Package `brolgar`

August 25, 2021

Title  Browse Over Longitudinal Data Graphically and Analytically in R

Version  0.1.2

Description  Provides a framework of tools to summarise, visualise, and explore longitudinal data. It builds upon the tidy time series data frames used in the 'tsibble' package, and is designed to integrate within the 'tidyverse', and 'tidyverts' (for time series) ecosystems. The methods implemented include calculating features for understanding longitudinal data, including calculating summary statistics such as quantiles, medians, and numeric ranges, sampling individual series, identifying individual series representative of a group, and extending the facet system in 'ggplot2' to facilitate exploration of samples of data. These methods are fully described in the paper `"brolgar: An R package to Browse Over Longitudinal Data Graphically and Analytically in R", Nicholas Tierney, Dianne Cook, Tania Prvan (2020) <arXiv:2012.01619>.

License  MIT + file LICENSE

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BugReports  https://github.com/njtierney/brolgar/issues

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R topics documented:

  add_n_obs ......................................................... 3
  brolgar .......................................................... 3
  brolgar-features ................................................. 4
  b_min ............................................................. 5
  facet_sample ..................................................... 6
  facet_strata ..................................................... 8
  heights ........................................................... 9
  index_summary ................................................... 11
  keys_near ......................................................... 12
  keys_near.data.frame ........................................... 12
  keys_near.tbl_ts ................................................. 13
  key_slope ........................................................ 14
  l_funs ........................................................... 15
  monotonic ......................................................... 15
  nearests ........................................................ 17
  near_between ..................................................... 18
  near_middle ..................................................... 20
  near_quantile ................................................... 20
  n_obs ............................................................ 21
  pisa ............................................................. 22
  sample-n-frac-keys .............................................. 24
  stratify_keys .................................................. 25
  wages ............................................................ 26

Index  28
add_n_obs

Add the number of observations for each key in a tsibble

Description

Here, we are not counting the number of rows in the dataset, but rather we are counting the number observations for each keys in the data.

Usage

add_n_obs(.data, ...)

Arguments

.data tsibble
...
extra arguments

Value

tsibble with n_obs, the number of observations per key added.

Examples

library(dplyr)
# you can explore the data to see those cases that have exactly two observations:
heights %>%
  add_n_obs() %>%
  filter(n_obs == 2)

brolgar

brolgar

Description

brolgar stands for: BRowse over Longitudinal data Graphically and Analytically in R.
brolgar-features

Calculate features of a tsibble object in conjunction with features()

Description

You can calculate a series of summary statistics (features) of a given variable for a dataset. For example, a three number summary, the minimum, median, and maximum, can be calculated for a given variable. This is designed to work with the features() function shown in the examples. Other available features in brolgar include:

- feat_three_num() - minimum, median, maximum
- feat_five_num() - minimum, q25, median, q75, maximum.
- feat_ranges() - min, max, range difference, interquartile range.
- feat_spread() - variance, standard deviation, median absolute distance, and interquartile range
- feat_monotonic() - is it always increasing, decreasing, or unvarying?
- feat_diff_summary() - the summary statistics of the differences amongst a value, including the five number summary, as well as the standard deviation and variance. Returns NA if there is only one observation, as we can’t take the difference of one observation, and a difference of 0 in these cases would be misleading.
- feat_brolgar() all features in brolgar.

Usage

feat_three_num(x, ...)
feat_five_num(x, ...)
feat_ranges(x, ...)
feat_spread(x, ...)
feat_monotonic(x, ...)
feat_brolgar(x, ...)
feat_diff_summary(x, ...)

Arguments

x
A vector to extract features from.

... Further arguments passed to other functions.
Examples

# You can use any of the features `feat_*` in conjunction with `features`
# like so:
heights %>%
  features(height_cm, # variable you want to explore
           feat_three_num) # the feature summarisation you want to perform

---

**b_min**

**Brolgar summaries (b_summaries)**

Description

Customised summaries of vectors with appropriate defaults for longitudinal data. The functions are prefixed with `b_` to assist with autocomplete. It uses `na.rm = TRUE` for all, and for calculations involving quantiles, `type = 8` and `names = FALSE`. Summaries include:

