Challenge 08 – Solution Report

Analyse der Matoma-HaNS-Daten

Sebastian Sauer

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Inhaltsverzeichnis

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

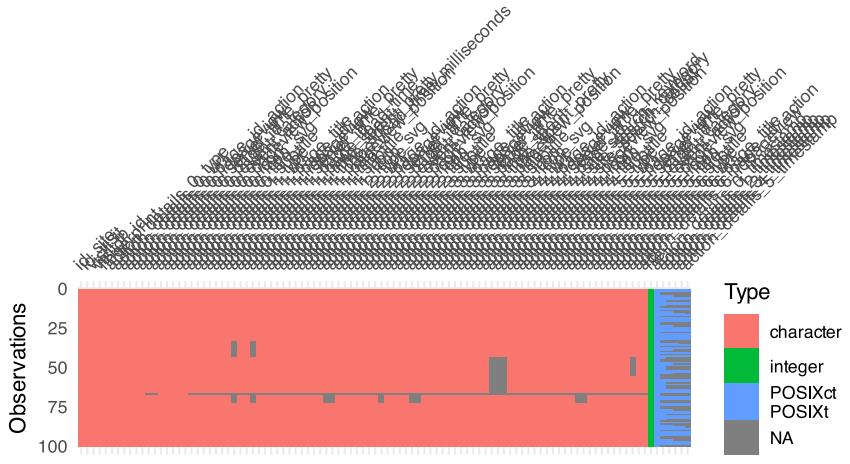
- 2351 Zeilen
- 9247 Spalten (Dubletten und Spalten mit Bildern bereits entfernt)

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", "",
"clic…
## $ action_details_0_event_action            <chr> "Kanäle", "", "Kanäle",
"…
## $ action_details_0_pageview_position        <chr> "", "1", "", "1", "1",
"1…
## $ action_details_0_timestamp                 <dttm> 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                    <dttm> 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", "1wrpnl", "",
"…
## $ 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                    <dttm> 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", "1wrpnl", "",
"…
## $ 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                    <dttm> 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", "1wrpnl", "",
"…
## $ 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           <chr> "2", "3", "", "", "",
"5"…
## $ action_details_4_icon                           <chr> "plugins/Morpheus/
images/…
## $ action_details_4_icon_svg                       <chr> "plugins/Morpheus/
images/…
## $ action_details_4_title                        <chr> "Site Search", "Event",
"…
## $ action_details_4_subtitle                      <chr> "ZELLKU", "Category:
\"\"…
## $ action_details_4_timestamp                     <dttm> 2024-03-04 23:17:20,
202…
## $ 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            <chr> "3", "4", "", "", "",
"5"…
## $ action_details_5_timestamp                     <dttm> 2024-03-04 23:17:30,
202…
## $ action_details_5_icon                           <chr> "plugins/Morpheus/
images/…
## $ action_details_5_icon_svg                       <chr> "plugins/Morpheus/
images/…
## $ 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", "wZEbOS",
"", "…
```

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	https://hans.th-nuernberg.de/channels?evalId=none&role=-developer	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	https://hans.th-nuernberg.de/channels?evalId=none&role=-developer	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	https://hans.th-nuernberg.de/channels?evalId=none&role=-developer	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	https://hans.th-nuernberg.de/search-results?evalId=none&role=developer	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()
```

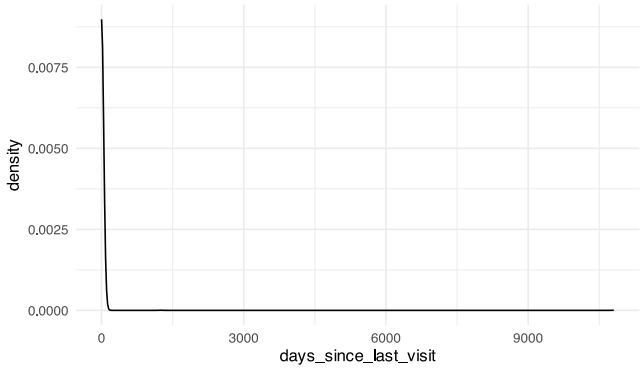
time_min	time_max
NA	NA

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	Skewness	Kurtosis	n	n_Missing
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, 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)

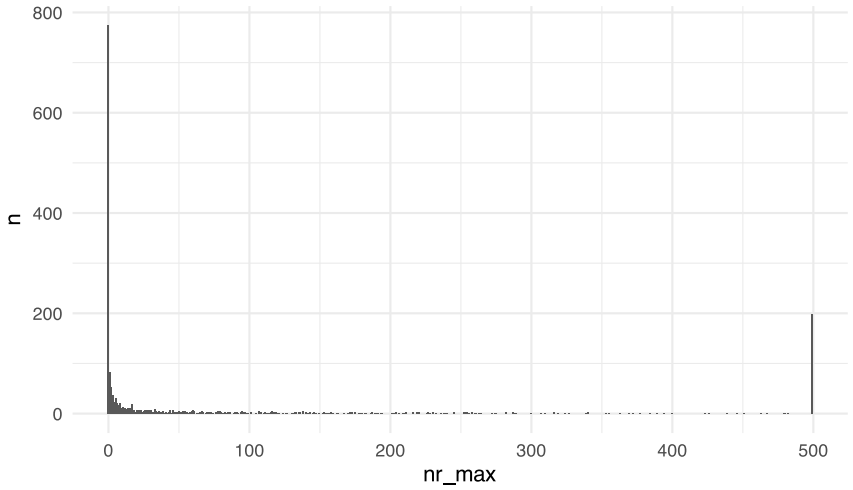
```
actions_per_visit |>
  describe_distribution(nr_max) |>
  gt() |>
  fmt_number(columns = where(is.numeric),
             decimals = 2)
```

Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
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.

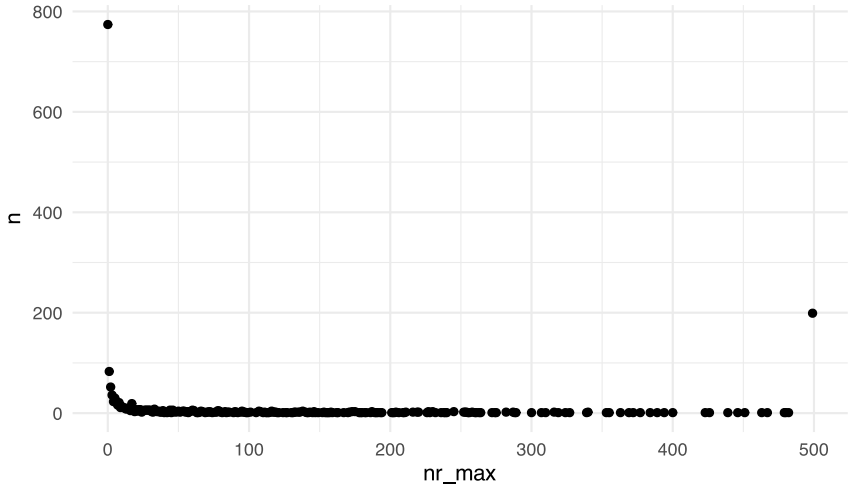
Betrachtet man die Anzahl der Aktionen pro Visitor näher, so fällt auf, dass der Maximalwert (499) sehr häufig vorkommt:

```
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)
```

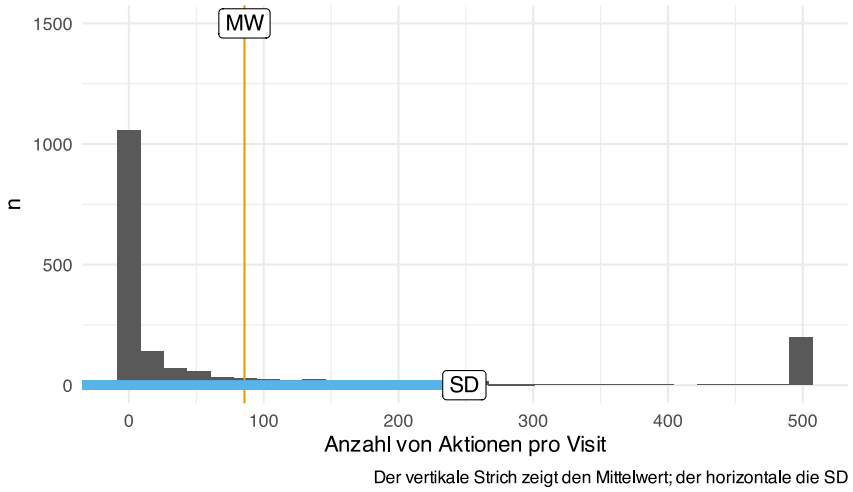
Variable	Mean	SD	IQR	Min	Max	Skewness	Kurtosis	n	n_Missing
nr_max	33.40	74.96	22.00	0.00	482.00	3.11	10.55	1,572.00	0.00

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")
```



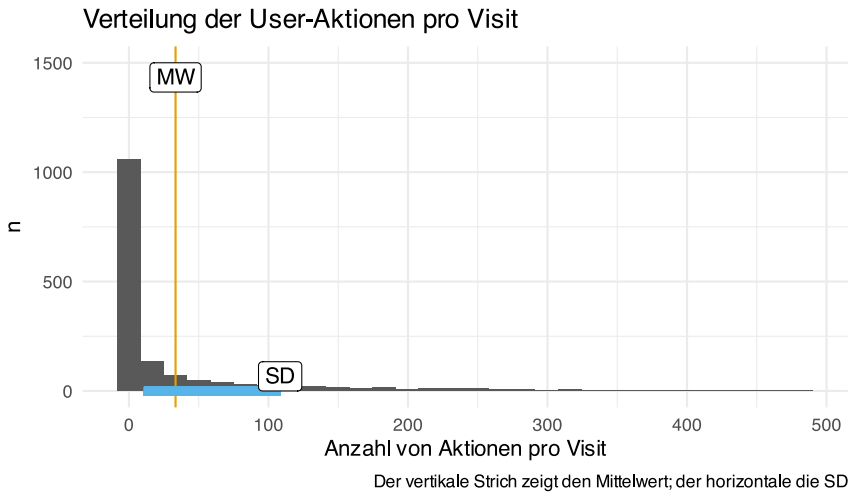

