Package 'accelmissing'

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Type Package

Title Missing Value Imputation for Accelerometer Data

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Description We present a statistical method for imputing missing values in accelerometer data. The methodology includes both parametric and semi-parametric multiple imputation under the zero-inflated Poisson lognormal model. It also offers several functions to preprocess accelerometer data before imputation. These include detecting wear and non-wear time, selecting valid days and subjects, and generating plots.

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`accelmissing-package` *Missing Value Imputation for Accelerometer Data*

Description

We present a statistical method for imputing missing values in accelerometer data. The methodology includes both parametric and semi-parametric multiple imputation under the zero-inflated Poisson lognormal model. It also offers several functions to preprocess accelerometer data before imputation. These include detecting wear and non-wear time, selecting valid days and subjects, and generating plots.

Details

Package:	accelmissing
Type:	Package
Version:	2.2
Date:	2025-05-30
License:	GPL (>=2)

Author(s)

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References

Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods and Medical Research.

See Also

`mice`, `pscl`

accel.impute *Missing Value Imputation for Accelerometer Data*

Description

This function imputes the missing count values generated by the accelerometer. The imputation is performed during the user-defined daytime (9am-9pm as a default). At each minute, the function runs the multiple imputation with chained equations under the assumption of the zero-inflated poisson log-normal distribution.

Usage

```
accel.impute(PA, label, flag, demo=NA, method = "zipln.pmm",
time.range = c("09:00","20:59"), K = 3, D = 5, mark.missing = 0,
thresh = 10000, graph.diagnostic = TRUE, seed = 1234, m = 5,
maxit = 6, demo.include = FALSE)
```

Arguments

PA	an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (T=1440).
label	an N by 2 matrix including the labels corresponding to PA matrix. The first column, label[,1], includes the person id, and the second column, label[,2], includes the day label of 1 to 7, indicating Sunday to Saturday.
flag	an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from create.flag().
demo	an n by p dataframe where n is the total number of subject. The first column must include the unique person id, which equals to unique(label[,1]). From the second column to p-th column, one may include the demographic variables of intrest, for example, age, sex, body mass index, and race. These variables will be used as covariates in the imputation model. Missing values in demo matrix leads to an error message. The default is demo=NA.
method	Either "zipln" or "zipln.pmm." The former conducts the parametric imputation assumming the zero-inflated Poisson Log-normal (zipln) distribution. The latter conducts the semiparametric impuation with the predictive mean matching (pmm) under the zipln assumption.
time.range	Define the time range for imputation. Default is 9am-9pm, coded by time.range = c("09:00", "20:59"). Missing values outside of this range is imputed by zero assuming the extended sleep or inactivity.
K	The number of the lag and lead variables. K=3 is default.
D	The number of donors when method="zipln.pmm". D=5 is default.
mark.missing	If mark.missing = 0(default), the nonwearing time is marked by 0 while the wearing time is marked by 1 in flag matrix. If mark.missing = 1, it is the opposite.

thresh	The upper bound of count values. thresh=10000 is default.
graph.diagnostic	If TRUE, the scatter plot with the observed vs. the imputed will be shown during the imputation process.
seed	A seed number for random process. seed=1234 is default.
m	The number of imputation datasets. m=5 is default.
maxit	The number of maximum iteration at a fixed time point. maxit=6 is default.
demo.include	To use demographic variables for imputation, demo.include = TRUE. FALSE is default.

Value

listimp	List with m datasets with imputations. The dimension of each dataset, dim(listimp[[1]]), is the same as dim(PA).

Note

seed, m, maxit are the input arguments in mice function.

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.
[2] van Buuren S, Groothuis-Oudshoorn K (2011). mice: Multivariate imputations by chained equations in R. Journal of Statistical Software.
[3] Jackman S (2014). pscl: Classes and Methods for R Developed in the Political Science Computational Laboratory. Stanford University. R package version 1.4.6.

Examples

```
#####################################################
# A full example from data filtering to imputation
#####################################################
data(acceldata)    # read data
ls(acceldata)      # This is a list with four matrix objects, PA, label, flag, and demo
d = acceldata

## missing rate
missing.rate(label=d$label, flag=d$flag)$total  # 32 percent

# create missing flag with 60 min criterion
flag60 = create.flag(PA=d$PA, window=60)

## missing rate with flag60
mr = missing.rate(label=d$label, flag=flag60)
```

```
mr$total  #28.1 percent

## missing proportion by days
mean(mr$table < 0.1)   # 45.8 percent

# wearing proportion over time
wear.time.plot(PA=d$PA, label=d$label, flag=flag60)

# data filtering for valid days
valid.days.out = valid.days(PA=d$PA, label=d$label, flag=flag60, wear.hr=8)
ls(valid.days.out)   # list with three matrix objects

# data filtering for valid subjects
x1 = list(PA=d$PA, label=d$label, flag=flag60) # original
x2 = valid.days.out   # output of valid.days()
valid.sub.out = valid.subjects(data1=x1, data2=x2, valid.days=3)
length(unique(valid.sub.out$label[,1]))   # 184 persons
ls(valid.sub.out)

## missing rate with the filtered data
missing.rate(valid.sub.out$label, valid.sub.out$flag)$total
# 20.1 percent

# demographic data for the filtered data
idv= unique(valid.sub.out$label[,1])
matchid = match(idv, d$demo[,1])
demo1 = d$demo[matchid, ]

# save the data before imputation
acceldata2 = list(PA=valid.sub.out$PA, label=valid.sub.out$label, flag=valid.sub.out$flag,
demo=demo1)
# save(acceldata2, file="acceldata2.RData")

################################
# prepare the imputation
library(mice); library(pscl)
data(acceldata2) # load prepared data in this package
# load("acceldata2.RData") # to use the data you saved in previous step.
data = acceldata2

# imputation: test only 10 minutes with semiparametic method
# accelimp = accel.impute(PA=data$PA, label=data$label, flag=data$flag,
# demo=data$demo, time.range=c("10:51","11:00"), method="zipln.pmm", D=5)

# imputation: test only 10 minutes with parametic method
# accelimp = accel.impute(PA=data$PA, label=data$label, flag=data$flag,
# demo=data$demo, time.range=c("10:51","11:00"), method="zipln")

# plot 7 days before imputation
accel.plot.7days(PA=data$PA[1:7, ], label=data$label[1:7, ], flag=data$flag[1:7, ],
 time.range=c("09:00", "20:59"), save.plot=FALSE)

# plot 7 days after imputation
```

```
data(accelimp) # load prepared data in this package, or use the data you created above.
accel.plot.7days(PA=accelimp[[1]][1:7, ], label=data$label[1:7, ], flag=data$flag[1:7, ],
time.range=c("09:00", "20:59"),  save.plot=FALSE)
```