- **b_min**: The minimum
- **b_max**: The maximum
- **b_median**: The median
- **b_mean**: The mean
- **b_q25**: The 25th quantile
- **b_q75**: The 75th quantile
- **b_range**: The range
- **b_range_diff**: difference in range (max - min)
- **b_sd**: The standard deviation
- **b_var**: The variance
- **b_mad**: The mean absolute deviation
- **b_iqr**: The Inter-quartile range
- **b_diff_var**: The variance of diff()
- **b_diff_sd**: The standard deviation of diff()
- **b_diff_mean**: The mean of diff()
- **b_diff_median**: The median of diff()
- **b_diff_q25**: The q25 of diff()
- **b_diff_q75**: The q75 of diff()

Usage

```r
b_min(x, ...)
b_max(x, ...)
b_median(x, ...)
b_mean(x, ...)
b_q25(x, ...)
b_q75(x, ...)
b_range(x, ...)
b_range_diff(x, ...)
b_sd(x, ...)
b_var(x, ...)
b_mad(x, ...)
```
\begin{verbatim}
  b_iqr(x, ...)
  b_diff_var(x, ...)
  b_diff_sd(x, ...)
  b_diff_mean(x, ...)
  b_diff_median(x, ...)
  b_diff_q25(x, ...)
  b_diff_q75(x, ...)
  b_diff_max(x, ...)
  b_diff_min(x, ...)
  b_diff_iqr(x, ...)

Arguments
  x a vector
  ... other arguments to pass

Examples
  x <- c(1:5, NA, 5:1)
  min(x)
  b_min(x)
  max(x)
  b_max(x)
  median(x)
  b_median(x)
  mean(x)
  b_mean(x)
  range(x)
  b_range(x)
  var(x)
  b_var(x)
  sd(x)
  b_sd(x)
\end{verbatim}

\textit{facet_sample} Facet data into groups to facilitate exploration
Description

This function requires a tbl_ts object, which can be created with tsibble::as_tsibble(). Under the hood, facet_strata is powered by stratify_keys() and sample_n_keys().

Usage

```r
facet_sample(
  n_per_facet = 3,
  n_facets = 12,
  nrow = NULL,
  ncol = NULL,
  scales = "fixed",
  shrink = TRUE,
  strip.position = "top"
)
```

Arguments

- `n_per_facet`: Number of keys per facet you want to plot. Default is 3.
- `n_facets`: Number of facets to create. Default is 12
- `nrow`: Number of rows and columns.
- `ncol`: Number of rows and columns.
- `scales`: Should scales be fixed ("fixed", the default), free ("free"), or free in one dimension ("free_x", "free_y")?
- `shrink`: If TRUE, will shrink scales to fit output of statistics, not raw data. If FALSE, will be range of raw data before statistical summary.
- `strip.position`: By default, the labels are displayed on the top of the plot. Using strip.position it is possible to place the labels on either of the four sides by setting strip.position = c("top", "bottom", "left", "right")

Value

a ggplot object

Examples

```r
library(ggplot2)
ggplot(heights, aes(x = year, 
y = height_cm, 
group = country)) + 
geom_line() + 
facet_sample()
```

```r
ggplot(heights, 
aes(x = year, 
y = height_cm, 
group = country)) + 
```
facet_strata

Facet data into groups to facilitate exploration

Description

This function requires a tbl_ts object, which can be created with tsibble::as_tsibble(). Under the hood, facet_strata is powered by stratify_keys().

Usage

```r
facet_strata(
  n_strata = 12,
  along = NULL,
  fun = mean,
  nrow = NULL,
  ncol = NULL,
  scales = "fixed",
  shrink = TRUE,
  strip.position = "top"
)
```

Arguments

- `n_strata` number of groups to create
- `along` variable to stratify along. This groups by each key and then takes a summary statistic (by default, the mean). It then arranges by the mean value for each key and assigns the `n_strata` groups.
- `fun` summary function. Default is mean.
- `nrow` Number of rows and columns.
- `ncol` Number of rows and columns.
- `scales` Should scales be fixed ("fixed", the default), free ("free"), or free in one dimension ("free_x", "free_y")?
- `shrink` If TRUE, will shrink scales to fit output of statistics, not raw data. If FALSE, will be range of raw data before statistical summary.
- `strip.position` By default, the labels are displayed on the top of the plot. Using `strip.position` it is possible to place the labels on either of the four sides by setting `strip.position = c("top", "bottom", "left", "right")`