```
  #geom_label(aes(x = actions_per_visit_avg), y = 1, label = "Mean")
```

- 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_avg-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. trunkiert/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

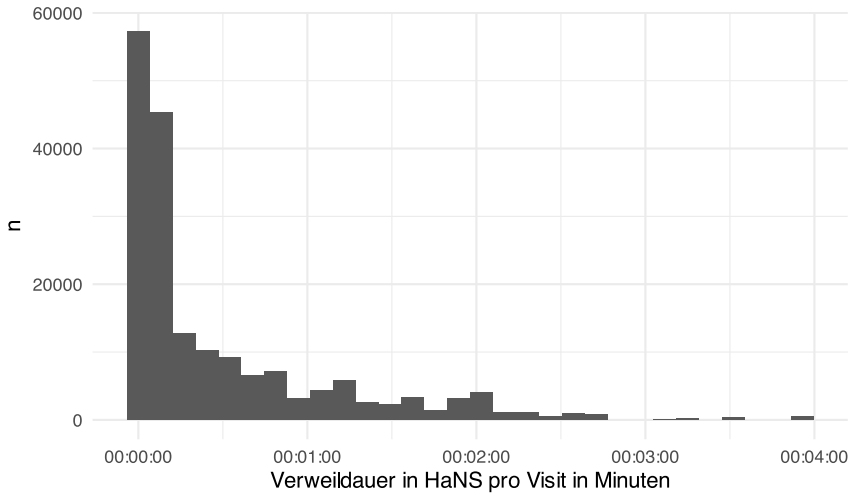
```
time_spent |>
  summarise(
    mean_t_min = mean(t_min),
    sd_t_min = sd(t_min),
    min_t_min = min(t_min),
    max_t_min = max(t_min)
  ) |>
   summarise(
    mean_t_min_avg = mean(mean_t_min),
    sd_t_min_avg = mean(sd_t_min, na.rm = TRUE),
    min_t_min_avg = mean(min_t_min),
    max_t_min_avg = 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

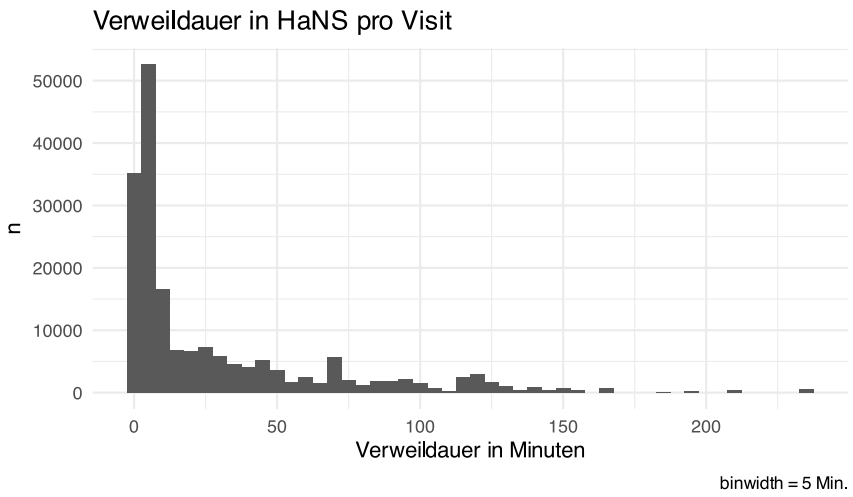
2.3.a bins=20

```
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")
```



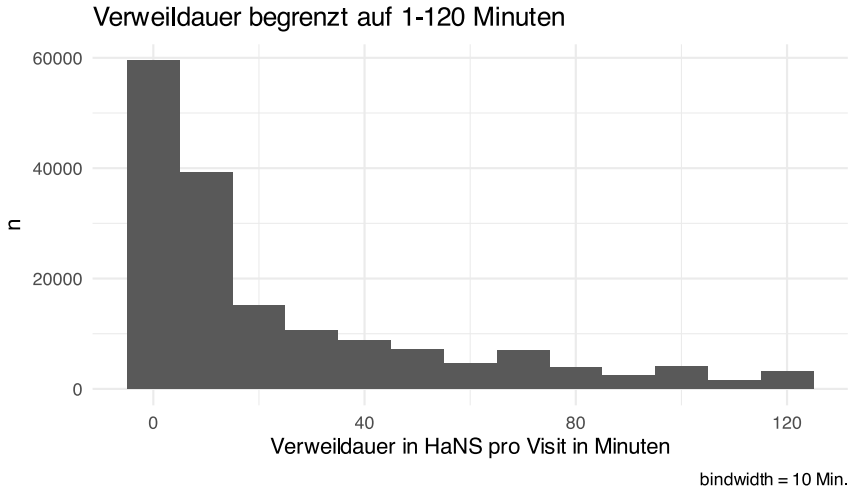
2.3.b bins=100

```
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.")
```



