url	<a href="https://hans.th-nuernberg.de/channels?evalld=none&amp;role=-developer">https://hans.th-nuernberg.de/channels?evalld=none&amp;role=-developer</a>	2

id_visit	name	value	action_count
19	action_details_2_page_id_action	33	2
19	action_details_2_idpageview	HKiQ62	2
19	action_details_2_server_time_pretty	Mar 4, 2024 23:17:20	2
19	action_details_2_page_id	6512	2
19	action_details_2_event_category	click_channelcard	2
19	action_details_2_event_action	ZELLKU	2
19	action_details_2_pageview_position	1	2
19	action_details_2_timestamp	2024-03-04 23:17:20	2
19	action_details_2_icon	plugins/Morpheus/images/event.png	2
19	action_details_2_icon_svg	plugins/Morpheus/images/event.svg	2
19	action_details_2_title	Event	2
19	action_details_2_subtitle	Category: "'click_channelcard', Action: "'ZELLKU'"	2
19	action_details_3_type	action	3
19	action_details_3_url	https://hans.th-nuernberg.de/ search-results?evalId=none& role=developer	3
19	action_details_3_page_title	HAnS	3
19	action_details_3_page_id_action	36	3
19	action_details_3_idpageview	E8FkLA	3
19	action_details_3_server_time_pretty	Mar 4, 2024 23:17:20	3
19	action_details_3_page_id	6513	3
19	action_details_3_time_spent	10	3

id_visit	name	value	action_count
19	action_details_3_time_spent_pretty	10s	3
19	action_details_3_pageview_position	2	3
19	action_details_3_title	HAnS	3
19	action_details_3_subtitle	<a href="https://hans.th-nuernberg.de/search-results?evalId=none&amp;role=developer">https://hans.th-nuernberg.de/search-results?evalId=none&amp;role=developer</a>	3
19	action_details_3_icon_svg	plugins/Morpheus/images/action.svg	3
19	action_details_3_timestamp	2024-03-04 23:17:20	3
19	action_details_4_type	search	4
19	action_details_4_idpageview	E8FkLA	4
19	action_details_4_server_time_pretty	Mar 4, 2024 23:17:20	4
19	action_details_4_page_id	6514	4
19	action_details_4_site_search_keyword	ZELLKU	4
19	action_details_4_site_search_count	0	4
19	action_details_4_pageview_position	2	4
19	action_details_4_icon	plugins/Morpheus/images/search.png	4
19	action_details_4_icon_svg	plugins/Morpheus/images/search.svg	4
19	action_details_4_title	Site Search	4
19	action_details_4_subtitle	ZELLKU	4
19	action_details_4_timestamp	2024-03-04 23:17:20	4
19	action_details_5_type	event	5

id_visit	name	value	action_count
19	action_details_5_url	https://hans.th-nuernberg.de/search-results?evalId=none&role=developer	5
19	action_details_5_page_id_action	38	5
19	action_details_5_idpageview	E8FkLA	5
19	action_details_5_server_time_pretty	Mar 4, 2024 23:17:30	5
19	action_details_5_page_id	6515	5
19	action_details_5_event_category	click_videocard	5
19	action_details_5_event_action	2-ELISA	5
19	action_details_5_pageview_position	3	5
19	action_details_5_timestamp	2024-03-04 23:17:30	5
19	action_details_5_icon	plugins/Morpheus/images/event.png	5
19	action_details_5_icon_svg	plugins/Morpheus/images/event.svg	5
19	action_details_5_title	Event	5
19	action_details_5_subtitle	Category: 'click_videocard', Action: '2-ELISA'	5
19	action_details_6_type	action	6
19	action_details_6_url	https://hans.th-nuernberg.de/video-player?uuid=762ed229-e6f4-415d-9f5d-f4279fbeb7d0&evalId=none&role=developer	6
19	action_details_6_page_title	HAnS	6
19	action_details_6_page_id_action	274	6
19	action_details_6_idpageview	DXTmIN	6

id_visit	name	value	action_count
19	action_details_6_server_time_pretty	Mar 4, 2024 23:17:30	6
19	action_details_6_page_id	6516	6
19	action_details_6_time_spent	14	6
19	action_details_6_time_spent_pretty	14s	6
19	action_details_6_pageview_position	4	6
19	action_details_6_title	HAnS	6
19	action_details_6_subtitle	https://hans.th-nuernberg.de/video-player?uuid=762ed229-e6f4-415d-9f5d-f4279fbeb7d0&evalId=none&role=developer	6
19	action_details_6_icon_svg	plugins/Morpheus/images/action.svg	6
19	action_details_6_timestamp	2024-03-04 23:17:30	6
19	action_details_7_type	event	7
19	action_details_7_url	https://hans.th-nuernberg.de/video-player?uuid=762ed229-e6f4-415d-9f5d-f4279fbeb7d0&evalId=none&role=developer	7
19	action_details_7_page_id_action	275	7

## 1.3 Zeitraum

### 1.3.a Beginn/Ende der Daten

```
time_minmax |>
  summarise(time_min = min(time_min),
            time_max = max(time_max)) |>
  gt()
```

time_min	time_max
NA	NA

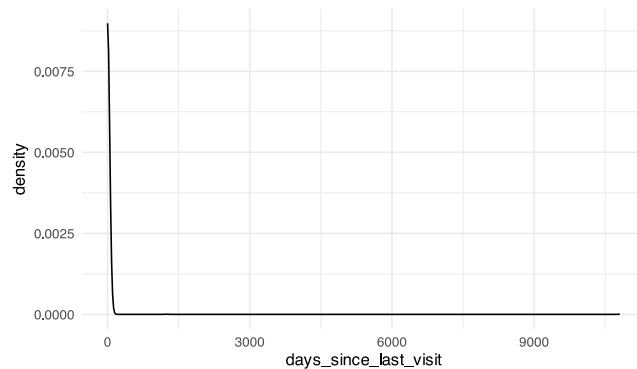
### 1.3.b Days since last visit

```
time_since_last_visit <-
time_since_last_visit |>
  mutate(days_since_last_visit = as.numeric(days_since_last_visit))

time_since_last_visit |>
  datawizard::describe_distribution(days_since_last_visit) |>
  knitr::kable()
```

Variable	Mean	SD	IQR	Min	Max	Skew- ness	Kurto- sis	n	n_Miss- ing
days_since_last_visit	6.726293	225.8745	0	0	10806	47.2408	2256.477	2320	31

```
time_since_last_visit |>
  ggplot(aes(x = days_since_last_visit)) +
  geom_density()
```



### 1.4 Anzahl Visits

```
glimpse(action_types)
## Rows: 2,585,360
## Columns: 4
## $ id_visit      <chr> "19", "19", "19", "19", "19", "19", "19", "19", "19",
##               "19..."
## $ type          <chr> "type", "url", "page", "idpageview", "server", "page",
##               "e..."
## $ value         <chr> "event", "https://hans.th-nuernberg.de/?evalId=none&
```



```
role=...
## $ action_count <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1,
1, ...
```

```
action_types$id_visit |> unique() |> length()
## [1] 1771
```

## 1.5 Anzahl der Aktionen pro Visit

`action_count` fasst die Nummer der Aktion innerhalb eines bestimmten Visits. `type` gibt den Typ der protokollierten Aktion an, z.B. ob es ein Timestamp war.

