# Package ‘rbenvo’

October 14, 2022

**Type** Package  
**Title** Built Environment Objects  
**Version** 1.0.5  
**Description** Provides S3 class objects and methods for built environment data to ease the use of working with these data and facilitate other packages that make use of this data structure.

**License** MIT + file LICENSE  
**Encoding** UTF-8  
**LazyData** true  
**Imports** ggplot2, dplyr, magrittr, tidyr, purrr, lme4, Matrix, forcats, sf, lubridate, rlang, stringr,  
**RoxygenNote** 7.1.1  
**Depends** R (>= 2.10)  
**Suggests** ggmap, knitr, glue, rmarkdown, testthat (>= 2.1.0), tidygraph, lwgeom  
**VignetteBuilder** knitr  
**URL** [https://github.com/apeterson91/rbenvo](https://github.com/apeterson91/rbenvo)  
**NeedsCompilation** no  
**Author** Adam Peterson [aut, cre] (<https://orcid.org/0000-0001-7071-7873>)  
**Maintainer** Adam Peterson <atpvyc@umich.edu>  
**Repository** CRAN  
**Date/Publication** 2020-11-18 10:40:02 UTC

## R topics documented:

- `rbenvo-package` ................................................................. 2  
- `activate` ........................................................................ 2  
- `add_BEF` ........................................................................ 3  
- `aggenvo` ........................................................................ 3  
- `base_benvo` ............................................................... 4  
- `benvo` ................................................................. 5

1
**activate**

Determine the context of subsequent manipulation

---

**Description**

A *benvo* is essentially a small relational database with a specific one-to-many structure between the subject table and each BEF tables. In order to know which data frame is of interest for displaying/manipulating at any given time use the `activate` function (akin to *activate*) to do so.

**Usage**

```r
activate(x, what)
active(x)
```
### add_BEF

**Arguments**
- `x`: benvo object
- `what`: name of df to activate

**Value**
- a benvo

---

**Description**

Add Built Environment Feature to Benvo

**Usage**

```r
add_BEF(x, bef_data, bef_id, d_function = sf::st_distance)
```

**Arguments**
- `x`: benvo or base benvo
- `bef_data`: 'tidy' data frame containing date/spatial information for one unique bef
- `bef_id`: unique bef_id column name
- `d_function`: function for calculating distance. Default is `st_distance`

---

### aggrenvo

**Aggregate Matrix to Subject or Subject - Measurement Level**

---

**Description**

Aggregate Matrix to Subject or Subject - Measurement Level

**Usage**

```r
aggrenvo(x, M, stap_term, component)
```

### S3 method for class 'benvo'

```r
aggrenvo(x, M, stap_term, component)
```
Arguments

- `x`: benvo object
- `M`: matrix to aggregate
- `stap_term`: relevant stap term
- `component`: one of c("Distance","Time","Distance-Time") indicating which column(s) of the bef dataset should be returned

Methods (by class)

- `benvo`: method

---

**Description**

When building a benvo iteratively the base benvo allows you to start with no bef data constructed a priori and build up from subject data that contains spatial and/or temporal raw data in the form of `sf` structures or `Date` columns.

**Usage**

```r
base_benvo(subject_data, by, ...)
```

Arguments

- `subject_data`: data.frame containing subject level covariates.
- `by`: optional key
- `...`: optional arguments for specifying date-time columns see `set_datetime_cols`

**Value**

a benvo with attribute `base = TRUE`
Create a benvo object

Usage

benvo(subject_data, sub_bef_data = NULL, by = NULL, ...)

Arguments

- subject_data: data.frame containing subject level covariates.
- sub_bef_data: named list of data frames that contain subject-bef relevant data. NULL by default which returns a "base benvo" which can be built upon/added to.
- by: optional key to link subject - sub_bef data. Will use the intersection of column names if not specified directly.
- ...: optional arguments for specifying date-time columns see set_datetime_cols

Details

benvo is a constructor function which creates benvo objects. In particular, note that the benvo function will explicitly check the data you provide, to ensure benvo methods can be performed without error.

Value

benvo object

See Also

Introductory and more Specialized vignettes.

Benvo Methods

Description

Benvo Methods
**Usage**

bef_names(x)

components(x)

component_lookup(x, term)

subject_has_sf(x)

bef_has_sf(x, term)

num_BEF(x)

## S3 method for class 'benvo'
head(x, ...)

## S3 method for class 'benvo'
tail(x, ...)

get_id(x)

has_subject_dt(x)

has_bef_dt(x, term)

is.benvo(x)

**Arguments**

x a benvo object
term bef_name string
... optional arguments

---

**create_CA_benvo**  
*Create California Benvo*

**Description**

This function exists primarily to save the hassle of having an sf object stored as an R data object, as it introduces non-ascii characters into the package. With this function, the appropriate benvo is returned.