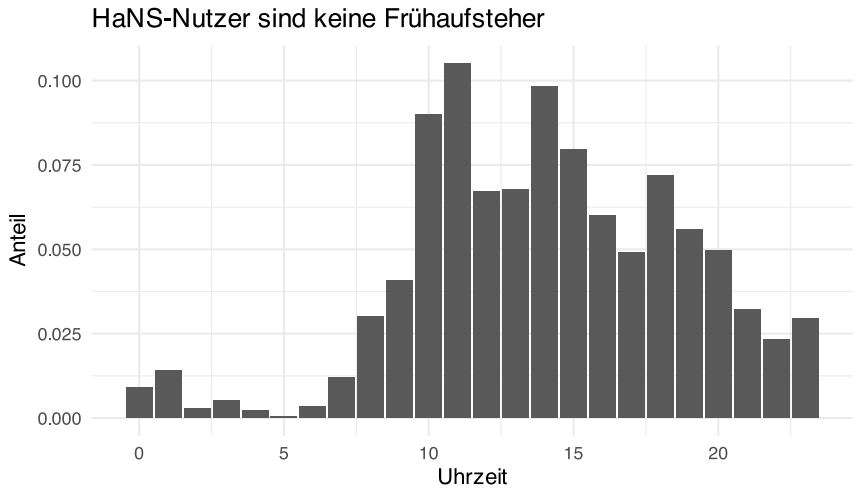
3 An welchen Tagen und zu welcher Zeit kommen die User zu HaNS?

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)
```

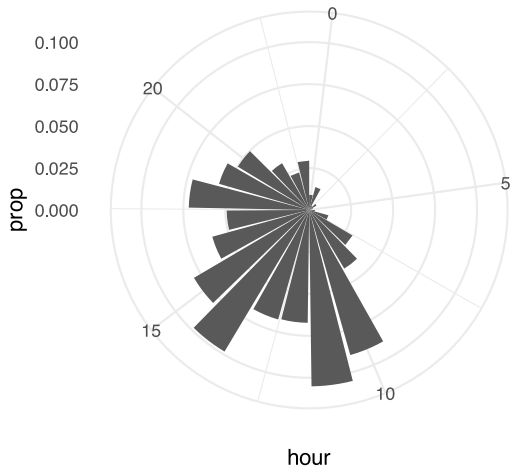
3.2 HaNS-Login nach Uhrzeit

```
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"
  )
```



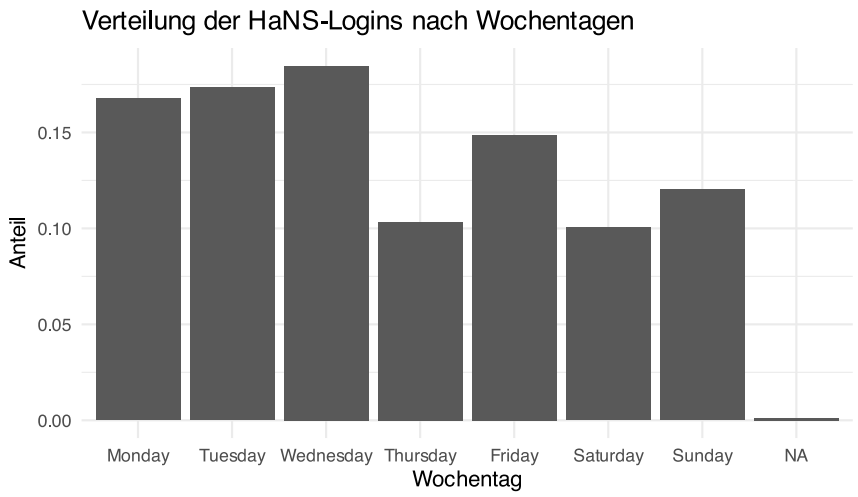

```
 # coord_polar()
```

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



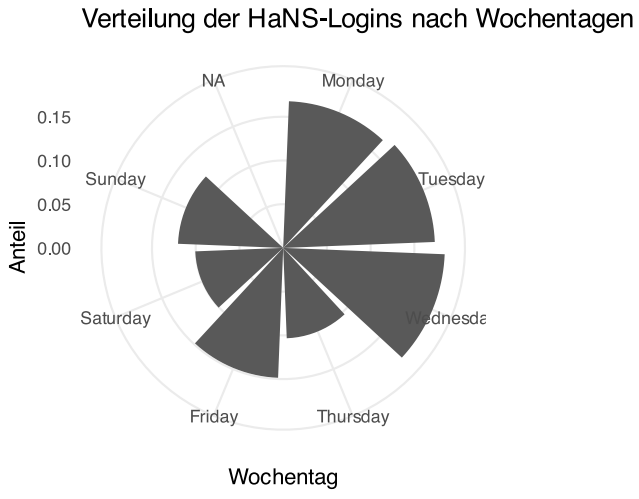
3.3 Verteilung der HaNS-Besuche nach Wochentagen

