Package 'ActiSleep'

November 21, 2022

Type Package

Title Sleep Duration Estimate Algorithm

Version 0.2.1

Date 2022-11-17

Description Estimate sleep duration using a Pruned Dynamic
Programming (PDP) algorithm that quickly and efficiently identifies
changepoints. When applied to physical activity data it can identify
transitions from wakefulness to sleep and vice versa. Baek, Jonggyu, Banker,
Margaret, Jansen, Erica C., She, Xichen, Peterson, Karen E., Pitchford,
E. Andrew, Song, Peter X. K. (2021) ``An Efficient Segmentation Algorithm to
Estimate Sleep Duration from Actigraphy Data'' <doi:10.1007/s12561-021-09309-3>.

License GPL (>= 2)

Imports dplyr, stringr, lubridate, accelerometry, DBI, RSQLite,
lazyeval, methods, utils, tibble

Depends R (>= 3.5)

NeedsCompilation yes

Encoding UTF-8

RoxygenNote 7.2.1

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R **topics documented:**

.onAttach	*Announce Segmentor3IsBack has Loaded*

Description

Print out a statement to the console when Segmentor3IsBack is successfully loaded

Usage

```
.onAttach(lib, pkg)
```

Arguments

lib	FILLER TEXT
pkg	FILLER TEXT

Details

This code was written by Alice Cleynen, Guillem Rigaill, and Michel Koskas as part of the Segmentor3IsBack package, which is no longer in CRAN. It has been imported into the ActiSleep package to ensure this package's longevity.

AccelData *Accelerometry Data*

Description

A dataset containing accelerometry data for a single subject in 1-minute epochs, includes vector magnitude and other measurements

- date. time and date of single measurement
- axis1. x-axis movement
- axis2. y-axis movement
- axis3. z-axis movement
- steps. steps taken by subject
- lux. amount of light present, measured in lux
- inclineOff.
- inclineStanding.
- inclineSitting.
- inclineLying.
- VM. vector magnitude, calculated from x-, y-, z-axis measurements

Usage

```
data("AccelData")
```

Format

a data frame with 1351 rows and 11 variables

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aggregate_dat *Aggregate Accelerometer Data*

Description

Obtain table from raw accelerometer table in 1-min intervals

Usage

```
aggregate_dat(datain, cutnum = 1, unit = c("min", "sec"), tz = "GMT")
```

Arguments

datain	raw ActiGraph GT3X data
cutnum	quantity of unit to serve as interval, default is 1
unit	time unit to use
tz	timezone, default is GMT

Value

data frame of accelerometer data aggregated by intervals

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cal_mean_idx   *Calculate Mean Index*

Description

Calculate the mean index of a segment

Usage

```
cal_mean_idx(i, datain, idx_start, idx_end)
```

Arguments

i	segment index
datain	activity data, must be a data frame
idx_start	array of segment start indices
idx_end	array of segment end indices

Value

mean value of segment indices

ChangeTimeVar   *Reformat Time Variable*

Description

Reformat the time variable to match analysis-ready format

Usage

```
ChangeTimeVar(datain, col_idx, format = "%Y-%m-%d %H:%M:%S")
```

Arguments

datain	input dataset, must be a data frame
col_idx	index of column to convert to date object
format	format of input date data, default is YYYY-MM-DD HH:MM:SS

Value

data frame with formatted time values

Examples

```
data("SleepDiary1Week")

ChangeTimeVar(
SleepDiary1Week,
col_idx = c(5:18),
format = "%Y-%m-%d %H:%M:%S")
```

GetDiary_subj   *Diary In/Out-bed Times*

Description

Obtain table of in-bed and out-bed times from sleep diary data

Usage

```
GetDiary_subj(datain, subj_idx, idx_bed, idx_wake, tz = "GMT")
```

Arguments

`datain`	input dataset, must be a data frame
`subj_idx`	index indicating subject
`idx_bed`	array specifying indices for in-bed time data
`idx_wake`	array specifying indices for out-bed time data
`tz`	timezone, default is GMT

Value

data frame with in-bed and out-bed times

Examples

```
data("SleepDiary1Week")

SleepDiary1Week <-
ChangeTimeVar(SleepDiary1Week, c(5:18), format = "%m/%d/%Y %H:%M")

colIdx_diary_bed <- c(1:7) * 2 - 2 + 5
colIdx_diary_wake <- c(1:7) * 2 - 1 + 5

GetDiary_subj(
SleepDiary1Week,
1,
colIdx_diary_bed,
colIdx_diary_wake,
tz = "GMT")
```

```
GetEstSleepInterval_subj
```
                                Estimated sleep interval

Description

Obtain in-bed and out-bed times from diary data

Usage

```
GetEstSleepInterval_subj(
  datain,
  bed = "22:00:00",
  wake = "8:00:00",
  tz = "GMT"
)
```

Arguments

datain	diary data
bed	default in-bed time
wake	default out-bed time
tz	timezone, default is GMT

Value

data frame containing in-bed and out-bed times based on sleep diary

---

read_agd   *Read in AGD filedata*

Description

Obtain a list of AGD filenames and data

Usage

```
read_agd(file, tz = "GMT", sec = 10)
```

Arguments

file	AGD data file
tz	timezone, default is GMT
sec	time interval used to set date

Value

list of AGD filenames and data

SearchSleepSeg   *Find specific sleep segment*

Description

Obtain specific sleep segment based on day, indices, etc.

