

# Package ‘webtrackR’

August 31, 2023

**Title** Preprocessing and Analyzing Web Tracking Data

**Version** 0.1.0

**Description**

Data structures and methods to work with web tracking data. The functions cover data preprocessing steps, enriching web tracking data with external information and methods for the analysis of digital behavior as used in several academic papers (e.g., Clemm von Hohenberg et al., 2023 <[doi:10.17605/OSF.IO/M3U9P](https://doi.org/10.17605/OSF.IO/M3U9P)>; Stier et al., 2022 <[doi:10.1017/S0003055421001222](https://doi.org/10.1017/S0003055421001222)>).

**URL** <https://github.com/schochastics/webtrackR>,  
<https://schochastics.github.io/webtrackR/>

**BugReports** <https://github.com/schochastics/webtrackR/issues>

**Depends** R (>= 3.5.0)

**License** MIT + file LICENSE

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**Imports** data.table, tibble, igraph, urltools, utils, rvest, httr

**LazyData** true

**Suggests** backbone, stats, testthat (>= 3.0.0)

**Config/testthat/edition** 3

**NeedsCompilation** no

**Author** David Schoch [aut, cre] (<<https://orcid.org/0000-0003-2952-4812>>),  
Bernhard Clemm von Hohenberg [aut]  
(<<https://orcid.org/0000-0002-6976-9745>>),  
Frank Mangold [aut] (<<https://orcid.org/0000-0002-9776-3113>>),  
Sebastian Stier [aut] (<<https://orcid.org/0000-0002-1217-5778>>)

**Maintainer** David Schoch <david@schochastics.net>

**Repository** CRAN

**Date/Publication** 2023-08-31 07:30:02 UTC

**R topics documented:**

add_duration . . . . .	2
add_next_visit . . . . .	4
add_panelist_data . . . . .	4
add_previous_visit . . . . .	5
add_referral . . . . .	6
add_session . . . . .	7
add_title . . . . .	8
audience_incidence . . . . .	9
audience_network . . . . .	10
bakshy . . . . .	10
classify_visits . . . . .	11
create_urldummy . . . . .	12
deduplicate . . . . .	13
domain_list . . . . .	14
drop_query . . . . .	15
extract_domain . . . . .	16
extract_host . . . . .	17
extract_path . . . . .	18
isolation_index . . . . .	18
news_types . . . . .	19
print.wt_dt . . . . .	20
summary.wt_dt . . . . .	20
sum_activity . . . . .	21
sum_durations . . . . .	21
sum_visits . . . . .	23
testdt_survey_l . . . . .	24
testdt_survey_w . . . . .	24
testdt_tracking . . . . .	24
vars_exist . . . . .	25
wt_dt . . . . .	25
<b>Index</b>	<b>27</b>

---

add_duration	<i>Add time spent on a visit in seconds</i>
--------------	---

---

**Description**

add\_duration() approximates the time spent on a visit based on the difference between two consecutive timestamps, replacing differences exceeding cutoff with the value defined in replace\_by.

**Usage**

```
add_duration(  
  wt,  
  cutoff = 300,  
  replace_by = NA,  
  last_replace_by = NA,  
  device_switch_na = FALSE,  
  device_var = NULL  
)
```

**Arguments**

wt	webtrack data object.
cutoff	numeric (seconds). If duration is greater than this value, it is reset to the value defined by <code>replace_by</code> . Defaults to 300 seconds.
replace_by	numeric. Determines whether differences greater than the cutoff are set to NA, or some value. Defaults to NA.
last_replace_by	numeric. Determines whether the last visit for an individual is set to NA, or some value. Defaults to NA.
device_switch_na	boolean. Relevant only when data was collected from multiple devices. When visits are ordered by timestamp sequence, two consecutive visits can come from different devices, which makes the timestamp difference less likely to be the true duration. It may be preferable to set the duration of the visit to NA (TRUE) rather than the difference to the next timestamp (FALSE). Defaults to FALSE.
device_var	character. Column indicating device. Required if 'device_switch_na' set to TRUE. Defaults to NULL.

**Value**

webtrack data.table (ordered by `panelist_id` and `timestamp`) with the same columns as `wt` and a new column called `duration`.