```
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")
```



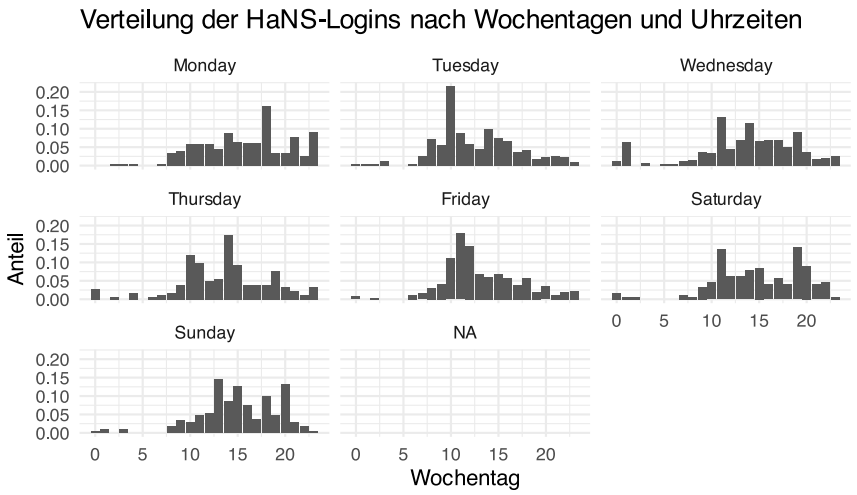

```
 # coord_polar()
```

```
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()
```



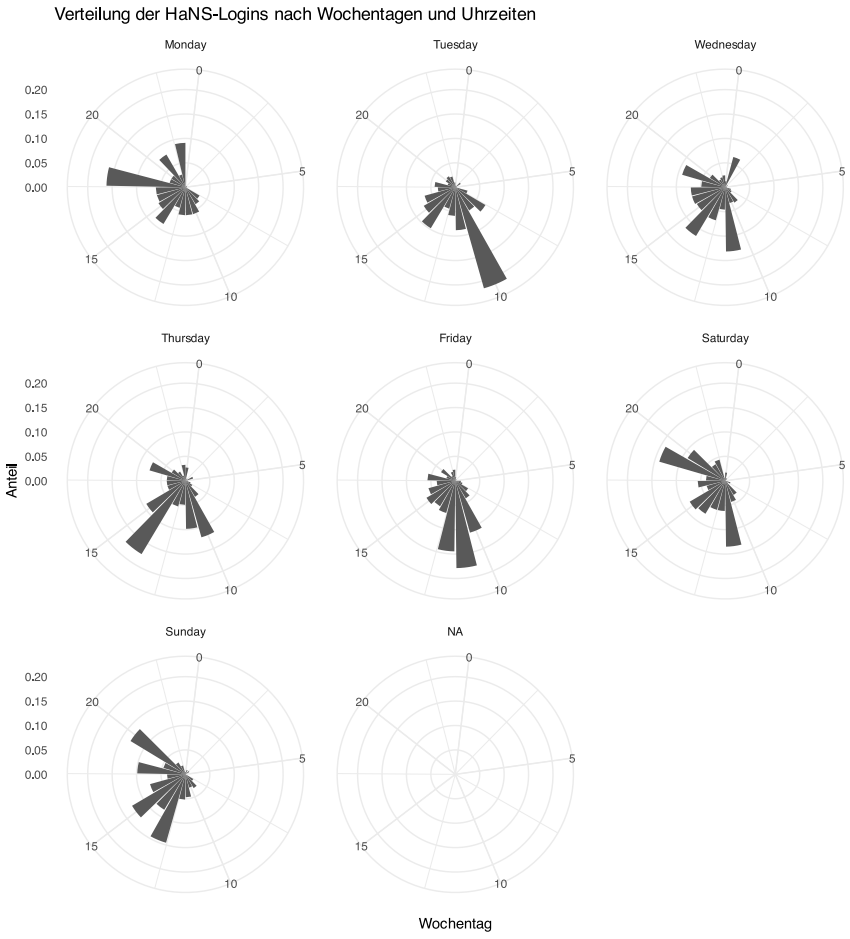
3.3.a HaNS-Login nach Wochentagen Uhrzeit