### 1.5.a Mit allen Daten (den 499er-Daten)

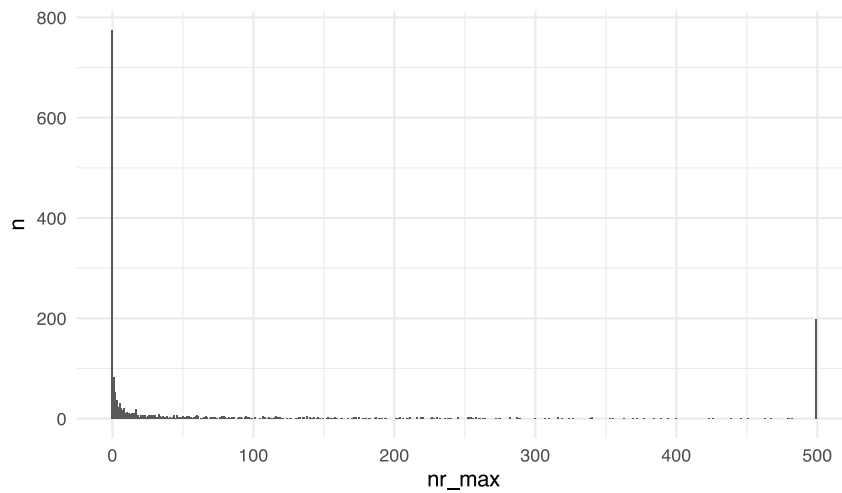
```
actions_per_visit |>
  describe_distribution(nr_max) |>
  gt() |>
  fmt_number(columns = where(is.numeric),
              decimals = 2)
```

Varia- ble	Mean	SD	IQR	Min	Max	Skew- ness	Kurto- sis	n	n_ Miss- ing
nr_max	85.71	163.16	65.00	0.00	499.00	1.89	1.96	1,771.00	0.00

`nr_max` gibt den Maximalwert von `nr` zurück, sagt also, wie viele Aktionen maximal von einem Visitor ausgeführt wurden.

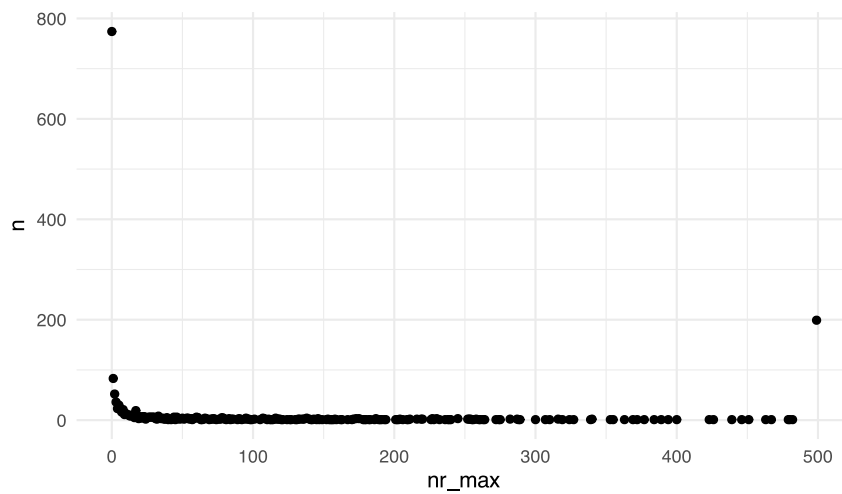
Betrachtet man die Anzahl der Aktionen pro Visitor näher, so fällt auf, dass der Maximalwert (499) sehr häufig vorkommt:

```
actions_per_visit |>
  count(nr_max) |>
  ggplot(aes(x = nr_max, y = n)) +
  geom_col()
```



Hier noch in einer anderen Darstellung:

```
actions_per_visit |>
  count(nr_max) |>
  ggplot(aes(x = nr_max, y = n)) +
  geom_point()
```



Der Maximalwert ist einfach auffällig häufig:

```
actions_per_visit |>
  count(nr_max == 499) |>
  gt()
```

nr_max == 499	n
FALSE	1572
TRUE	199

Es erscheint plausibel, dass der Maximalwert alle „gekappten“ (zensierten, abgeschnittenen) Werte fasst, also viele Werte, die eigentlich größer wären (aber dann zensiert wurden).

### 1.5.b Nur Visitors, für die weniger als 500 Aktionen protokolliert sind

```
actions_per_visit2 <-
actions_per_visit |>
  filter(nr_max != 499)

actions_per_visit2 |>
  describe_distribution(nr_max) |>
  gt() |>
  fmt_number(columns = where(is.numeric),
              decimals = 2)
```

Varia-										n_-
ble	Mean	SD	IQR	Min	Max	Skew-	Kurto-			Miss-
						ness	sis	n		ing
nr_max	33.40	74.96	22.00	0.00	482.00	3.11	10.55	1,572.00		0.00