**Examples**

```
## Not run:  
data("testdt_tracking")  
wt <- as.wt_dt(testdt_tracking)  
wt <- add_duration(wt)  
# Defining cutoff at 10 minutes, replacing those exceeding cutoff to 5 minutes,  
# and setting duration before device switch to `NA`:  
wt <- add_duration(wt,  
  cutoff = 600, replace_by = 300,  
  device_switch_na = TRUE, device_var = "device"  
)  
  
## End(Not run)
```

---

add_next_visit	<i>Add the next visit as a new column</i>
----------------	---

---

### Description

add\_next\_visit() adds the subsequent visit, as determined by order of timestamps as a new column. The next visit can be added as either the full URL, the extracted host or the extracted domain, depending on level.

### Usage

```
add_next_visit(wt, level = "url")
```

### Arguments

wt	webtrack data object.
level	character. Either "url", "host" or "domain". Defaults to "url".

### Value

webtrack data.table with the same columns as wt and a new column called url\_next, host\_next or domain\_next.

### Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# Adding next full URL as new column
wt <- add_next_visit(wt, level = "url")
# Adding next host as new column
wt <- add_next_visit(wt, level = "host")
# Adding next domain as new column
wt <- add_next_visit(wt, level = "domain")

## End(Not run)
```

---

add_panelist_data	<i>Add panelist features to tracking data</i>
-------------------	---

---

### Description

add\_panelist\_data() adds information about panelists (e.g., from a survey) to the tracking data.

### Usage

```
add_panelist_data(wt, data, cols = NULL, join_on = "panelist_id")
```

**Arguments**

wt	webtrack data object.
data	a data.table (or object that can be converted to data.table) which contains columns about panelists
cols	character vector of columns to add. If NULL, all columns are added. Defaults to NULL.
join_on	which columns to join on. Defaults to "panelist_id".

**Value**

webtrack object with the same columns and the columns from data specified in cols.

**Examples**

```
## Not run:
data("testdt_tracking")
data("testdt_survey_w")
wt <- as.wt_dt(testdt_tracking)
# add survey test data
add_panelist_data(wt, testdt_survey_w)

## End(Not run)
```

---

add\_previous\_visit     *Add the previous visit as a new column*

---

**Description**

add\_previous\_visit() adds the previous visit, as determined by order of timestamps as a new column. The previous visit can be added as either the full URL, the extracted host or the extracted domain, depending on level.

**Usage**

```
add_previous_visit(wt, level = "url")
```

**Arguments**

wt	webtrack data object.
level	character. Either "url", "host" or "domain". Defaults to "url".

**Value**

webtrack data.table with the same columns as wt and a new column called url\_previous, host\_previous or domain\_previous..

**Examples**

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# Adding previous full URL as new column
wt <- add_previous_visit(wt, level = "url")
# Adding previous host as new column
wt <- add_previous_visit(wt, level = "host")
# Adding previous domain as new column
wt <- add_previous_visit(wt, level = "domain")

## End(Not run)
```

---

add\_referral

*Add social media referrals as a new column*


---

**Description**

Identifies whether a visit was referred to from social media and adds it as a new column. See details for method.

**Usage**

```
add_referral(wt, platform_domains, patterns)
```

**Arguments**

wt	webtrack data object.
platform_domains	character. A vector of platform domains for which referrers should be identified. Order and length must correspondent to patterns argument
patterns	character. A vector of patterns for which referrers should be identified. Order and length must correspondent to platform_domains vector.

**Details**

To identify referrals, we rely on the method described as most valid in Schmidt et al.: When the domain preceding a visit was to the platform in question, and the query string of the visit's URL contains a certain pattern, we count it as a referred visit. For Facebook, the pattern has been identified by Schmidt et al. as 'fbclid=', although this can change in future.

**Value**

webtrack data.table with the same columns as wt and a new column called referral, which takes on NA if no referral has been identified, or the name specified platform\_domains if a referral from that platform has been identified

## References

Schmidt, Felix, Frank Mangold, Sebastian Stier and Roberto Ulloa. "Facebook as an Avenue to News: A Comparison and Validation of Approaches to Identify Facebook Referrals". Working paper.

## Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
wt <- add_referral(wt, platform_domains = "facebook.com", patterns = "fbclid=")
wt <- add_referral(wt,
  platform_domains = c("facebook.com", "twitter.com"),
  patterns = c("fbclid=", "utm_source=twitter")
)

## End(Not run)
```

---

add_session	<i>Add a session variable</i>
-------------	-------------------------------

---

## Description

add\_session() groups visits into "sessions", defining a session to end when the difference between two consecutive timestamps exceeds a cutoff.

## Usage

```
add_session(wt, cutoff)
```

## Arguments

wt	webtrack data object.
cutoff	numeric (seconds). If the difference between two consecutive timestamps exceeds this value, a new browsing session is defined.

## Value

webtrack data.table (ordered by panelist\_id and timestamp) with the same columns as wt and a new column called session.

## Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# Setting cutoff to 30 minutes
wt <- add_session(wt, cutoff = 1800)

## End(Not run)
```

---

`add_title`*Download and add the "title" of a URL*

---

### Description

`add_title()` gets the title of a URL by accessing the web address online and adds the title as a new column. See details for the meaning of "title". You need an internet connection to run this function.

### Usage

```
add_title(wt, lang = "en-US,en-GB,en")
```

### Arguments

<code>wt</code>	webtrack data object.
<code>lang</code>	character (a language tag). Language accepted by the request. Defaults to "en-US,en-GB,en". Note that you are likely to still obtain titles different from the ones seen originally by the user, because the language also depend on the user's IP and device settings.

### Details

The title of a website (the text within the `<title>` tag of a web site's `<head>`) # is the text that is shown on the "tab" when looking at the website in a browser. It can contain useful information about a URL's content and can be used, for example, for classification purposes. Note that it may take a while to run this function for a large number of URLs.

### Value

webtrack data.table with the same columns as `wt` and a new column called "title", which will be NA if the title cannot be retrieved.

### Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)[1:2]
# Get titles with `lang` set to default English
wt_titles <- add_title(wt)
# Get titles with `lang` set to German
wt_titles <- add_title(wt, lang = "de")

## End(Not run)
```



---

audience\_incidence      *Create incidence matrix for two-mode networks including audiences*

---

### Description

audience\_incidence() created an incidence matrix, which is a matrix  $A$  with entries  $A[i, j]=1$  if panelist  $i$  visited web site  $j$  at least once. Web site can be defined, for example, by the URL's domain, or its host.

### Usage

```
audience_incidence(wt, mode2 = "domain", cutoff = 3)
```

### Arguments

`wt`                      webtrack data object.  
`mode2`                    character. Name of column that includes the second mode (e.g., domain or host)  
`cutoff`                    visits below this cutoff will not be considered as a visit.

### Value

Incidence matrix of a two-mode network

### See Also

To create audience networks see [audience\\_network](#).

### Examples

```
## Not run:  
data("testdt_tracking")  
wt <- as.wt_dt(testdt_tracking)  
wt <- add_duration(wt)  
wt <- suppressWarnings(extract_domain(wt))  
# create incidence matrix using domains as second mode  
incidence <- audience_incidence(wt)  
# create incidence matrix using hosts as second mode  
wt <- suppressWarnings(extract_host(wt))  
incidence <- audience_incidence(wt, mode2 = "host")  
  
## End(Not run)
```

---

audience\_network      *Create audience networks*

---

### Description

audience network

### Usage

```
audience_network(wt, mode2 = "domain", cutoff = 3, type = "pmi", alpha = 0.05)
```

### Arguments

wt	webtrack data object
mode2	character. name of column that includes the second mode (e.g. 'domain' or 'host')
cutoff	visits below this cutoff will not be considered as a visit
type	one of "pmi", "phi", "disparity", "sds", "or "fdsm".
alpha	significance level

### Value

audience network as igraph object

### Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
wt <- add_duration(wt)
wt <- suppressWarnings(extract_domain(wt))
network <- audience_network(wt, type = "pmi", cutoff = 120)

## End(Not run)
```

---

bakshy      *Bakshy Top500 Ideological alignment of 500 domains based on facebook data*

---

### Description

Bakshy Top500 Ideological alignment of 500 domains based on facebook data

### Usage

bakshy

**Format**

An object of class `data.table` (inherits from `data.frame`) with 500 rows and 7 columns.

**References**

Bakshy, Eytan, Solomon Messing, and Lada A. Adamic. "Exposure to ideologically diverse news and opinion on Facebook." *Science* 348.6239 (2015): 1130-1132.