```
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()
```

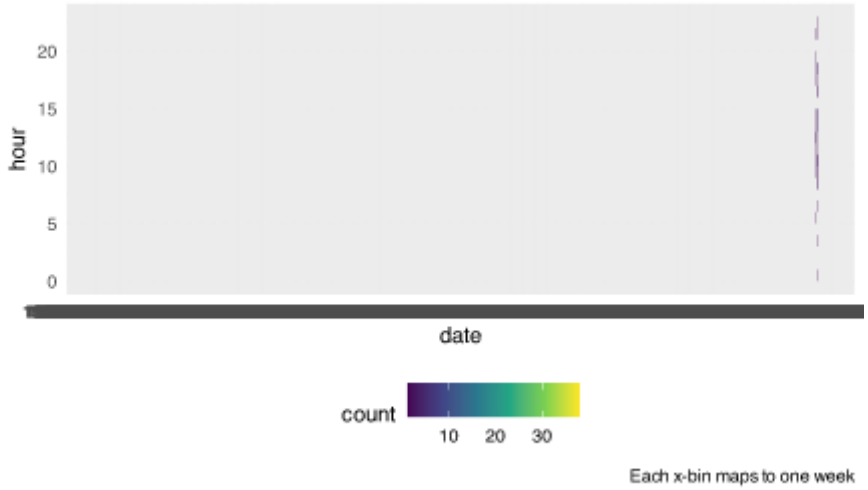
```
time_visit_wday |>
  as_tibble() |>
  count(dow2, hour) |>
  group_by(dow2) |>
  mutate(prop = n/sum(n)) |>
  ggplot(aes(x = hour, y = prop)) +
  geom_col() +
  facet_wrap(~ dow2) +
  theme_minimal() +
  labs(title = "Verteilung der HaNS-Logins nach Wochentagen und Uhrzeiten",
       x = "Wochentag",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



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

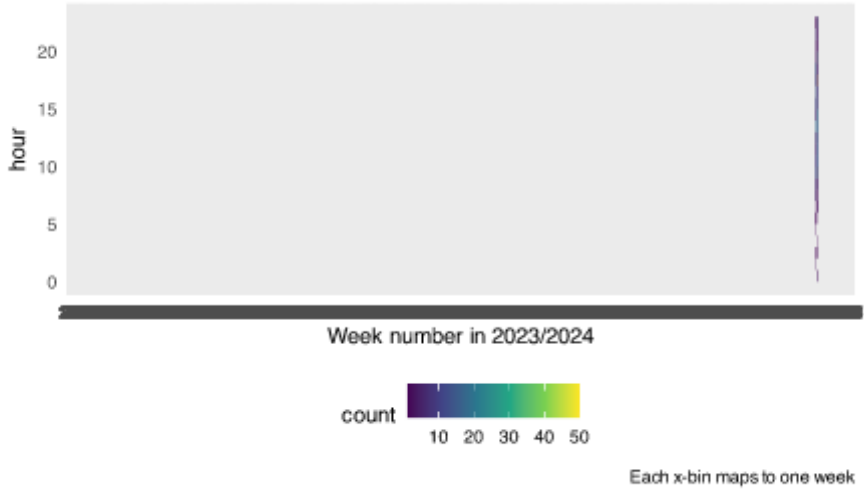
```
time2 <-
time_visit_wday |>
  ungroup() |>
  mutate(date = as.Date(date_time))

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")
```



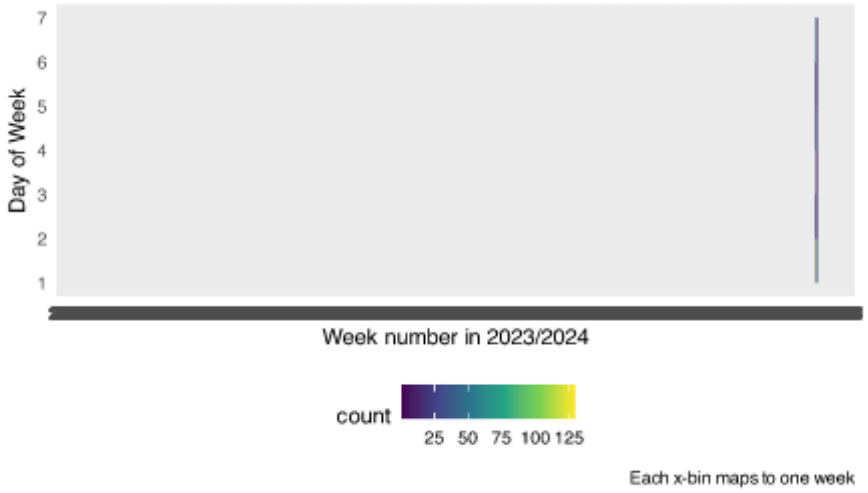
3.5 Anzahl der Visits nach Datum (Wochen) und Uhrzeit (bin2d)

```
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.

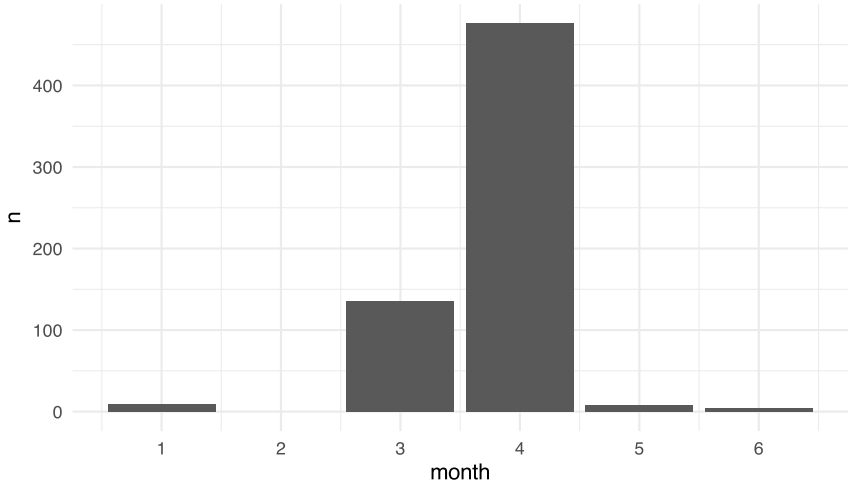
4.1.a Insgesamt

```
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.