## 1.6 Verteilung

### 1.6.a Mit den 499er-Daten

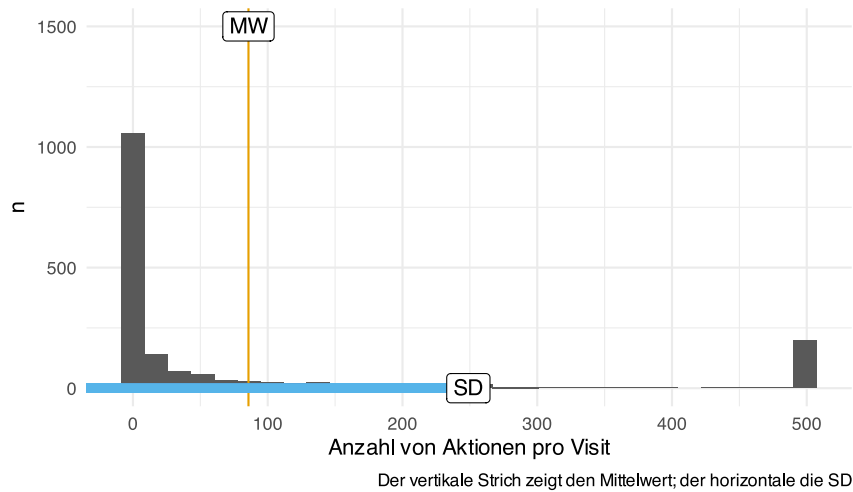
```
actions_per_visit_avg = mean(actions_per_visit$nr_max)
actions_per_visit_sd = sd(actions_per_visit$nr_max)

actions_per_visit |>
  ggplot() +
  geom_histogram(aes(x = nr_max)) +
  labs(x = "Anzahl von Aktionen pro Visit",
       y = "n",
       caption = "Der vertikale Strich zeigt den Mittelwert; der horizontale die SD") +
  theme_minimal() +
  geom_vline(xintercept = actions_per_visit_avg,
             color = palette_okabe_ito()[1]) +
  geom_segment(x = actions_per_visit_avg-actions_per_visit_sd,
              y = 0,
              xend = actions_per_visit_avg + actions_per_visit_sd,
```

```

    yend = 0,
    color = palette_okabe_ito()[2],
    size = 2) +
  annotate("label", x = actions_per_visit_avg, y = 1500, label = "MW") +
  annotate("label", x = actions_per_visit_avg + actions_per_visit_sd, y = 0,
label = "SD")

```



```

#geom_label(aes(x = actions_per_visit_avg), y = 1, label = "Mean")

```

- Mittelwert der Aktionen pro Visit: 85.71.
- SD der Aktionen pro Visit: 163.16.

### 1.6.b Ohne 499er-Daten

```

actions_per_visit_avg2 = mean(actions_per_visit2$nr_max)
actions_per_visit_sd2 = sd(actions_per_visit2$nr_max)

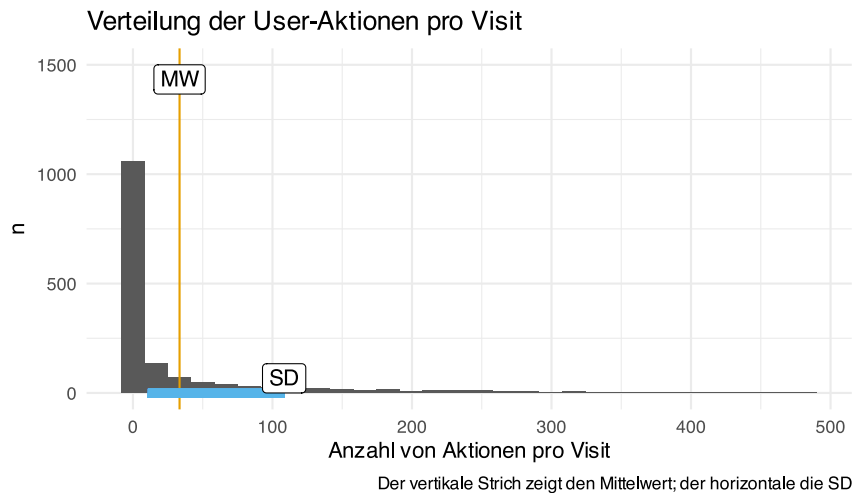
actions_per_visit2 |>
  ggplot() +
  geom_histogram(aes(x = nr_max)) +
  labs(x = "Anzahl von Aktionen pro Visit",
    y = "n",
    title = "Verteilung der User-Aktionen pro Visit",
    caption = "Der vertikale Strich zeigt den Mittelwert; der horizontale die
SD") +
  theme_minimal() +
  geom_vline(xintercept = actions_per_visit_avg2,
    color = palette_okabe_ito()[1]) +
  geom_segment(x = actions_per_visit_avg2 - actions_per_visit_sd2,
    y = 0,
    xend = actions_per_visit_avg2 + actions_per_visit_sd2,

```

```

    yend = 0,
    color = palette_okabe_ito()[2],
    size = 2) +
  annotate("label", x = actions_per_visit_avg2, y = 1500, label = "MW", vjust =
"top") +
  annotate("label", x = actions_per_visit_avg2 + actions_per_visit_sd2, y = 0,
label = "SD", vjust = "bottom")

```



```

#geom_label(aes(x = actions_per_visit_avg), y = 1, label = "Mean")

```

- Mittelwert der Aktionen pro Visit: 33.4.
- SD der Aktionen pro Visit: 74.96.

## 2 Wieviel Zeit verbringen die Nutzer pro Visit?

Die Visit-Zeit wurde auf 600 Min. trunziert/begrenzt.

```

time_spent <-
  time_spent |>
  mutate(t_min = as.numeric(time_diff, units = "mins")) |>
  filter(t_min < 600)

```

### 2.1 Verweildauer-Statistiken in Sekunden

```

time_spent |>
  summarise(
    mean_time_diff = round(mean(time_diff), 2),
    sd_time_diff = sd(time_diff),
    min_time_diff = min(time_diff),
    max_time_diff = max(time_diff)
  )

```

```

) |>
summarise(
  mean_time_diff_avg = mean(mean_time_diff),
  sd_time_diff_avg = mean(sd_time_diff, na.rm = TRUE),
  min_time_diff_avg = mean(min_time_diff),
  max_time_diff_avg = mean(max_time_diff)
) |>
gt() |>
fmt_number(columns = everything(),
            decimals = 2)

```

mean_time_diff_avg	sd_time_diff_avg	min_time_diff_avg	max_time_diff_avg
812.839590443686	0.00	812.839590443686	812.839590443686

```

time_duration |>
  summarise(duration_sec_avg = mean(visit_duration_sec, na.rm = TRUE)) |>
  mutate(duration_min_avg = duration_sec_avg / 60)
##   duration_sec_avg duration_min_avg
## 1          1046.685           17.44475