---

<code>classify_visits</code>	<i>Classify visits by matching to a list of classes</i>
------------------------------	---

---

**Description**

`classify_visits()` categorizes visits by either extracting the visit URL's domain or host and matching them to a list of domains or hosts; or by matching a list of regular expressions against the visit URL.

**Usage**

```
classify_visits(  
  wt,  
  classes,  
  match_by = "domain",  
  regex_on = NULL,  
  return_rows_by = NULL,  
  return_rows_val = NULL  
)
```

**Arguments**

<code>wt</code>	webtrack data object.
<code>classes</code>	a <code>data.table</code> containing classes that can be matched to visits.
<code>match_by</code>	character. Whether to match list entries from <code>classes</code> to the domain of a visit ("domain") or the host ("host") with an exact match; or with a regular expression against the whole URL of a visit ("regex"). If set to "domain" or "host", both <code>wt</code> and <code>classes</code> need to have a column called accordingly. If set to "regex", the <code>url</code> column of <code>wt</code> will be used, and you need to set <code>regex_on</code> to the column in <code>classes</code> for which to do the pattern matching. Defaults to "domain".
<code>regex_on</code>	character. Column in <code>classes</code> which to use for pattern matching. Defaults to <code>NULL</code> .
<code>return_rows_by</code>	character. A column in <code>classes</code> on which to subset the returning data. Defaults to <code>NULL</code> .

return\_rows\_val

character. The value of the columns specified in return\_rows\_by, for which data should be returned. For example, if your classes data contains a column type, which has a value called "shopping", setting return\_rows\_by to "type" and return\_rows\_val to "shopping" will only return visits classified as "shopping".

### Value

webtrack data.table with the same columns as wt and any column in classes except the column specified by match\_by.

### Examples

```
## Not run:
data("testdt_tracking")
data("domain_list")
wt <- as.wt_dt(testdt_tracking)
# classify visits via domain
wt_domains <- extract_domain(wt, drop_na = FALSE)
wt_classes <- classify_visits(wt_domains, classes = domain_list, match_by = "domain")
# classify visits via domain
# for the example, just renaming "domain" column
domain_list$host <- domain_list$domain
wt_hosts <- extract_host(wt, drop_na = FALSE)
wt_classes <- classify_visits(wt_hosts, classes = domain_list, match_by = "host")
# classify visits with pattern matching
# for the example, any value in "domain" treated as pattern
data("domain_list")
regex_list <- domain_list[type == "facebook"]
wt_classes <- classify_visits(wt[1:5000],
  classes = regex_list,
  match_by = "regex", regex_on = "domain"
)
# classify visits via domain and only return class "search"
data("domain_list")
wt_classes <- classify_visits(wt_domains,
  classes = domain_list,
  match_by = "domain", return_rows_by = "type",
  return_rows_val = "search"
)

## End(Not run)
```

---

create\_urldummy

*Create an urldummy variable from a data.table object*

---

### Description

Create an urldummy variable from a data.table object

**Usage**

```
create_urldummy(wt, dummy, name)
```

**Arguments**

wt	webtrack data object
dummy	a vector of urls that should be dummy coded
name	name of dummy variable to create.

**Value**

webtrack object with the same columns and a new column called "name" including the dummy variable

**Examples**

```
## Not run:  
data("testdt_tracking")  
wt <- as.wt_dt(testdt_tracking)  
wt <- extract_domain(wt)  
code_urls <- "https://dkr1.ssisurveys.com/tzktsxomta"  
create_urldummy(wt, dummy = code_urls, name = "test_dummy")  
  
## End(Not run)
```

---

deduplicate	<i>Deduplicate visits</i>
-------------	---------------------------

---

**Description**

deduplicate() flags, drops or aggregates duplicates, which are defined as consecutive visits to the same URL within a certain time frame.