Value

a ggplot object
Examples

```r
library(ggplot2)

# Example 1
ggplot(heights,
      aes(x = year,
           y = height_cm,
           group = country)) +
  geom_line() +
  facet_strata()

# Example 2
ggplot(heights,
      aes(x = year,
           y = height_cm,
           group = country)) +
  geom_line() +
  facet_wrap(~continent)

# Example 3
ggplot(heights,
      aes(x = year,
           y = height_cm,
           group = country)) +
  geom_line() +
  facet_strata(along = year)

library(dplyr)

# Example 4
heights %>%
  key_slope(height_cm ~ year) %>%
  right_join(heights, ., by = "country") %>%
  ggplot(aes(x = year,
             y = height_cm)) +
  geom_line(aes(group = country)) +
  geom_smooth(method = "lm") +
  facet_strata(along = .slope_year)
```

---

**heights**

**World Height Data**

---

**Description**

Average male heights in 144 countries from 1810-1989, with a smaller number of countries from 1500-1800. Data has been filtered to only include countries with more than one observation.

**Usage**

heights
Format

An object of class tbl_ts (inherits from tbl_df, tbl, data.frame) with 1490 rows and 4 columns.

Details

heights is stored as a time series tsibble object. It contains the variables:

- country: The Country. This forms the identifying key.
- year: Year. This forms the time index.
- height_cm: Average male height in centimeters.

For more information, see the article: "Why are you tall while others are short? Agricultural production and other proximate determinants of global heights", Joerg Baten and Matthias Blum, European Review of Economic History 18 (2014), 144–165. Data available from https://datasets.iisg.amsterdam/dataset.xhtml?persistentId=hdl:10622/IAEKLA, accessed via the Clio Infra website.

Examples

# show the data
heights

# show the spaghetti plot (ugh!)
library(ggplot2)
ggplot(heights, 
  aes(x = year, 
       y = height_cm, 
       group = country)) + 
  geom_line()

# Explore all samples with `facet_strata()`
ggplot(heights, 
  aes(x = year, 
       y = height_cm, 
       group = country)) + 
  geom_line() + 
  facet_strata()

# Explore the heights over each continent
ggplot(heights, 
  aes(x = year, 
       y = height_cm, 
       group = country)) + 
  geom_line() + 
  facet_wrap(~continent)

# explore the five number summary of height_cm with `features`
heights %>%
  features(height_cm, feat_five_num)
Description

These functions check if the index is regular (\texttt{index\_regular()}), and summarise the index variable (\texttt{index\_summary()}). This can be useful to check your index variables.

Usage

\begin{verbatim}
index\_regular(.data, ...)
## S3 method for class 'tbl\_ts'
index\_regular(.data, ...)

## S3 method for class 'data.frame'
index\_regular(.data, index, ...)

index\_summary(.data, ...)
## S3 method for class 'tbl\_ts'
index\_summary(.data, ...)

## S3 method for class 'data.frame'
index\_summary(.data, index, ...)
\end{verbatim}

Arguments

\begin{itemize}
  \item \texttt{.data} data.frame or tsibble
  \item \texttt{...} extra arguments
  \item \texttt{index} the proposed index variable
\end{itemize}

Value

logical TRUE means it is regular, FALSE means not

Examples

\begin{verbatim}
# a tsibble
index\_regular(heights)

# some data frames
index\_regular(pisa, year)
index\_regular(airquality, Month)

# a tsibble
index\_summary(heights)
\end{verbatim}
# some data frames
index_summary(pisa, year)
index_summary(airquality, Month)
index_summary(airquality, Day)

keys_near(.data, ...)  
## Default S3 method:  
keys_near(.data, ...)

Arguments
- .data: tsibble
- ...: extra arguments to pass to `mutate_at` when performing the summary as given by `funs`.

Value
data.frame containing keys closest to a given statistic.

Examples
es:
keys_near(heights, height_cm)

keys_near.data.frame

Description
Return keys nearest to a given statistics or summary.

Usage
## S3 method for class 'data.frame'
keys_near(.data, key, var, top_n = 1, funs = l_five_num, ...)

Description
Return keys nearest to a given statistics or summary.
keys_near.tbl_ts

Arguments

- `.data` (data.frame)
  - key, which identifies unique observations.
- `var`
  - variable to summarise
- `top_n`
  - top number of closest observations to return - default is 1, which will also return ties.
- `funs`
  - named list of functions to summarise by. Default is a given list of the five number summary, `l_five_num`.
- `...`
  - extra arguments to pass to `mutate_at` when performing the summary as given by `funs`.