```

## 2.2 Verweildauer-Statistiken in Minuten

```

time_spent |>
  summarise(
    mean_t_min = mean(t_min),
    sd_t_min = sd(t_min),
    min_t_min = min(t_min),
    max_t_min = max(t_min)
  ) |>
  summarise(
    mean_t_min_avg = mean(mean_t_min),
    sd_t_min_avg = mean(sd_t_min, na.rm = TRUE),
    min_t_min_avg = mean(min_t_min),
    max_t_min_avg = mean(max_t_min)
  ) |>
  gt() |>
  fmt_number(columns = everything(),
            decimals = 2)

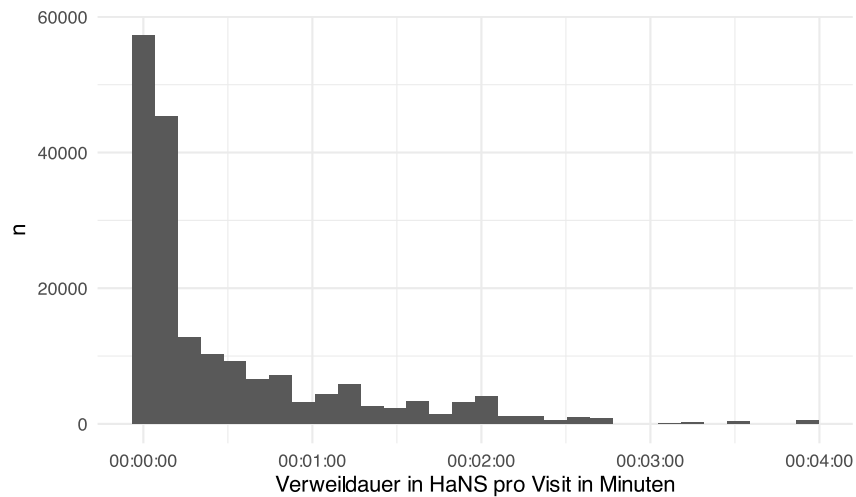
```

mean_t_min_avg	sd_t_min_avg	min_t_min_avg	max_t_min_avg
13.55	0.00	13.55	13.55

## 2.3 Visualisierung der Verweildauer

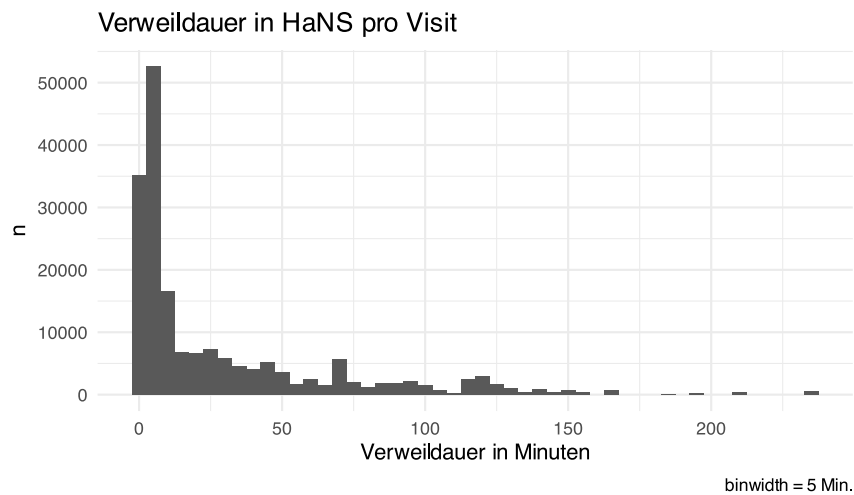
### 2.3.a bins=20

```
time_spent |>
  ggplot(aes(x = t_min)) +
  geom_histogram() +
  scale_x_time() +
  theme_minimal() +
  labs(y = "n",
       x = "Verweildauer in HaNS pro Visit in Minuten")
```



### 2.3.b bins=100

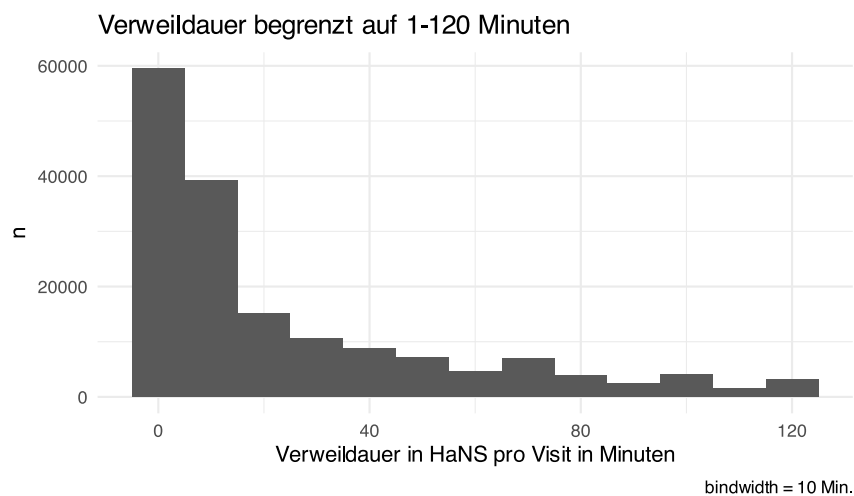
```
time_spent |>
  ggplot(aes(x = t_min)) +
  geom_histogram(binwidth = 5) +
  theme_minimal() +
  labs(y = "n",
       x = "Verweildauer in Minuten",
       title = "Verweildauer in HaNS pro Visit",
       caption = "binwidth = 5 Min.")
```



### 2.3.c Zeitdauer begrenzt auf 1-120 Min.

```
time_spent2 <-
time_spent |>
  filter(t_min > 1, t_min < 120)

time_spent2 |>
  ggplot(aes(x = t_min)) +
  geom_histogram(binwidth = 10) +
  theme_minimal() +
  labs(y = "n",
       x = "Verweildauer in HaNS pro Visit in Minuten",
       title = "Verweildauer begrenzt auf 1-120 Minuten",
       caption = "bindwidth = 10 Min.")
```





## 3 An welchen Tagen und zu welcher Zeit kommen die User zu HaNS?

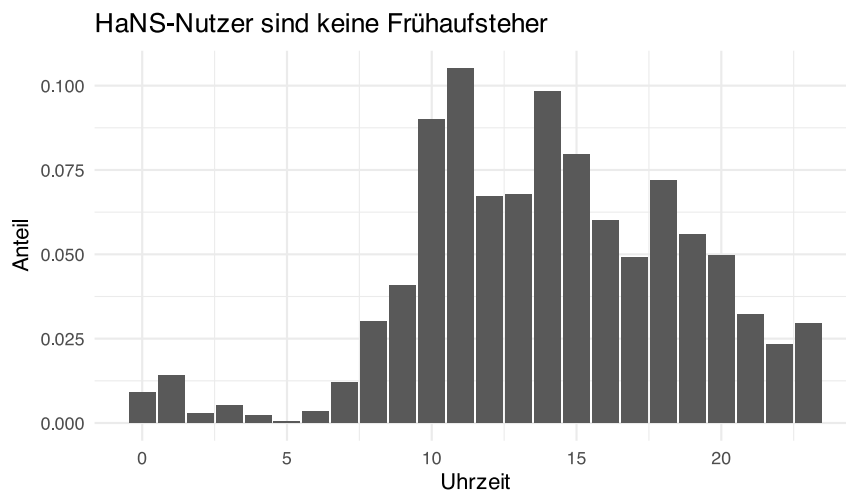
### 3.1 Setup

```
# 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)
```