**Usage**

```
deduplicate(  
  wt,  
  method = "aggregate",  
  within = 1,  
  duration_var = "duration",  
  keep_nvisits = FALSE,  
  same_day = TRUE  
)
```

**Arguments**

wt	webtrack data object.
method	character. One of "aggregate", "flag" or "drop". If set to "aggregate", consecutive visits (no matter the time difference) to the same URL are combined and their duration aggregated. In this case, a duration column must be specified via "duration_var". If set to "flag", duplicates within a certain time frame are flagged in a new column called duplicate. In this case, within argument must be specified. If set to "drop", duplicates are dropped. Again, within argument must be specified. Defaults to "aggregate".
within	numeric (seconds). If method set to "flag" or "drop", a subsequent visit is only defined as a duplicate when happening within this time difference. Defaults to 1 second.
duration_var	character. Name of duration variable. Defaults to "duration".
keep_nvisits	boolean. If method set to "aggregate", this determines whether number of aggregated visits should be kept as variable. Defaults to FALSE.
same_day	boolean. If method set to "aggregate", determines whether to count visits as consecutive only when on the same day. Defaults to TRUE.

**Value**

webtrack data.table with the same columns as wt with updated duration

**Examples**

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
wt <- add_duration(wt, cutoff = 300, replace_by = 300)
# Dropping duplicates with one-second default
wt_dedup <- deduplicate(wt, method = "drop")
# Flagging duplicates with one-second default
wt_dedup <- deduplicate(wt, method = "flag")
# Aggregating duplicates
wt_dedup <- deduplicate(wt[1:1000], method = "aggregate")
# Aggregating duplicates and keeping number of visits for aggregated visits
wt_dedup <- deduplicate(wt[1:1000], method = "aggregate", keep_nvisits = TRUE)

## End(Not run)
```

---

domain\_list

*Domain list classification of domains into news, portals, search, and social media*

---

**Description**

Domain list classification of domains into news, portals, search, and social media

**Usage**

```
domain_list
```

**Format**

An object of class `data.table` (inherits from `data.frame`) with 663 rows and 2 columns.

**References**

Stier, S., Mangold, F., Scharnow, M., & Breuer, J. (2022). Post Post-Broadcast Democracy? News Exposure in the Age of Online Intermediaries. *American Political Science Review*, 116(2), 768-774.

---

drop_query	<i>Drop the query and fragment from URL</i>
------------	---

---

**Description**

`drop_query()` adds the URL without query and fragment as a new column. The query is defined as the part following a "?" after the path. The fragment is anything following a "#" after the query.

**Usage**

```
drop_query(wt, varname = "url")
```

**Arguments**

<code>wt</code>	webtrack data object.
<code>varname</code>	character. name of the column from which to extract the host. Defaults to "url".

**Value**

webtrack `data.table` with the same columns as `wt` and a new column called '`<varname>_noquery`'

**Examples**

```
## Not run:  
data("testdt_tracking")  
wt <- as.wt_dt(testdt_tracking)  
# Extract URL without query/fragment  
wt <- drop_query(wt)  
  
## End(Not run)
```

---

extract_domain	<i>Extract the domain from URL</i>
----------------	------------------------------------

---

### Description

extract\_domain() adds the domain of a URL as a new column. By "domain", we mean the "top private domain", i.e., the domain under the public suffix (e.g., "com") as defined by the Public Suffix List. See details.

Extracts the domain from urls.

### Usage

```
extract_domain(wt, varname = "url", drop_na = TRUE)
```

### Arguments

wt	webtrack data object.
varname	character. Name of the column from which to extract the host. Defaults to "url".
drop_na	boolean. Determines whether rows for which no host can be extracted should be dropped from the data. Defaults to TRUE.

### Details

We define a "web domain" in the common colloquial meaning, that is, the part of an web address that identifies the person or organization in control. is google.com. More technically, what we mean by "domain" is the "top private domain", i.e., the domain under the public suffix, as defined by the Public Suffix List. Note that this definition sometimes leads to counterintuitive results because not all public suffixes are "registry suffixes". That is, they are not controlled by a domain name registrar, but allow users to directly register a domain. One example of such a public, non-registry suffix is blogspot.com. For a URL like www.mysite.blogspot.com, our function, and indeed the packages we are aware of, would extract the domain as mysite.blogspot.com, although you might think of blogspot.com as the domain. For details, see [here](#)

### Value

webtrack data.table with the same columns as wt and a new column called 'domain' (or, if varname not equal to 'url', '<varname>\_domain')

### Examples