Examples

```r
heights %>%
  key_slope(height_cm ~ year) %>%
  keys_near(key = country, var = .slope_year)
# Specify your own list of summaries
l_ranges <- list(min = b_min,
                 range_diff = b_range_diff,
                 max = b_max,
                 iqr = b_iqr)
heights %>%
  key_slope(formula = height_cm ~ year) %>%
  keys_near(key = country, var = .slope_year, funs = l_ranges)
```

Description

Return keys nearest to a given statistics or summary.

Usage

```r
## S3 method for class 'tbl_ts'
keys_near(.data, var, top_n = 1, funs = l_five_num, stat_as_factor = TRUE, ...)
```

Arguments

- `.data` (tsibble)
- `var` (variable to summarise)
top_n  top number of closest observations to return - default is 1, which will also return ties.
funs  named list of functions to summarise by. Default is a given list of the five number summary, l_five_num.
stat_as_factor  coerce stat variable into a factor? Default is TRUE.
...  extra arguments to pass to mutate_at when performing the summary as given by funs.

Examples

# Return observations closest to the five number summary of height_cm
heights %>%
  keys_near(var = height_cm)

---

key_slope  Fit linear model for each key

Description

Using key_slope you can fit a linear model to each key in the tsibble. add_key_slope adds this slope information back to the data, and returns the full dimension tsibble.

Usage

key_slope(.data, formula, ...)

add_key_slope(.data, formula)

add_key_slope.default(.data, formula)

Arguments

.data  tsibble
formula  formula
...  extra arguments

Value

tibble with coefficient information

Examples

key_slope(heights, height_cm ~ year)
A named list of the five number summary

Description

Designed for use with the keys_near() function.

Usage

l_five_num

l_three_num

Format

An object of class list of length 5.
An object of class list of length 3.

Examples

# Specify your own list of summaries
l_ranges <- list(min = b_min,
                 range_diff = b_range_diff,
                 max = b_max,
                 iqr = b_iqr)

heights %>%
  key_slope(formula = height_cm ~ year) %>%
  keys_near(key = country,
            var = .slope_year,
            funs = l_ranges)

Are values monotonic? Always increasing, decreasing, or unvarying?

Description

These provides three families of functions to tell you if values are always increasing, decreasing, or unvarying, with the functions, increasing(), decreasing(), or unvarying(). Under the hood it uses diff to find differences, so if you like you can pass extra arguments to diff.
Usage

increasing(x, ...)

decreasing(x, ...)

unvarying(x, ...)

monotonic(x, ...)

Arguments

x numeric or integer

... extra arguments to pass to diff

Value

logical TRUE or FALSE

Examples

vec_inc <- c(1:10)
vec_dec <- c(10:1)
vec_ran <- c(sample(1:10))
vec_flat <- rep.int(1,10)

increasing(vec_inc)
increasing(vec_dec)
increasing(vec_ran)
increasing(vec_flat)

decreasing(vec_inc)
decreasing(vec_dec)
decreasing(vec_ran)
decreasing(vec_flat)

unvarying(vec_inc)
unvarying(vec_dec)
unvarying(vec_ran)
unvarying(vec_flat)

library(ggplot2)
library(gghighlight)
library(dplyr)

heights_mono <- heights %>%
  features(height_cm, feat_monotonic) %>%
  left_join(heights, by = "country")

ggplot(heights_mono,
       aes(x = year,
           y = height_cm,
           color = monotonic))
nearests

\begin{verbatim}
ggplot(heights_mono,
   aes(x = year,
       y = height_cm,
       group = country)) +
   geom_line() +
gghighlight(increase)

heights_mono %>%
filter(monotonic) %>%
ggplot(aes(x = year,
           y = height_cm,
           group = country)) +
   geom_line()

heights_mono %>%
filter(increase) %>%
ggplot(aes(x = year,
           y = height_cm,
           group = country)) +
   geom_line()
\end{verbatim}

---

**nearests**

Is x nearest to y?

---

**Description**

Returns TRUE if x is nearest to y. There are two implementations. `nearest_lgl()` returns a logical vector when an element of the first argument is nearest to an element of the second argument. `nearest_qt_lgl()` is similar to `nearest_lgl()`, but instead determines if an element of the first argument is nearest to some value of the given quantile probabilities. See example for more detail.