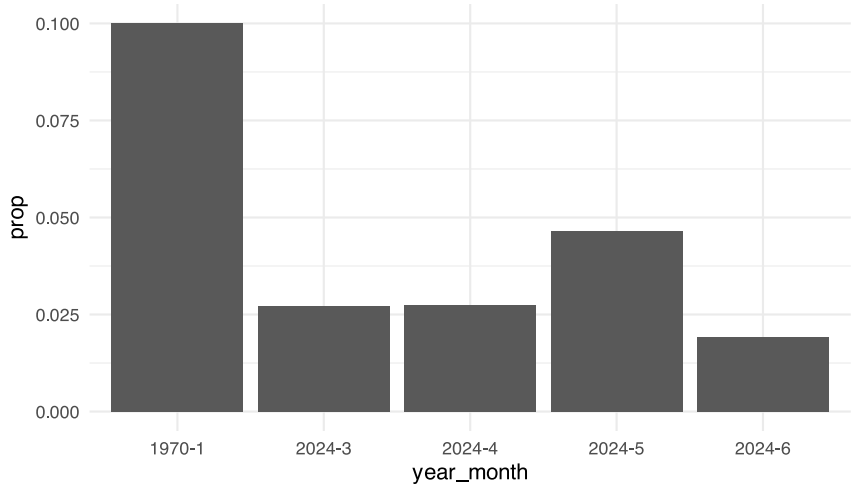
```
ai_transcript_clicks_per_month |>
  count(clicks_transcript_any) |>
  mutate(prop = n / sum(n))
## # A tibble: 2 × 3
##   clicks_transcript_any     n   prop
##   <lgl>                 <int>  <dbl>
## 1 FALSE                  1709 0.967
## 2 TRUE                     59 0.0334
```

4.2.b Pro Monat

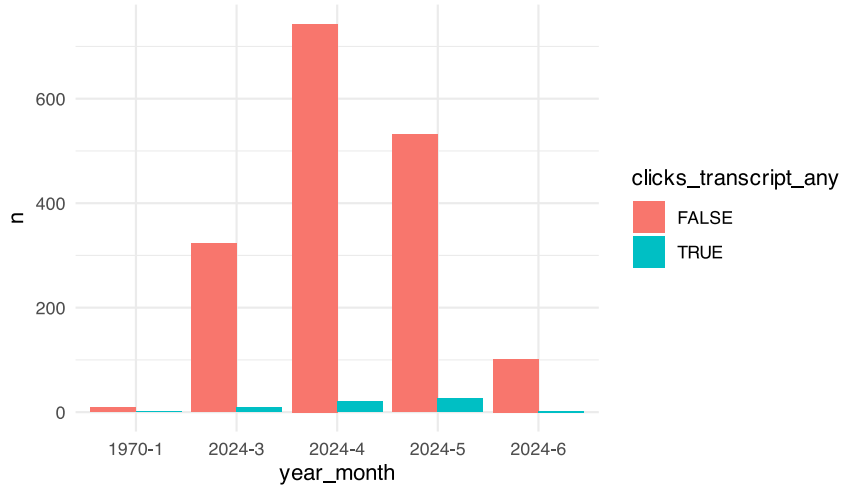
```
ai_transcript_clicks_per_month |>
  group_by(year_month) |>
  summarise(prop = sum(clicks_transcript_any) / n())
## # A tibble: 5 × 2
##   year_month   prop
##   <chr>       <dbl>
## 1 1970-1     0.1
## 2 2024-3     0.0271
## 3 2024-4     0.0275
## 4 2024-5     0.0466
## 5 2024-6     0.0192
```

```
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")
```