**Usage**

create_CA_benvo()
Value

a benvo with the Los Angeles data converted to sf objects.

See Also

The building benvos vignette

drop_BEF (x)

Arguments

x benvo or base benvo

Value

benvo without the active bef data

drop_BEF (x)

Drop Built Environment Feature from Benvo

Description

Remove the active BEF data table and corresponding sub-bef data from the benvo

Usage

drop_BEF (x)

Arguments

x benvo or base benvo

Value

benvo without the active bef data

drop_BEF (x)

Small benvo for use in benvo examples and vignettes.

example_benvo

Small benvo for use in benvo examples and vignettes.

drop_BEF (x)

Description

Small benvo for use in benvo examples and vignettes.

Usage

FFbenvo

Format

A benvo with 1000 subjects and nearby simulated FFRs

FFR_subjects see FFR_subjects dataset

FFR_distances see FFR_distances dataset
FFR_distances  
Small dataset for use in benvo examples and vignettes.

Description
Small dataset for use in benvo examples and vignettes.

Usage
FFR_distances

Format
A data frame with 9501 rows and 2 columns

id  The subject unique identifier
Distance  The simulated distance between a hypothetical subject and fast food restaurant.

FFR_subjects  
Small dataset for use in benvo examples and vignettes.

Description
Small dataset for use in benvo examples and vignettes.

Usage
FFR_subjects

Format
A data frame with 1000 rows and 3 columns

id  The subject unique identifier
sex  The measurement unique identifier
BMI  The Built Environment Unique identifier
**HFS_distances_times**

*Small dataset for use in benvo examples and vignettes.*

**Description**

Small dataset for use in benvo examples and vignettes.

**Usage**

HFS_distances_times

**Format**

A data frame with 5709 rows and 3 columns

- id The subject unique identifier
- measurement The subject repeat measurement id
- Distance The simulated distance between a hypothetical subject and fast food restaurant.
- Time The simulated time between a hypothetical subject and fast food restaurant.

---

**HFS_subjects**

*Longitudinal Dataset for use in benvo examples and vignettes.*

**Description**

Longitudinal Dataset for use in benvo examples and vignettes.

**Usage**

HFS_subjects

**Format**

A data frame with 596 rows and 4 columns

- id The subject unique identifier
- measurement The subject repeat measurement id
- sex The measurement unique identifier
- BMI The Built Environment Unique identifier
- subj_effect subject specific intercept used in simulating BMI
- exposure The hypothetical Healthy Food Store exposure effect
**joinvo**

*Join BEF and subject data within a benvo*

**Description**

Join BEF and subject data within a benvo

**Usage**

```r
joinvo(x, term, component = "Distance", NA_to_zero = F)
```

## S3 method for class 'benvo'

joinvo(x, term, component = "Distance", NA_to_zero = F)

**Arguments**

- `x`: benvo object
- `term`: string of bef name to join on in sub_bef_data
- `component`: one of c("Distance","Time","Distance-Time") indicating which column(s) of the bef dataset should be returned
- `NA_to_zero`: replaces NA values with zeros - potentially useful when constructing design matrices

**Details**

Joins the subject dataframe within a benvo to the supplied BEF dataframe keeping the selected component

**Methods (by class)**

- benvo: method

---

**LA_restaurants**

*Los Angeles Fast Food Restaurants*

**Description**

Los Angeles Fast Food Restaurants

**Usage**

```r
LA_FF
```
LA_schools

**Format**

A dataframe with 8101 rows and 4 columns

- **name**: Restaurant Name
- **osm_id**: openstreetmap unique id
- **Latitude**: Self Explanatory
- **Longitude**: Self Explanatory

**Details**

data downloaded from the openstreetmap overpass api classified as "amenity:fast_food".

---

<table>
<thead>
<tr>
<th>LA_schools</th>
<th>California Public Schools Fitnessgram Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

California Public Schools Fitnessgram Data

**Usage**

LA_schools

**Format**

A dataframe with 308 rows and 8 columns

- **Perc5c**: Proportion of Obese 5th Graders
- **NoStud5**: Number of 5th Graders in the class
- **Charter**: Factor variable indicating whether or not school is a charter school or not
- **cdscode**: School identifier
- **City**: Self Explanatory
- **County**: Self Explanatory
- **Latitude**: Self Explanatory
- **Longitude**: Self Explanatory

**Details**

data downloaded from the CA department of education website, subset to include just those schools in Los Angeles.
longitudinal_design

Longitudinal design dataframe

Description
For use with glmer type formulas/models

Usage
longitudinal_design(x, formula, ...)