**Usage**

`nearest_lgl(x, y)`

`nearest_qt_lgl(y, ...)`

**Arguments**

- `x`: a numeric vector
- `y`: a numeric vector
- `...`: (if used) arguments to pass to `quantile()`.
Value

logical vector of length(y)

Examples

```r
x <- 1:10
y <- 5:14
z <- 16:25
a <- -1:-5
b <- -1

nearest_lgl(x, y)
nearest_lgl(y, x)

nearest_lgl(x, z)
nearest_lgl(z, x)

nearest_lgl(x, a)
nearest_lgl(a, x)

nearest_lgl(x, b)
nearest_lgl(b, x)

library(dplyr)
heights_near_min <- heights %>%
  filter(nearest_lgl(min(height_cm), height_cm))

heights_near_fivenum <- heights %>%
  filter(nearest_lgl(fivenum(height_cm), height_cm))

heights_near_qt_1 <- heights %>%
  filter(nearest_qt_lgl(height_cm, c(0.5)))

heights_near_qt_3 <- heights %>%
  filter(nearest_qt_lgl(height_cm, c(0.1, 0.5, 0.9)))
```

---

**near_between**

*Return* x percent to y percent of values

**Description**

Return x percent to y percent of values

**Usage**

```r
near_between(x, from, to)
```
Arguments

- **x** numeric vector from the lower bound of percentage to the upper bound of percentage

Value

logical vector

Examples

```r
x <- runif(20)

near_middle(x = x,
            middle = 0.5,
            within = 0.2)

library(dplyr)
heights %>% features(height_cm, list(min = min)) %>%
           filter(near_between(min, 0.1, 0.9))

near_quantile(x = x,
              probs = 0.5,
              tol = 0.01)

heights %>%
   features(height_cm, list(min = min)) %>%
   near_quantile(x = x,
                 probs = 0.5,
                 tol = 0.01)

heights %>%
   features(height_cm, list(min = min)) %>%
   near_quantile(x, c(0.25, 0.5, 0.75), 0.05)

heights %>%
   features(height_cm, 1_five_num) %>%
   mutate_at(vars(min:max),
             .funs = near_quantile,
             0.5,
             0.01) %>%
   filter(min)

heights %>%
   features(height_cm, list(min = min)) %>%
   mutate(min_near_q3 = near_quantile(min, c(0.25, 0.5, 0.75), 0.01)) %>%
   filter(min_near_q3)

heights %>%
   features(height_cm, list(min = min)) %>%
   filter(near_between(min, 0.1, 0.9))

heights %>%
   features(height_cm, list(min = min)) %>%
   filter(near_middle(min, 0.5, 0.1))
```
near_middle

Description

Return the middle x percent of values

Usage

near_middle(x, middle, within)

Arguments

x numeric vector
middle percentage you want to center around
within percentage around center

Value

logical vector

Examples

x <- runif(20)
near_middle(x = x,
    middle = 0.5,
    within = 0.2)

library(dplyr)
heights %>% features(height_cm, list(min = min)) %>%
    filter(near_middle(min, 0.5, 0.1))
	near_quantile

Which values are nearest to any given quantiles

Description

Which values are nearest to any given quantiles

Usage

near_quantile(x, probs, tol = 0.01)
n_obs

Arguments

- **x**  
  vector

- **probs**  
  quantiles to calculate

- **tol**  
  tolerance in terms of x that you will accept near to the quantile. Default is 0.01.

Value

logical vector of TRUE/FALSE if number is close to a quantile

Examples

```r
x <- runif(20)
near_quantile(x, 0.5, 0.05)
near_quantile(x, c(0.25, 0.5, 0.75), 0.05)
```

```r
library(dplyr)
heights %>%
  features(height_cm, list(min = min)) %>%
  mutate(min_near_median = near_quantile(min, 0.5, 0.01)) %>%
  filter(min_near_median)
heights %>%
  features(height_cm, list(min = min)) %>%
  mutate(min_near_q3 = near_quantile(min, c(0.25, 0.5, 0.75), 0.01)) %>%
  filter(min_near_q3)
```

---

n_obs  

Return the number of observations

Description

Returns the number of observations of a vector or data.frame. It uses vctrs::vec_size() under the hood.

Usage

```r
n_obs(x, names = TRUE)
```

Arguments

- **x**  
  vector or data.frame

- **names**  
  logical; If TRUE the result is a named vector named "n_obs", else it is just the number of observations.

Value

number of observations
Note

You cannot use n_obs with features counting the key variable like so - features(heights, country, n_obs). Instead, use any other variable.