```
## Not run:  
data("testdt_tracking")  
wt <- as.wt_dt(testdt_tracking)  
# Extract domain and drop rows without domain  
wt <- extract_domain(wt)  
# Extract domain and keep rows without domain
```



```
wt <- extract_domain(wt, drop_na = FALSE)

## End(Not run)
```

---

extract\_host                      *Extract the host from URL*

---

## Description

extract\_host() adds the host of a URL as a new column. The host is defined as the part following the scheme (e.g., "https://") and preceding the subdirectory (anything following the next "/"). Note that for URL entries like chrome-extension://something or http://192.168.0.1/something, result will be set to NA.

## Usage

```
extract_host(wt, varname = "url", drop_na = TRUE)
```

## Arguments

wt	webtrack data object.
varname	character. Name of the column from which to extract the host. Defaults to "url".
drop_na	boolean. Determines whether rows for which no host can be extracted should be dropped from the data. Defaults to TRUE.

## Value

webtrack data.table with the same columns as wt and a new column called 'host' (or, if varname not equal to 'url', '<varname>\_host')

## Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# Extract host and drop rows without host
wt <- extract_host(wt)
# Extract host and keep rows without host
wt <- extract_host(wt, drop_na = FALSE)

## End(Not run)
```

---

extract_path	<i>Extract the path from URL</i>
--------------	----------------------------------

---

**Description**

extract\_path() adds the path of a URL as a new column. The path is defined as the part following the host but not including a query (anything after a "?") or a fragment (anything after a "#").

**Usage**

```
extract_path(wt, varname = "url")
```

**Arguments**

wt	webtrack data object
varname	character. name of the column from which to extract the host. Defaults to "url".

**Value**

webtrack data.table with the same columns as wt and a new column called 'path' (or, if varname not equal to 'url', '<varname>\_path')

**Examples**

```
## Not run:  
data("testdt_tracking")  
wt <- as.wt_dt(testdt_tracking)  
# Extract path  
wt <- extract_path(wt)  
  
## End(Not run)
```

---

isolation_index	<i>Isolation Index</i>
-----------------	------------------------

---

**Description**

Given two groups (A and B) of individuals, the isolation index captures the extent to which group A disproportionately visit websites whose other visitors are also members of group A.

**Usage**

```
isolation_index(grp_A, grp_B)
```

**Arguments**

grp\_A            vector (usually corresponds to a column in a webtrack data.table) indicating the number of individuals of group A using a website

grp\_B            vector (usually corresponds to a column in a webtrack data.table) indicating the number of individuals of group B using a website

**Details**

a value of 1 indicates that the websites visited by group A and group B do not overlap. A value of 0 means both visit exactly the same websites

**Value**

numeric value between 0 and 1. 0 indicates no isolation and 1 perfect isolation

**References**

Cutler, David M., Edward L. Glaeser, and Jacob L. Vigdor. "The rise and decline of the American ghetto." *Journal of political economy* 107.3 (1999): 455-506. Gentrification, Matthew, and Jesse M. Shapiro. "Ideological segregation online and offline." *The Quarterly Journal of Economics* 126.4 (2011): 1799-1839.

**Examples**

```
# perfect isolation
left <- c(5, 5, 0, 0)
right <- c(0, 0, 5, 5)
isolation_index(left, right)

# perfect overlap
left <- c(5, 5, 5, 5)
right <- c(5, 5, 5, 5)
isolation_index(left, right)
```

---

news\_types

*News Types*


---

**Description**

Classification of domains into different news types

**Usage**

```
news_types
```

**Format**

An object of class `data.table` (inherits from `data.frame`) with 690 rows and 2 columns.

**References**

Stier, S., Mangold, F., Scharrow, M., & Breuer, J. (2022). Post Post-Broadcast Democracy? News Exposure in the Age of Online Intermediaries. *American Political Science Review*, 116(2), 768-774.

---

print.wt_dt	<i>Print web tracking data</i>
-------------	--------------------------------

---

**Description**

Print web tracking data

**Usage**

```
## S3 method for class 'wt_dt'
print(x, ...)
```

**Arguments**

x	object of class wt_dt
...	additional parameters for print

**Value**

No return value, called for side effects

---

summary.wt_dt	<i>Summary function for web tracking data</i>
---------------	---

---

**Description**

Summary function for web tracking data

**Usage**

```
## S3 method for class 'wt_dt'
summary(object, ...)
```

**Arguments**

object	object of class wt_dt
...	additional parameters for summary

**Value**

No return value, called for side effects

---

sum_activity	<i>Summarize activity per person</i>
--------------	--------------------------------------

---

### Description

sum\_activity() counts the number of active time periods (i.e., days, weeks, months, years, or waves) by panelist\_id. A period counts as "active" if the panelist provided at least one visit for that period.