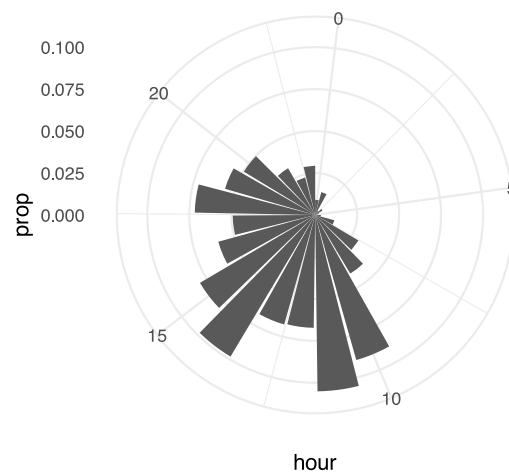
### 3.2 HaNS-Login nach Uhrzeit

```
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"
  )
```



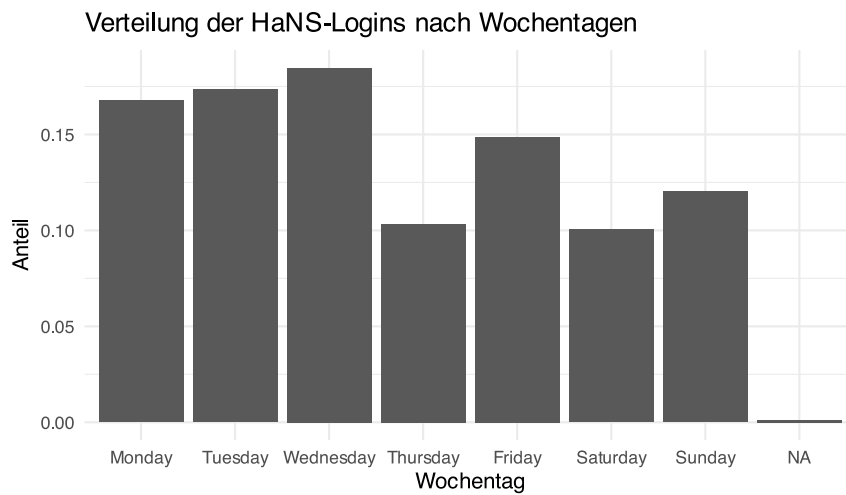
```
# coord_polar()
```

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



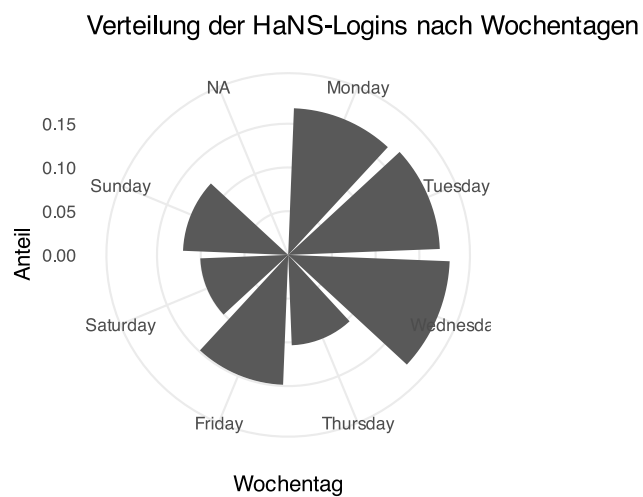
### 3.3 Verteilung der HaNS-Besuche nach Wochentagen

```
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")
```



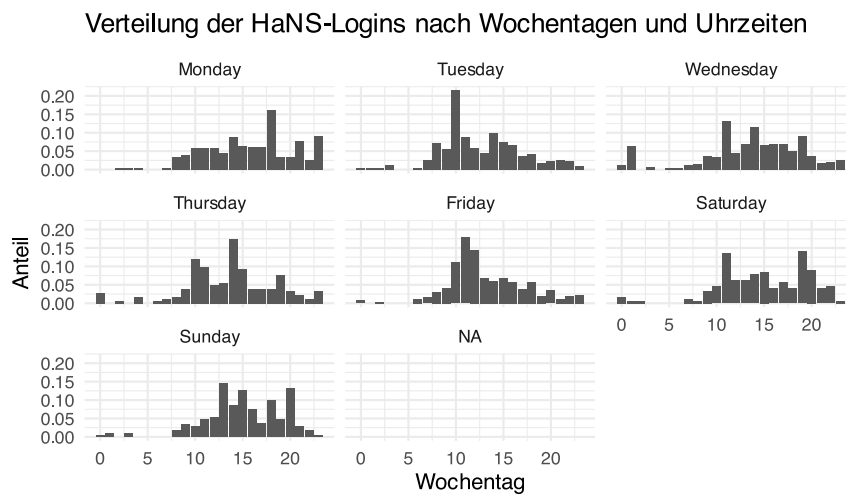
```
# coord_polar()
```

```
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") +
  coord_polar()
```



### 3.3.a HaNS-Login nach Wochentagen Uhrzeit

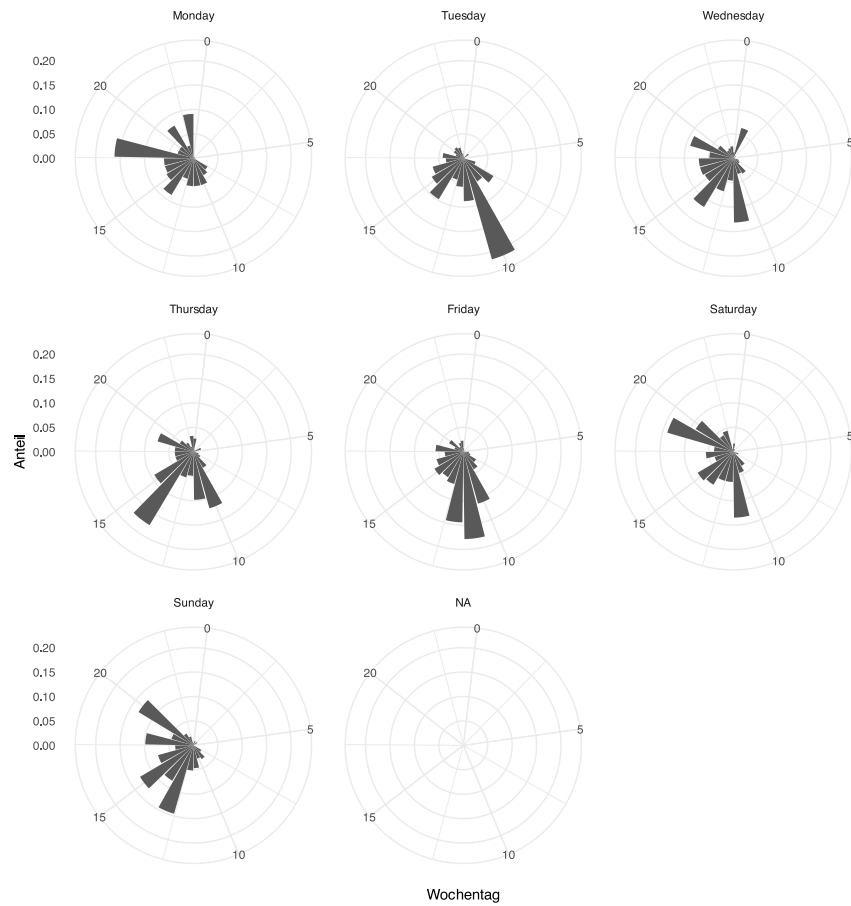
```
time_visit_wday |>
  as_tibble() |>
  count(dow2, hour) |>
  group_by(dow2) |>
  mutate(prop = n/sum(n)) |>
  ggplot(aes(x = hour, y = prop)) +
  geom_col() +
  facet_wrap(~ dow2) +
  theme_minimal() +
  labs(title = "Verteilung der HaNS-Logins nach Wochentagen und Uhrzeiten",
       x = "Wochentag",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