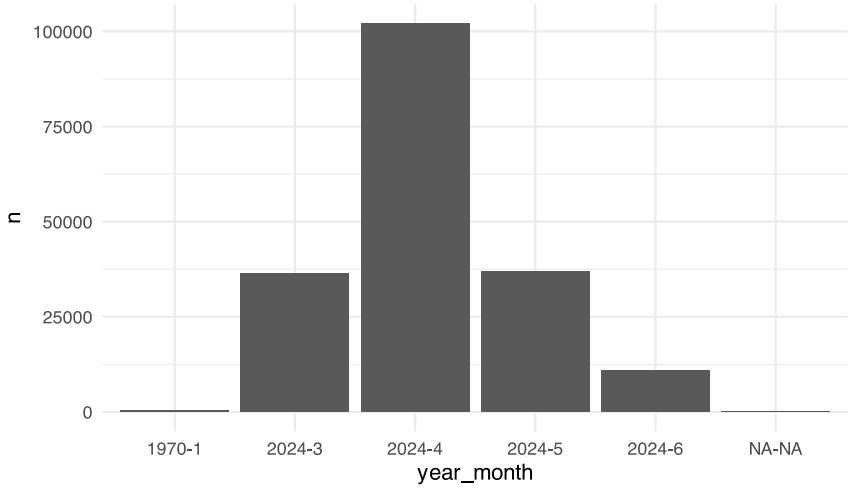


4.3 Wie oft wird (pro Monat) mit dem LLM interagiert?

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()
```

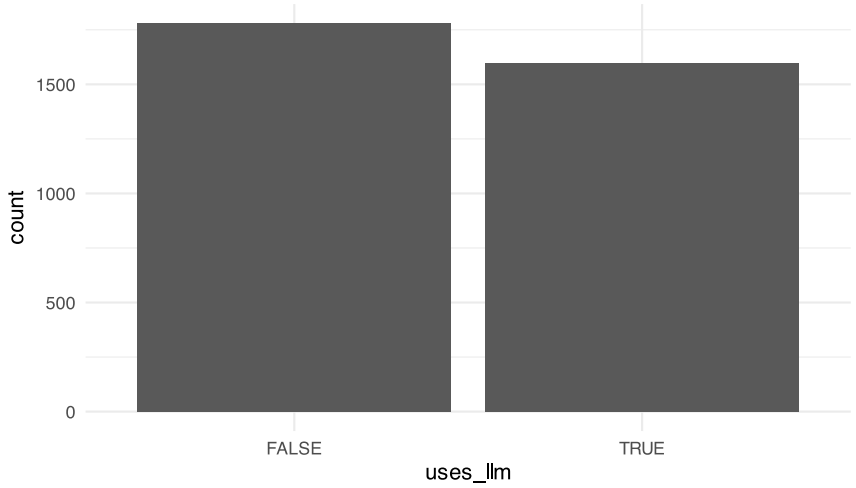


4.4 Welcher Anteil der Besucher (visitors) interagiert mit dem LLM?

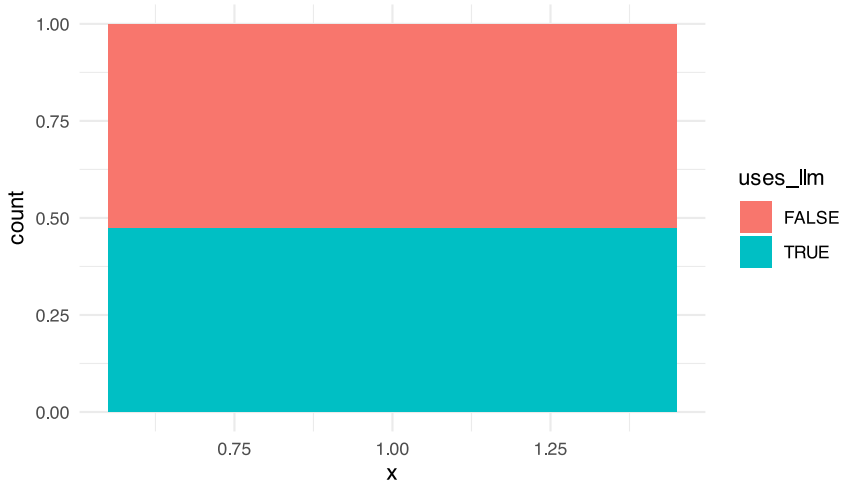
4.4.a Insgesamt

```
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")
```

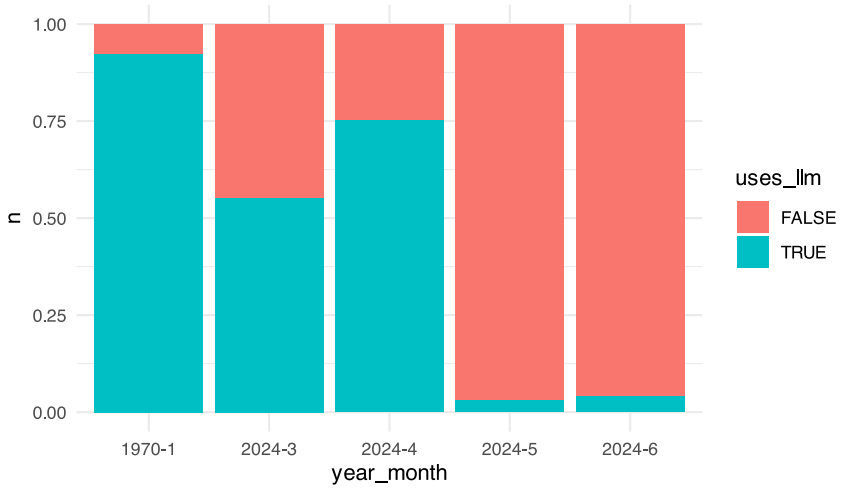


4.4.b Pro Monat

```
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