### Usage

```
sum_activity(wt, timeframe = "date")
```

### Arguments

wt	webtrack data object.
timeframe	character. Indicates for what time frame to aggregate visits. Possible values are "date", "week", "month", "year" or "wave". If set to "wave", wt must contain a column call wave. Defaults to "date".

### Value

a data.table with columns panelist\_id, column indicating the number of active time units.

### Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# summarize activity by day
wt_sum <- sum_activity(wt, timeframe = "date")

## End(Not run)
```

---

sum_durations	<i>Summarize visit duration by person</i>
---------------	---

---

### Description

sum\_durations() summarizes the duration of visits by person within a timeframe, and optionally by visit\_class of visit. Note:

- If for a time frame all rows are NA on the duration column, the summarized duration for that time frame will be NA.
- If only some of the rows of a time frame are NA on the duration column, the function will ignore those NA rows.

- If there were no visits to a class (i.e., a value of the 'visit\_class' column) for a time frame, the summarized duration for that time frame will be zero; if there were visits, but NA on duration, the summarized duration will be NA.

## Usage

```
sum_durations(wt, var_duration = NULL, timeframe = NULL, visit_class = NULL)
```

## Arguments

<code>wt</code>	webtrack data object.
<code>var_duration</code>	character. Name of the duration variable if already present. Defaults to NULL, in which case duration will be approximated with <code>add_duration(wt, cutoff = 300, replace_by = "na", replace_val = NULL)</code>
<code>timeframe</code>	character. Indicates for what time frame to aggregate visit durations. Possible values are "date", "week", "month", "year", "wave" or NULL. If set to "wave", <code>wt</code> must contain a column call <code>wave</code> . Defaults to NULL, in which case the output contains duration of visits for the entire time.
<code>visit_class</code>	character. Column that contains a classification of visits. For each value in this column, the output will have a column indicating the number of visits belonging to that value. Defaults to NULL.

## Value

a data.table with columns `panelist_id`, column indicating the time unit (unless `timeframe` set to NULL), `duration_visits` indicating the duration of visits (in seconds, or whatever the unit of the variable specified by `var_duration` parameter), and a column for each value of `visit_class`, if specified.

## Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# summarize for whole period
wt_summ <- sum_durations(wt)
# summarize by week
wt_summ <- sum_durations(wt, timeframe = "week")
# create a class variable to summarize by class
wt <- suppressWarnings(extract_domain(wt, drop_na = TRUE))
wt[, google := ifelse(domain == "google.com", 1, 0)]
wt_summ <- sum_durations(wt, timeframe = "week", visit_class = "google")

## End(Not run)
```

---

sum_visits	<i>Summarize number of visits by person</i>
------------	---

---

### Description

sum\_visits() summarizes the number of visits by person within a timeframe, and optionally by visit\_class of visit.

### Usage

```
sum_visits(wt, timeframe = NULL, visit_class = NULL)
```

### Arguments

wt	webtrack data object.
timeframe	character. Indicates for what time frame to aggregate visits. Possible values are "date", "week", "month", "year", "wave" or NULL. If set to "wave", wt must contain a column call wave. Defaults to NULL, in which case the output contains number of visits for the entire time.
visit_class	character. Column that contains a classification of visits. For each value in this column, the output will have a column indicating the number of visits belonging to that value. Defaults to NULL.

### Value

a data.table with columns panelist\_id, column indicating the time unit (unless timeframe set to NULL), n\_visits indicating the number of visits, and a column for each value of visit\_class, if specified.