```
# coord_polar()
```

```
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") +
  coord_polar()
```

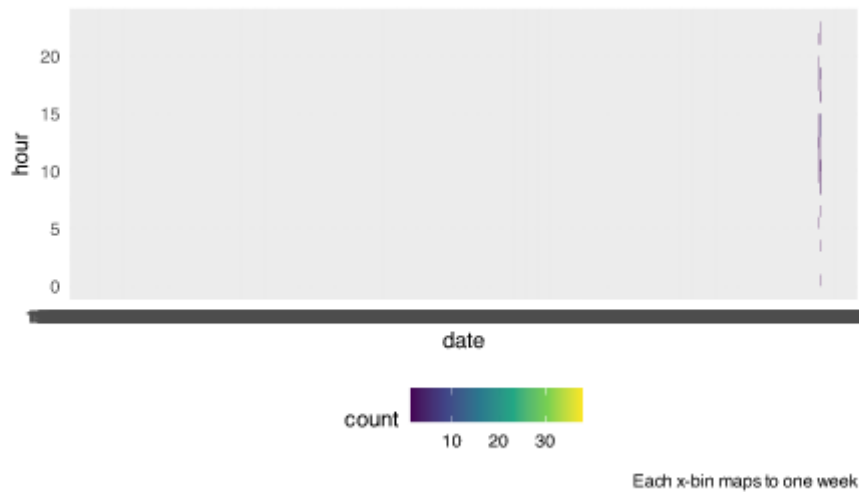
Verteilung der HaNS-Logins nach Wochentagen und Uhrzeiten



### 3.4 Anzahl der Visits nach Datum (Tagen) und Uhrzeit (bin2d)

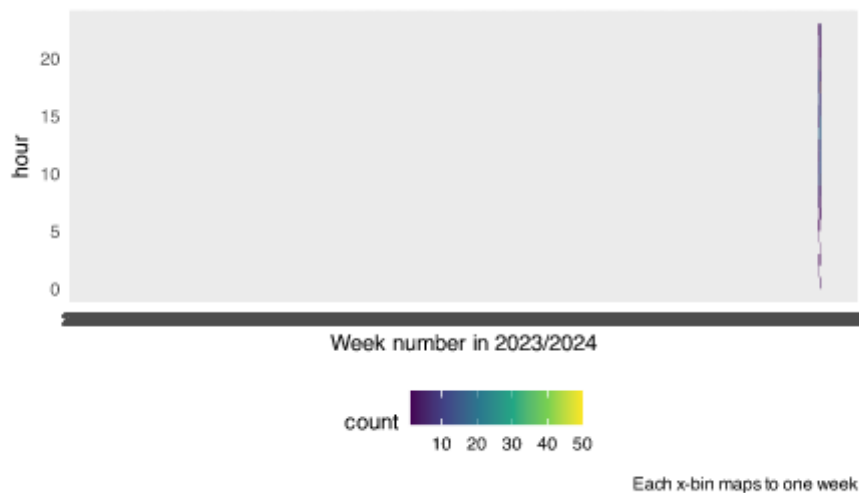
```
time2 <-  
time_visit_wday |>  
  ungroup() |>  
  mutate(date = as.Date(date_time))  
  
time2 |>
```

```
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")
```



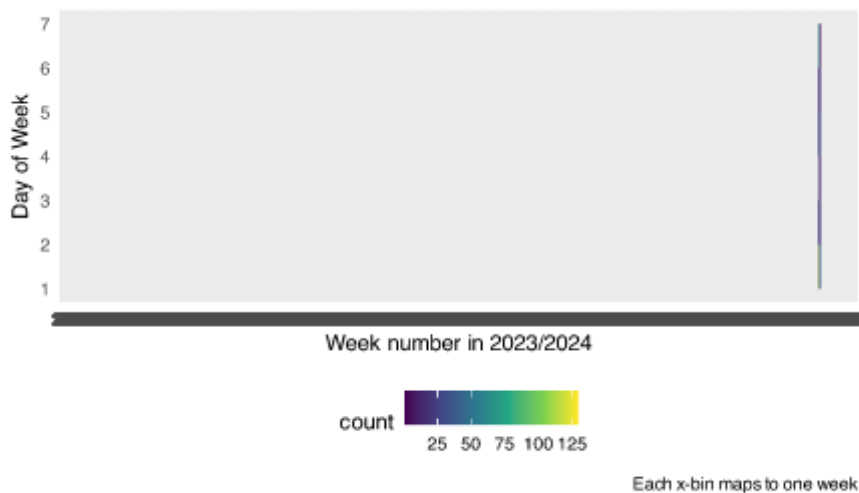
### 3.5 Anzahl der Visits nach Datum (Wochen) und Uhrzeit (bin2d)

```
time2 |>
  ggplot(aes(x = date, y = hour)) +
  geom_bin2d(binwidth = c(7, 1)) + # 1 week, 1 hour
  scale_x_date(date_breaks = "1 week", date_labels = "%W") +
  theme(legend.position = "bottom") +
  scale_fill_viridis_c() +
  labs(x = "Week number in 2023/2024",
       caption = "Each x-bin maps to one week")
```



### 3.6 Anzahl der Visits nach Datum (Wochen) und Wochentag (bin2d)

