Package ‘ActFrag’

February 11, 2020

Type Package

Title Activity Fragmentation Metrics Extracted from Minute Level Activity Data

Version 0.1.1

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Description Recent studies have shown that, on top of total daily active/sedentary volumes, the time accumulation strategies provide more sensitive information. This package provides functions to extract commonly used fragmentation metrics to quantify such time accumulation strategies based on minute level actigraphy-measured activity counts data.

License GPL-3

Imports accelerometry, dplyr, ineq, survival, stats, tidyr

Depends R (>= 3.5.0),

Suggests knitr, rmarkdown, testthat

Encoding UTF-8

LazyData TRUE

ByteCompile true

VignetteBuilder knitr

URL https://github.com/junruidi/ActFrag

BugReports https://github.com/junruidi/ActFrag/issues

RoxygenNote 7.0.2

NeedsCompilation no

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Repository CRAN

Date/Publication 2020-02-11 19:00:10 UTC
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example_activity_data  Activity/Wear Data from 50 Subjects from NHANES 2003 - 2006

Description
A list of two data.frames containing the counts and the weartime for 50 NHANES subjects

Usage

example_activity_data

Format
A list of two data.frames with 1442 columns, which are in the following order:

ID  identifier of the person.
Day  numeric sequence 1,2,... indicating the order of days within a subject.
MIN1-MIN1440 counts of activity of that specific minute.

fragmentation  Fragmentation Metrics

Description
Fragmentation methods to study the transition between two states, e.g. sedentary v.s. active.

Usage

fragmentation(  
  x,  
  w,  
  thresh,  
  bout.length = 1,  
  metrics = c("mean_bout", "TP", "Gini", "power", "hazard", "all")
)
**Arguments**

- `x`: integer vector of activity data.
- `w`: vector of wear flag data with same dimension as `x`.
- `thresh`: threshold to binarize the data.
- `bout.length`: minimum duration of defining an active bout; defaults to 1.
- `metrics`: What is the fragmentation metrics to extract. Can be "mean_bout", "TP", "Gini", "power", "hazard", or all the above metrics "all".

**Details**

Metrics include mean_bout (mean bout duration), TP (between states transition probability), Gini (gini index), power (alpha parameter for power law distribution) hazard (average hazard function)

**Value**

A list with elements

- `mean_r`: mean sedentary bout duration
- `mean_a`: mean active bout duration
- `SATP`: sedentary to active transition probability
- `ASTP`: active to sedentary transition probability
- `Gini_r`: Gini index for active bout
- `Gini_a`: Gini index for sedentary bout
- `h_r`: hazard function for sedentary bout
- `h_a`: hazard function for active bout
- `alpha_r`: power law parameter for sedentary bout
- `alpha_a`: power law parameter for active bout

**References**

Junrui Di, Andrew Leroux, Jacek Urbanek, Ravi Varadhan, Adam P. Spira, Jennifer Schrack, Vadim Zipunnikov. Patterns of sedentary and active time accumulation are associated with mortality in US adults: The NHANES study. bioRxiv 182337; doi: https://doi.org/10.1101/182337

**Examples**

```r
data(example_activity_data)
count1 = c(t(example_activity_data$count[1,-c(1,2)]))
wear1 = c(t(example_activity_data$wear[1,-c(1,2)]))
frag = fragmentation(x = count1, w = wear1, thresh = 100, bout.length = 1, metrics = "mean_bout")
```
Description

Fragmentation methods to study the transition between two states, e.g. sedentary v.s. active. This function is a whole dataset wrapper for fragmentation.

Usage

fragmentation_long(
  count.data, 
  weartime, 
  thresh, 
  bout.length = 1, 
  metrics = c("mean_bout", "TP", "Gini", "power", "hazard", "all"), 
  by = c("day", "subject")
)

Arguments

count.data data.frame of dimension n*1442 containing the 1440 minutes of activity data for all n subject days. The first two columns have to be ID and Day. ID can be either character or numeric. Day has to be numeric indicating the sequencey of days within each subject.

weartime data.frame with dimension of count.data. The first two columns have to be ID and Day. ID can be either character or numeric. Day has to be numeric indicating the sequencey of days within each subject.

thresh threshold to define the two states.

bout.length minimum duration of defining an active bout; defaults to 1.

metrics What is the fragmentation metrics to exract. Can be "mean_bout", "TP", "Gini", "power", "hazard", or all the above metrics "all".

by Determine whether fragmentation is calcualted by day or by subjects (i.e. ag- 

Details

Metrics include mean_bout (mean bout duration), TP (between states transition probability), Gini (gini index), power (alpha parameter for power law distribution) hazard (average hazard function)

Value

A dataframe with some of the following columns

ID identifier of the person

Day numeric vector indicating the sequence of days within each subject.
wear_flag

mean_r mean sedentary bout duration
mean_a mean active bout duration
SATP sedentary to active transition probability
ASTP active to sedentary transition probability
Gini_r Gini index for active bout
Gini_a Gini index for sedentary bout
h_r hazard function for sedentary bout
h_a hazard function for active bout
alpha_r power law parameter for sedentary bout
alpha_a power law parameter for active bout

Examples

data(example_activity_data)
count = example_activity_data$count
count = example_activity_data$wear
type_by_day = fragmentation_long(count.data = count,
wear = wear, thresh = 100, bout.length = 1,
metrics = "all", by = "day")
tp_by_subject = fragmentation_long(count.data = count,
wear = wear, thresh = 100, bout.length = 1,
metrics = "TP", by = "subject")

wear_flag

Create Wear/Nonwear Flags

Description

Determine during which time period, subject should wear the device. It is preferable that user provide their own wear/non wear flag which should has the same dimension as the activity data. This function provide wear/non wear flag based on time of day.

Usage

wear_flag(count.data, start = "05:00", end = "23:00")

Arguments

count.data data.frame of dimension n*1442 containing the 1440 minute activity data for all n subject days. The first two columns have to be ID and Day.
start start time, a string in the format of 24hr, e.g. "05:00"; defaults to "05:00".
end end time, a string in the format of 24hr, e.g. "23:00"; defaults to "23:00"
Details

Fragmentation metrics are usually defined when subject is awake. The weartime provide time periods on which those features should be extracted. This can be also used as indication of wake/sleep.

Value

A data.frame with same dimension and column name as the count.data, with 0/1 as the elements reprensting wear, nonwear respectively.

Examples

data(example_activity_data)
count = example_activity_data$count
weartime = wear_flag(count.data = count)
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