### Examples

```
## Not run:
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
# summarize for whole period
wt_summ <- sum_visits(wt)
# summarize by week
wt_summ <- sum_visits(wt, timeframe = "week")
# create a class variable to summarize by class
wt <- suppressWarnings(extract_domain(wt, drop_na = TRUE))
wt[, google := ifelse(domain == "google.com", 1, 0)]
wt_summ <- sum_visits(wt, timeframe = "week", visit_class = "google")

## End(Not run)
```

---

testdt_survey_1	<i>Test survey</i>
-----------------	--------------------

---

**Description**

Same randomly generated survey data, one row per person/wave (long format)

**Usage**

```
testdt_survey_1
```

**Format**

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 15 rows and 7 columns.

---

testdt_survey_w	<i>Test survey</i>
-----------------	--------------------

---

**Description**

Randomly generated survey data only used for illustrative purposes (wide format)

**Usage**

```
testdt_survey_w
```

**Format**

An object of class `data.frame` with 5 rows and 8 columns.

---

testdt_tracking	<i>Test data</i>
-----------------	------------------

---

**Description**

Sample of fully anonymized webtrack data from a research project with US participants

**Usage**

```
testdt_tracking
```

**Format**

An object of class `data.table` (inherits from `data.frame`) with 49612 rows and 5 columns.



---

vars_exist	<i>Check if columns are present</i>
------------	-------------------------------------

---

**Description**

vars\_exist() checks if columns are present in a webtrack data object. By default, checks whether the data has a panelist\_id, a url and a timestamp column.#'

**Usage**

```
vars_exist(wt, vars = c("panelist_id", "url", "timestamp"))
```

**Arguments**

wt	webtrack data object.
vars	character vector of variables. Defaults to c("panelist_id", "url", "timestamp").

**Value**

A data.table object.

---

wt_dt	<i>An S3 class, based on <a href="#">data.table</a>, to store web tracking data</i>
-------	---

---

**Description**

An S3 class, based on [data.table](#), to store web tracking data  
Convert a data.frame containing web tracking data to a wt\_dt object

**Usage**

```
as.wt_dt(
  x,
  timestamp_format = "%Y-%m-%d %H:%M:%OS",
  varnames = c(panelist_id = "panelist_id", url = "url", timestamp = "timestamp")
)

is.wt_dt(x)
```

**Arguments**

x	data.frame containing a necessary set of columns, namely panelist's ID, visit URL and visit timestamp.
timestamp_format	string. Specifies the raw timestamp's formatting. Defaults to "%Y-%m-%d %H:%M:%OS".
varnames	Named vector of column names, which contain the panelist's ID (panelist_id), the visit's URL (url) and the visit's timestamp (timestamp).

**Details**

A `wt_dt` table is a [data.table](#). Therefore, it can be used by any function that would work on a [data.frame](#) or a [data.table](#). Most of the operation such as variable creation, subsetting and joins are inherited from the [data.table](#) `[]` operator, following the convention `DT[i, j, by]` (see [data table](#) package for detail).

**Value**

a webtrack data object with at least columns `panelist_id`, `url` and `timestamp`  
logical. TRUE if `x` is a webtrack data object and FALSE otherwise

**See Also**

- [data.table](#) – on which `wt_dt` is based

**Examples**

```
data("testdt_tracking")
wt <- as.wt_dt(testdt_tracking)
is.wt_dt(wt)
```

# Index

## \* datasets

- bakshy, 10
- domain\_list, 14
- news\_types, 19
- testdt\_survey\_l, 24
- testdt\_survey\_w, 24
- testdt\_tracking, 24

- add\_duration, 2
- add\_next\_visit, 4
- add\_panelist\_data, 4
- add\_previous\_visit, 5
- add\_referral, 6
- add\_session, 7
- add\_title, 8
- as.wt\_dt (wt\_dt), 25
- audience\_incidence, 9
- audience\_network, 9, 10

- bakshy, 10

- classify\_visits, 11
- create\_urldummy, 12

- data.frame, 26
- data.table, 25, 26
- deduplicate, 13
- domain\_list, 14
- drop\_query, 15

- extract\_domain, 16
- extract\_host, 17
- extract\_path, 18

- is.wt\_dt (wt\_dt), 25
- isolation\_index, 18

- news\_types, 19

- print.wt\_dt, 20

- sum\_activity, 21

- sum\_durations, 21
- sum\_visits, 23
- summary.wt\_dt, 20

- testdt\_survey\_l, 24
- testdt\_survey\_w, 24
- testdt\_tracking, 24

- vars\_exist, 25

- wt\_dt, 25