```
time2 |>
  ggplot(aes(x = date, y = dow)) +
  geom_bin2d(binwidth = c(7, 1)) + # 1 week, 1 hour
  scale_x_date(date_breaks = "1 week", date_labels = "%W") +
  theme(legend.position = "bottom") +
  scale_fill_viridis_c() +
  labs(x = "Week number in 2023/2024",
       caption = "Each x-bin maps to one week",
       y = "Day of Week") +
  scale_y_continuous(breaks = 1:7)
```



## 4 Interaktion mit dem LLM

## 4.1 LLM pro Visit

Gesucht wird nach Zeilen, in denen das Wort „llm“ vorkommt.

### 4.1.a Insgesamt

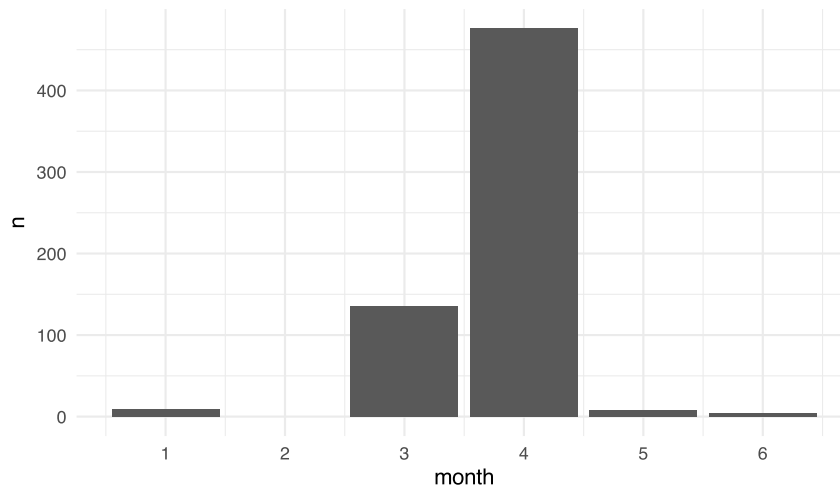
```
llm_per_visit |>
  count(visit_uses_llm) |>
  mutate(prop = n/sum(n))
## # A tibble: 2 × 3
##   visit_uses_llm     n prop
##   <lgl>         <int> <dbl>
## 1 FALSE         1136 0.641
## 2 TRUE           635 0.359
```

### 4.1.b Pro Monat

```
llm_per_visit |>
  mutate(month = month(min_time)) |>
  group_by(month) |>
  summarise(sum(visit_uses_llm))
## # A tibble: 6 × 2
##   month `sum(visit_uses_llm)`
##   <dbl>         <int>
## 1     1             9
## 2     3          136
## 3     4          476
## 4     5             8
## 5     6             4
## 6    NA             2
```

```
llm_per_visit |>
  mutate(month = month(min_time)) |>
  group_by(month) |>
  summarise(n = sum(visit_uses_llm)) |>
  ggplot(aes(x = month, y = n)) +
  geom_col() +
  scale_x_continuous(breaks = 1:6)
```





## 4.2 Wie oft wird (pro Monat) ein AI transcript angefordert?

### 4.2.a Insgesamt

Es wurde sehr selten ein AI Transcript angefordert.

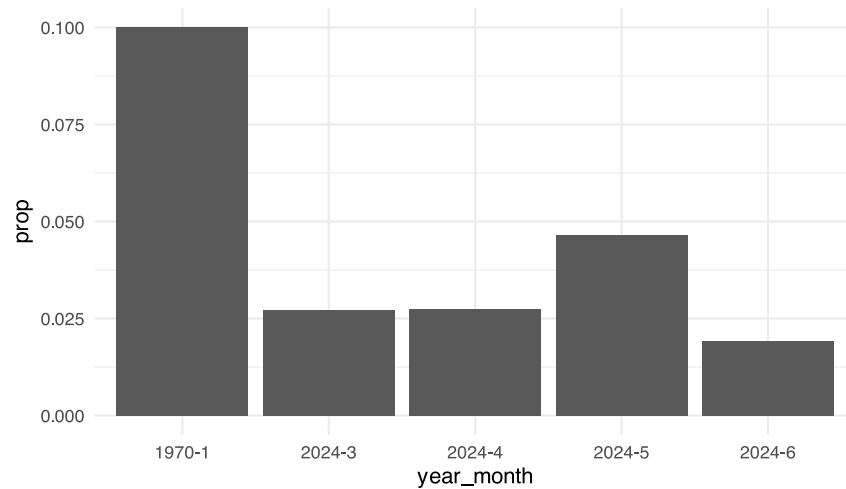
```
ai_transcript_clicks_per_month |>
  count(clicks_transcript_any) |>
  mutate(prop = n / sum(n))
## # A tibble: 2 × 3
##   clicks_transcript_any      n  prop
##   <lgl>                <int> <dbl>
## 1 FALSE                1709 0.967
## 2 TRUE                  59 0.0334
```

### 4.2.b Pro Monat

```
ai_transcript_clicks_per_month |>
  group_by(year_month) |>
  summarise(prop = sum(clicks_transcript_any) / n())
## # A tibble: 5 × 2
##   year_month  prop
##   <chr>      <dbl>
## 1 1970-1    0.1
## 2 2024-3    0.0271
## 3 2024-4    0.0275
## 4 2024-5    0.0466
## 5 2024-6    0.0192
```

```
ai_transcript_clicks_per_month |>
  group_by(year_month) |>
```

```
summarise(prop = sum(clicks_transcript_any) / n()) |>
ggplot(aes(x = year_month, y = prop)) +
geom_col()
```



```
ai_transcript_clicks_per_month |>
group_by(year_month) |>
count(clicks_transcript_any) |>
ggplot(aes(x = year_month, y = n, fill = clicks_transcript_any)) +
geom_col(position = "dodge")
```

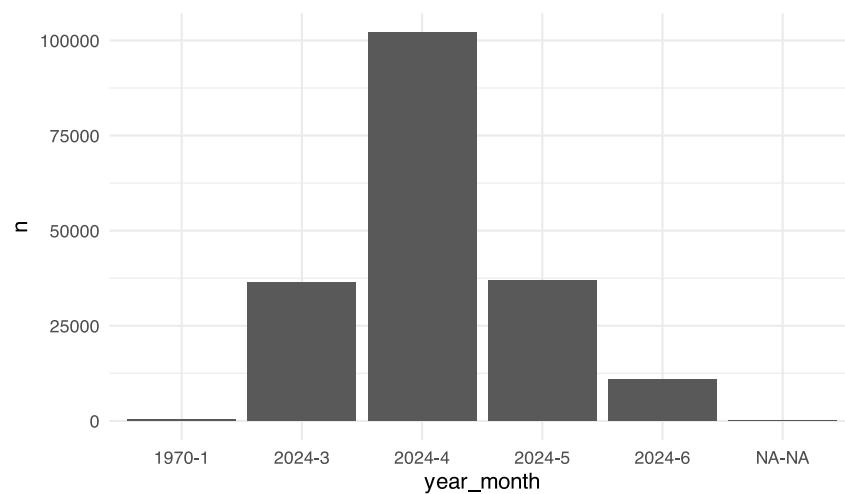


## 4.3 Wie oft wird (pro Monat) mit dem LLM interagiert?

### 4.3.a Insgesamt