Usage

```
SearchSleepSeg(
  date,
  Y,
  idx_start,
  idx_end,
  NoPA_cut = 0.7,
  sleep_mins = 30,
  SI_i,
  tz = "GMT"
)
```

Arguments

date	date of interest
Y	vector containing validated sleep counts
idx_start	start index of sleep segment
idx_end	end index of sleep segment
NoPA_cut	percent of 0 counts to define NoPA segments
sleep_mins	threshold number of minutes to define sleep segment
SI_i	estimated sleep intervals based on sleep diary data
tz	timezone, default is GMT

Value

list of validated sleep segments

Segmentor	*PDP-based Segmenting Algorithm*

Description

This code was written by Alice Cleynen, Guillem Rigaill, and Michel Koskas as part of the Segmentor3IsBack package, which is no longer in CRAN. It has been imported into the ActiSleep package to ensure this package's longevity.

Usage

```
Segmentor(
  data = numeric(),
  model = 1,
  Kmax = 15,
  phi = numeric(),
  m = numeric(),
  keep = FALSE,
```

```
    bounds = c(0, 0),
    compress = TRUE
)
```

Arguments

`data`	FILLER TEXT
`model`	number 1-5 indicating which distribution model to use
`Kmax`	FILLER TEXT
`phi`	FILLER TEXT
`m`	FILLER TEXT
`keep`	FILLER TEXT
`bounds`	FILLER TEXT
`compress`	FILLER TEXT

Segmentor-class	*This code was written by Alice Cleynen, Guillem Rigaill, and Michel Koskas as part of the Segmentor3IsBack package, which is no longer in CRAN. It has been imported into the ActiSleep package to ensure this package's longevity.*

Description

This code was written by Alice Cleynen, Guillem Rigaill, and Michel Koskas as part of the Segmentor3IsBack package, which is no longer in CRAN. It has been imported into the ActiSleep package to ensure this package's longevity.

SleepDiary1Day	*Sleep Diary 1-Day Data*

Description

A small dataset containing sleep diary data for a single day and single subject

- bed. time at which the subject reported going to sleep on day 1
- wake. time at which the subject reported waking up on day 1

Usage

```
data("SleepDiary1Day")
```

Format

a data frame with 1 row and 2 variables

SleepDiary1Week	*Sleep Diary 1-Week Data*

Description

A small dataset containing sleep diary data for a single week and single subject

- FOLIOCC. unique subject id
- etapa.
- stage.
- start_day. first day of measurement
- time_bed1. time at which the subject reported going to sleep on day 1
- time_wake1. time at which the subject reported waking up on day 1
- time_bed2. time at which the subject reported going to sleep on day 2
- time_wake2. time at which the subject reported waking up on day 2
- time_bed3. time at which the subject reported going to sleep on day 3
- time_wake3. time at which the subject reported waking up on day 3
- time_bed4. time at which the subject reported going to sleep on day 4
- time_wake4. time at which the subject reported waking up on day 4
- time_bed5. time at which the subject reported going to sleep on day 5
- time_wake5. time at which the subject reported waking up on day 5
- time_bed6. time at which the subject reported going to sleep on day 6
- time_wake6. time at which the subject reported waking up on day 6
- time_bed7. time at which the subject reported going to sleep on day 7
- time_wake7. time at which the subject reported waking up on day 7

Usage

```
data("SleepDiary1Week")
```

Format

a data frame with 1 row and 18 variables

SleepEstEachDay   *Daily sleep estimate*

Description

Obtain sleep data from accelerometer data

Usage

```
SleepEstEachDay(
  datain,
  f = 1,
  id = NA,
  Y_name = "max_count",
  T = 0.4,
  nonwear_detect = FALSE,
  wear_mins = 120,
  S = 3,
  NoPA_cut = 0.7,
  sleep_mins = 20,
  wake_mins = 180,
  nap_mins = 20,
  UseDiary = FALSE,
  diary_data = c(),
  CommonBedTime = "22:00:00",
  CommonWakeTime = "8:00:00",
  tz = "GMT"
)
```

Arguments

datain	input accelerometry dataset, must be tibble, data frame, etc.
f	cost function indicator
id	subject id
Y_name	column name of the activity count data to be used in analysis, for example max count of x, y, z axes or vector magnitude
T	threshold percentile of activity level
nonwear_detect	flag indicating use of nonwear detection algorithm, default is FALSE
wear_mins	threshold number of minutes to define wear segment
S	number of segments per hour
NoPA_cut	percent of 0 counts to define NoPA segments
sleep_mins	threshold number of minutes to define sleep segment
wake_mins	threshold number of minutes to define wake segment
nap_mins	threshold number of minutes to define nap segment

UseDiary	flag indicating if diary data to be used, default is FALSE
diary_data	diary data, must be a data frame
CommonBedTime	in-bed time if no diary data, default is "22:00:00"
CommonWakeTime	out-bed time if no diary data, default is "8:00:00"
tz	timezone, default is GMT

Value

list containing a data frame of summary sleep data

Examples

```
data("AccelData")

AccelData <-
ChangeTimeVar(AccelData, col_idx = 1, format = "%m/%d/%Y %H:%M")

SleepEstEachDay(AccelData, Y_name = "VM")

data("AccelData")

AccelData <-
ChangeTimeVar(AccelData, col_idx = 1, format = "%m/%d/%Y %H:%M")

SleepEstEachDay(AccelData, Y_name = "VM", nonwear_detect = TRUE)

data("AccelData")
data("SleepDiary1Day")

SleepDiary1Day <-
ChangeTimeVar(
SleepDiary1Day,
col_idx = c(1,2),
format = "%m/%d/%Y %H:%M")

AccelData <-
ChangeTimeVar(AccelData, col_idx = 1, format = "%m/%d/%Y %H:%M")

SleepEstEachDay(
AccelData,
f = 2,
Y_name = "VM",
T = 0,
nonwear_detect = TRUE,
S = 2,
NoPA_cut = 0.45,
sleep_mins = 5,
UseDiary = TRUE,
diary_data = SleepDiary1Day,
)
```

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