Examples

n_obs(iris)
n_obs(1:10)
add_n_obs(heights)
hights %>%
  features(height_cm, n_obs) # can be any variable except id, the key.

Description

A subset of PISA data, containing scores and other information from the triennial testing of 15 year olds around the globe. Original data available from https://www.oecd.org/pisa/data/. Data derived from https://github.com/kevinwang09/learningtower.

Usage

pisa

Format

A tibble of the following variables
- year the year of measurement
- country the three letter country code. This data contains Australia, New Zealand, and Indonesia. The full data from learningtower contains 99 countries.
- school_id The unique school identification number
- student_id The student identification number
- gender recorded gender - 1 female or 2 male or missing
- math Simulated score in mathematics
- read Simulated score in reading
- science Simulated score in science
- stu_wgt The final survey weight score for the student score

Understanding a bit more about the PISA data, the school_id and student_id are not unique across time. This means the longitudinal element is the country within a given year.

We can cast pisa as a tsibble, but we need to aggregate the data to each year and country. In doing so, it is important that we provide some summary statistics of each of the scores - we want to
include the mean, and minimum and maximum of the math, reading, and science scores, so that we do not lose the information of the individuals.

The example code below does this, first grouping by year and country, then calculating the weighted mean for math, reading, and science. This can be done using the student weight variable stu_wgt, to get the survey weighted mean. The minimum and maximum are then calculated.

**Examples**

```r
library(dplyr)
# Let's identify
#1. The **key**, the individual, who would have repeated measurements.
#2. The **index**, the time component.
#3. The **regularity** of the time interval (index).

# Here it looks like the key is the student_id, which is nested within school_id # and country,
# And the index is year, so we would write the following

as_tsibble(pisa,
    key = country,
    index = year)

# We can assess the regularity of the year like so:

index_regular(pisa, year)
index_summary(pisa, year)

# We can now convert this into a `tsibble`:

pisa_ts <- as_tsibble(pisa,
    key = country,
    index = year,
    regular = TRUE)

pisa_ts
pisa_ts_au_nz <- pisa_ts %>% filter(country %in% c("AUS", "NZL", "QAT"))

library(ggplot2)
ggplot(pisa_ts_au_nz,
    aes(x = year,
        y = math_mean,
        group = country,
        colour = country)) +
    geom_ribbon(aes(ymin = math_min,
                    ymax = math_max),
                fill = "grey70") +
    geom_line(size = 1) +
    lims(y = c(0, 1000)) +
```
sample-n-frac-keys

Sample a number or fraction of keys to explore

Description
Sample a number or fraction of keys to explore

Usage
sample_n_keys(.data, size)
sample_frac_keys(.data, size)

Arguments
.data tsibble object
size The number or fraction of observations, depending on the function used. In sample_n_keys, it is a number > 0, and in sample_frac_keys it is a fraction, between 0 and 1.

Value
tsibble with fewer observations of key

Examples
library(ggplot2)
sample_n_keys(heights,
  size = 10) %>%
ggplot(aes(x = year,
  y = height_cm,
  group = country)) +
  geom_line()
library(ggplot2)
sample_frac_keys(wages,
  0.1) %>%
ggplot(aes(x = xp,
  y = unemploy_rate,
  group = id)) +
  geom_line()
Stratify the keys into groups to facilitate exploration

Description
To look at as much of the raw data as possible, it can be helpful to stratify the data into groups for plotting. You can stratify the keys using the stratify_keys() function, which adds the column, .strata. This allows the user to create faceted plots showing a more of the raw data.

Usage
stratify_keys(.data, n_strata, along = NULL, fun = mean, ...)

Arguments
- .data: data.frame to explore
- n_strata: number of groups to create
- along: variable to stratify along. This groups by each key and then takes a summary statistic (by default, the mean). It then arranges by the mean value for each key and assigns the n_strata groups.
- fun: summary function. Default is mean.
- ...: extra arguments

Value
data.frame with column, .strata containing n_strata groups

Examples
library(ggplot2)
library(brolgar)

heights %>%
sample_frac_keys(size = 0.1) %>%
stratify_keys(10) %>%
ggplot(aes(x = height_cm,
         y = year,
         group = country)) +
geom_line() +
facet_wrap(~.strata)

