

# Package ‘ActiSleep’

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**Type** Package

**Title** Sleep Duration Estimate Algorithm

**Version** 0.2.2

**Date** 2024-06-17

**Description** Provides sleep duration estimates using a Pruned Dynamic Programming (PDP) algorithm that efficiently identifies change-points. PDP applied to physical activity data 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](https://doi.org/10.1007/s12561-021-09309-3)>.

**License** GPL-3

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

**Depends** R (>= 3.5)

**NeedsCompilation** yes

**Encoding** UTF-8

**RoxygenNote** 7.3.1

**Author** Jonggyu Baek [aut],  
Margaret Banker [aut],  
Nathan Szeto [aut, cre],  
Alice Cleynen [aut],  
Guillem Rigail [aut],  
Michel Koskas [aut]

**Maintainer** Nathan Szeto <[nszeto@umich.edu](mailto:nszeto@umich.edu)>

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AccelData	<i>Accelerometry Data</i>
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## 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 a single measurement.
- axis1: X-axis movement.
- axis2: Y-axis movement.
- axis3: Z-axis movement.
- steps: Steps taken by the subject.
- lux: Amount of light present, measured in lux.
- inclineOff: Incline off.
- inclineStanding: Incline standing.
- inclineSitting: Incline sitting.
- inclineLying: Incline lying.
- VM: Vector magnitude, calculated from x-, y-, and z-axis measurements.

## Usage

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

## Format

A data frame with 1351 rows and 11 variables.

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aggregate_dat	<i>Aggregate Accelerometer Data</i>
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**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	<i>Calculate Mean Index</i>
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**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*

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**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**

dataframe 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**

dataframe 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

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read_agd	<i>Read in AGD filedata</i>
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**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

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SearchSleepSeg	<i>Find specific sleep segment</i>
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**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-class	<i>This code was written by Alice Cleynen, Guillem Rigaiill, 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.</i>
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**Description**

This code was written by Alice Cleynen, Guillem Rigaiill, 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.

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SleepDiary1Day	<i>Sleep Diary 1-Day Data</i>
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**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

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SleepDiary1Week	<i>Sleep Diary 1-Week Data</i>
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**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

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SleepEstEachDay	<i>Daily sleep estimate</i>
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**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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