```
ai_llm_per_months |>
  ungroup() |>
  summarise(sum(n))
## # A tibble: 1 × 1
##   `sum(n)`
##   <int>
## 1 186593
```

```
ai_llm_per_months |>
  ggplot(aes(x = year_month, y = n)) +
  geom_col()
```

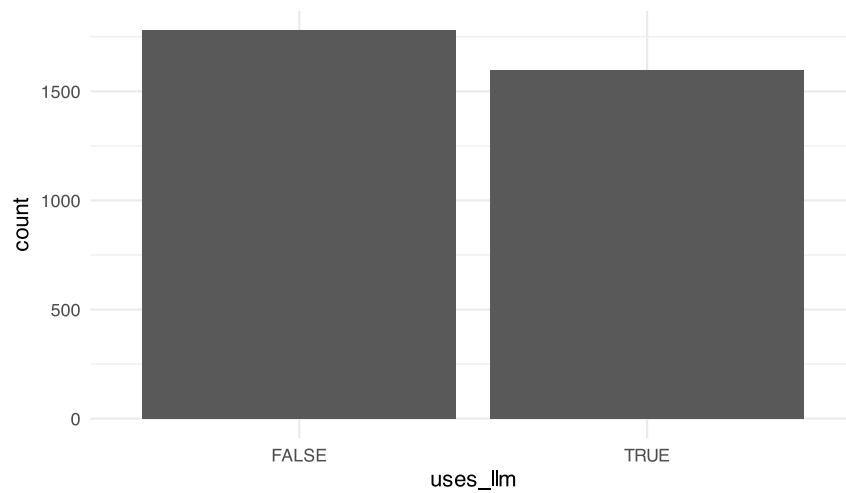


## 4.4 Welcher Anteil der Besucher (visitors) interagiert mit dem LLM?

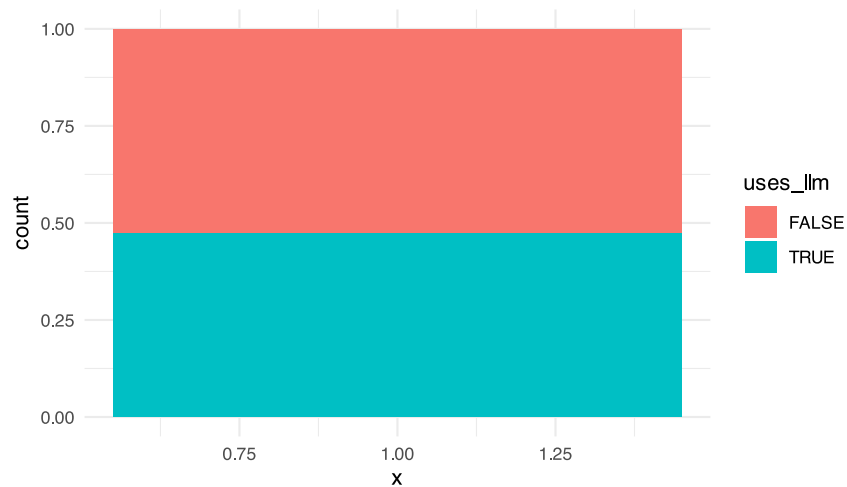
### 4.4.a Insgesamt

```
idvisit_has_llm |>
  count(uses_llm) |>
  mutate(prop = n / sum(n))
## # A tibble: 2 × 3
##   uses_llm      n prop
##   <lgl>    <int> <dbl>
## 1 FALSE    1779 0.527
## 2 TRUE     1596 0.473
```

```
idvisit_has_llm |>
  ggplot(aes(x = uses_llm)) +
  geom_bar()
```



```
idvisit_has_llm |>
  ggplot(aes(fill = uses_llm, x = 1)) +
  geom_bar(position = "fill")
```

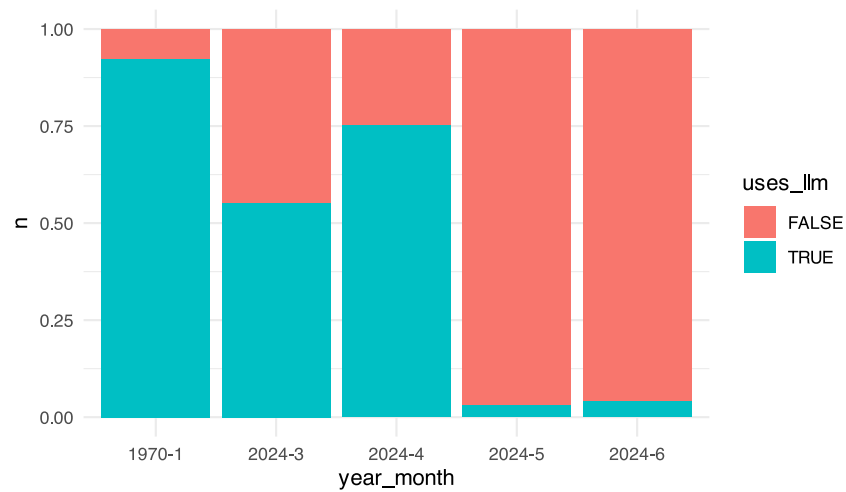


#### 4.4.b Pro Monat

```
idvisit_has_llm |>
  group_by(year_month) |>
  count(uses_llm)
## # A tibble: 10 × 3
## # Groups:   year_month [5]
##   year_month uses_llm     n
##   <chr>      <lgl>   <int>
## 1 1970-1     FALSE     1
## 2 1970-1     TRUE     12
```

```
## 3 2024-3 FALSE 288
## 4 2024-3 TRUE 354
## 5 2024-4 FALSE 393
## 6 2024-4 TRUE 1193
## 7 2024-5 FALSE 831
## 8 2024-5 TRUE 26
## 9 2024-6 FALSE 266
## 10 2024-6 TRUE 11
```

```
idvisit_has_llm |>
  group_by(year_month) |>
  count(uses_llm) |>
  ggplot(aes(x = year_month, fill = uses_llm, y = n)) +
  geom_col(position = "fill")
```



## Bibliographie