# now facet along some feature
library(dplyr)
heights %>%
key_slope(height_cm ~ year) %>%
right_join(heights, ., by = "country") %>%
stratify_keys(n_strata = 12,
             along = .slope.year,
fun = median) %>%
ggplot(aes(x = year,
          y = height_cm,
          group = country)) +
  geom_line() +
  facet_wrap(~.strata)

heights %>%
  stratify_keys(n_strata = 12,
                along = height_cm) %>%
  ggplo(aes(x = year,
            y = height_cm,
            group = country)) +
  geom_line() +
  facet_wrap(~.strata)

---

**wages**

*Wages data from National Longitudinal Survey of Youth (NLSY)*

**Description**

This data contains measurements on hourly wages by years in the workforce, with education and race as covariates. The population measured was male high-school dropouts, aged between 14 and 17 years when first measured. wages is a time series tsibble. It comes from J. D. Singer and J. B. Willett. Applied Longitudinal Data Analysis. Oxford University Press, Oxford, UK, 2003. 

https://stats.idre.ucla.edu/stat/r/examples/alda/data/wages_pp.txt

**Usage**

wages

**Format**

A tsibble data frame with 6402 rows and 8 variables:

- **id** 1–888, for each subject. This forms the key of the data
- **ln_wages** natural log of wages, adjusted for inflation, to 1990 dollars.
- **xp** Experience - the length of time in the workforce (in years). This is treated as the time variable, with 0 for each subject starting on their first day at work. The number of time points and values of time points for each subject can differ. This forms the index of the data
- **ged** when/if a graduate equivalency diploma is obtained.
- **xp_since_ged** change in experience since getting a ged (if they get one)
- **black** categorical indicator of race = black.
- **hispanic** categorical indicator of race = hispanic.
- **high_grade** highest grade completed
- **unemploy_rate** unemployment rates in the local geographic region at each measurement time.
Examples

# show the data
wages
library(ggplot2)
# set seed so that the plots stay the same
set.seed(2019-7-15-1300)
# explore a sample of five individuals
wages %>%
sample_n_keys(size = 5) %>%
ggplot(aes(x = xp,
y = ln_wages,
group = id)) +
  geom_line()

# Explore many samples with `facet_sample()`
ggplot(wages,
aes(x = xp,
y = ln_wages,
group = id)) +
  geom_line() +
  facet_sample()

# explore the five number summary of ln_wages with `features`
wages %>%
  features(ln_wages, feat_five_num)
Index

* datasets
  heights, 9
  l_funs, 15
  pisa, 22
  wages, 26

add_key_slope (key_slope), 14
add_n_obs, 3

b_diff_iqr (b_min), 5
b_diff_max (b_min), 5
b_diff_mean (b_min), 5
b_diff_median (b_min), 5
b_diff_min (b_min), 5
b_diff_q25 (b_min), 5
b_diff_q75 (b_min), 5
b_diff_sd (b_min), 5
b_diff_var (b_min), 5
b_iqr (b_min), 5
b_mad (b_min), 5
b_max (b_min), 5
b_mean (b_min), 5
b_median (b_min), 5
b_min, 5
b_q25 (b_min), 5
b_q75 (b_min), 5
b_range (b_min), 5
b_range_diff (b_min), 5
b_sd (b_min), 5
b_summaries (b_min), 5
b_var (b_min), 5
brolgar, 3
brolgar-features, 4

features(), 4
feats_five_num (brolgar-features), 4
feats_five_num(), 4
feats_monotonic (brolgar-features), 4
feats_monotonic(), 4
feats_ranges (brolgar-features), 4
feats_ranges(), 4
feats_spread (brolgar-features), 4
feats_spread(), 4
feats_three_num (brolgar-features), 4
feats_three_num(), 4
increasing (monotonic), 15
index_regular (index_summary), 11
increasing (monotonic), 15
index_summary, 11

keys_near(), 15
keys_near.data.frame, 12
keys_near.tbl_ts, 13

l_five_num (l_funs), 15
l_funs, 15
l_three_num (l_funs), 15

monotonic, 15

n_obs, 21
near_between, 18
near_middle, 20
near_quantile, 20
nearest_lgl (nearests), 17
nearest_qt_lgl (nearests), 17

pisas, 22
sample-n-frac-keys. 24
sample_frac_keys (sample-n-frac-keys), 24
sample_n_keys (sample-n-frac-keys), 24
sample_n_keys(). 7
stratify_keys. 25
stratify_keys(). 7, 8

unvarying (monotonic). 15

wages. 26