Arguments
x benvo object
formula similar to glmer.
... other arguments passed to the model frame

Functions
• longitudinal_design: method

longitudinal_HFS
Small benvo for use in benvo longitudinal examples and vignettes.

Description
Small benvo for use in benvo longitudinal examples and vignettes.

Usage
longitudinal_HFS

Format
A benvo with 1000 subjects and nearby simulated FFRs
HFS_subjects see HFS_subjects dataset
HFS_distances see HFS_distances dataset

Details
A hypothetical example showing how exposure to Healthy Food Stores (HFS) over time may decrease BMI
### plot.benvo

**Benvo plots**

#### Description

Variety of plotting functions for benvo objects

#### Usage

```r
## S3 method for class 'benvo'
plot(x, plotfun = "pointrange", ...)
```

#### Arguments

- `x`: benvo object
- `plotfun`: one of c("pointrange","map")
- `...`: extra arguments for plotfun

---

### plot_map

**Spatial Plot of benvo**

#### Description

Provides a plot of benvo subjects and (one) BEF's locations

#### Usage

```r
plot_map(x, term = NULL)
```

#### Arguments

- `x`: benvo object
- `term`: BEF term
plot_pointrange  

**Plot Pointrange**

**Description**

Plot Pointrange

**Usage**

```r
plot_pointrange(x, term = NULL, component = NULL, p = 0.95)
```

**Arguments**

- `x` benvo object
- `term` name of BEF to plot. If NULL plots the first component listed in the Benvo.
- `component` one of c("Distance","Time") indicating which measure to use. Defaults to Distance if both measures are available, otherwise uses the only option.
- `p` The probability of distances/times that should be included in interval

plot_timeline  

**Temporal Plot of benvo**

**Description**

Provides a plot of benvo subjects temporal exposure over time.

**Usage**

```r
plot_timeline(x, ...)
```

**Arguments**

- `x` benvo object
- `...` currently ignored
print.benvo

### S3 method for class 'benvo'

```r
print(x, ...) # benvo object
```

<table>
<thead>
<tr>
<th>Arguments</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>x</code></td>
</tr>
<tr>
<td><code>...</code></td>
</tr>
</tbody>
</table>

#### Description

When exposure time and lag exposure time need to be calculated the measurement date, and start/stop date columns can be provided to the `benvo` and `base_benvo` functions as optional arguments. Note that these columns will be converted to `Date` objects if they’re not already.

#### Usage

```r
set_datetime_cols(
    measurement_date = NULL, # column string for the date at which a subject was measured
    start_date_col = NULL,   # column string for the date at which a subject/bef moved to their corresponding location
    stop_date_col = NULL     # column string for the date at which a subject/bef stopped having exposure at the corresponding location.
)
```
### S3 method for class 'benvo'

```r
summary(object, ...)  
```

#### Arguments

- `object` - a benvo object
- `...` - ignored
Index

* datasets
  - example_benvo, 7
  - FFR_distances, 8
  - FFR_subjects, 8
  - HFS_distances_times, 9
  - HFS_subjects, 9
  - LA_restaurants, 10
  - LA_schools, 11
  - longitudinal_HFS, 12

activate, 2, 2
active (activate), 2
add_BEF, 3
aggrenvo, 3

base_benvo, 4
bef_has_sf (benvo-methods), 5
bef_names (benvo-methods), 5
benvo, 5
benvo-methods, 5

component_lookup (benvo-methods), 5
components (benvo-methods), 5
create_CA_benvo, 6

Date, 4, 15
drop_BEF, 7

eexample_benvo, 7

FFbenvo (example_benvo), 7
FFR_distances, 8
FFR_subjects, 8

get_id (benvo-methods), 5
glmer, 12

has_bef_dt (benvo-methods), 5
has_subject_dt (benvo-methods), 5
head (benvo-methods), 5
HFS_distances_times, 9

HFS_subjects, 9
is.benvo (benvo-methods), 5
joinvo, 10

LA_FF (LA_restaurants), 10
LA_restaurants, 10
LA_schools, 11
longitudinal_design, 12
longitudinal_HFS, 12

num_BEF (benvo-methods), 5
plot.benvo, 13
plot_map, 13
plot_pointrange, 14
plot_timeline, 14
print.benvo, 15

rbenvo (rbenvo-package), 2
rbenvo-package, 2

set_datetime_cols, 4, 5, 15
sf, 4
st_distance, 3
subject_has_sf (benvo-methods), 5
summary.benvo, 16
tail (benvo-methods), 5