`accel.plot.7days` *Daily Activity Plot*

Description

Displays an individual's physical activity pattern of a day during one week.

Usage

```
accel.plot.7days(PA, label, flag, time.range = c("00:00", "23:59"),
mark.missing = 0, axis.time = TRUE, save.plot = FALSE,
directory.plot = getwd() )
```

Arguments

`PA`	an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (T=1440).
`label`	an N by 2 matrix including the labels corresponding to `PA` matrix. The first column, `label[,1]`, includes the person id, and the second column, `label[,2]`, includes the day label of 1 to 7, indicating Sunday to Saturday.
`flag`	an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from `create.flag()`.
`time.range`	Define the time range for display. Default is midnight to midnight, which is coded by `time.range = c("00:00", "23:59")`.
`save.plot`	If `TRUE`, pdf files are saved in your current directory or designated directory. Default is `FALSE`.
`mark.missing`	If `mark.missing = 0` (default), the nonwearing time is marked by 0 while the wearing time is marked by 1 in flag matrix. If `mark.missing = 1`, it is the opposite.
`axis.time`	If TRUE, the x-axis displays the clock times, 8:00, 8:01, 8:02, etc. If FALSE, displays the time index by minute, 481, 482, 483, etc.
`directory.plot`	Directory to save the plots when save.plot=TRUE. If no input, plots are saved to your current directory.

Value

Plot of activity counts with smoothing curve and missing flag.

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.
[2] Ramsay, J. O., Wickham, H., Graves, S., and Hooker, G. (2014). fda: Functional Data Analysis. R package version 2.4.3.

Examples

```
data(acceldata2) ; data=acceldata2 # read data before imputation
data(accelimp) # read data after imputation

# plot 7 days before imputation
accel.plot.7days(PA=data$PA[1:7, ], label=data$label[1:7, ], flag=data$flag[1:7, ],
 time.range=c("09:00", "20:59"), save.plot=FALSE)

# plot 7 days after imputation
accel.plot.7days(PA=accelimp[[1]][1:7, ], label=data$label[1:7, ], flag=data$flag[1:7, ],
time.range=c("09:00", "20:59"), save.plot=FALSE)

# save the plot
# setwd("yourfolder")  #--- set the directory to save plot when save.plot=TRUE
# accel.plot.7days(PA=accelimp[[1]], label=data$label, flag=data$flag,
# time.range=c("09:00", "20:59"),  save.plot=TRUE)
```

`acceldata` *Accelerometer Data Example*

Description

Data example from 2003-4 National Health and Nutrition Examination Survey dataset. The dataset is available at the website: http://wwwn.cdc.gov/nchs/nhanes/search/nhanes03_04.aspx. This data example only includes 218 individuals, which gives 1526 daily profiles, from 7176 total participants in the physical activity survey.

Usage

```
data(acceldata)
```

Format

List with four matrix objects:

- `acceldata$PA`: matrix
- `acceldata$label`: matrix
- `acceldata$flag`: matrix
- `acceldata$demo`: matrix

Details

PA an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (N=1526, T=1440).

label an N by 2 matrix including the labels corresponding to `PA` matrix. The first column, `label[,1]`, includes the person id, and the second column, `label[,2]`, includes the day label of 1 to 7, indicating Sunday to Saturday.

flag an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from `create.flag()`.

demo an n by p matrix (or dataframe) where n is the total number of subject (n=218). The first column must include the unique person id, which equals to `unique(label[,1])`. From the second column to p-th column, one may include the demographic variables of intrest, for example, age, sex, body mass index, and race. These variables will be used as covariates in the imputation model.

Note

This data format is strongly recommended for proceeding the missing value imputation from this package.

Source

http://wwwn.cdc.gov/nchs/nhanes/search/nhanes03_04.aspx

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.

Examples

```
data(acceldata)
ls(acceldata)
dim(acceldata$PA)
```

---

acceldata2 *Accelerometer Data Example 2*

Description

Data example from 2003-4 National Health and Nutrition Examination Survey dataset. This data example includes 184 individuals to give 1288 daily profiles. This only includes valid subjects that have at least three complete days, a subset of `acceldata` as a result of `valid.subjects()`.

Usage

```
data(acceldata2)
```

Format

List with four matrix objects:

- `acceldata2$PA`: matrix
- `acceldata2$label`: matrix
- `acceldata2$flag`: matrix
- `acceldata2$demo`: matrix

Details

PA an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (N=1288, T=1440).

label an N by 2 matrix including the labels corresponding to `PA` matrix. The first column, `label[,1]`, includes the person id, and the second column, `label[,2]`, includes the day label of 1 to 7, indicating Sunday to Saturday.

flag an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from `create.flag()`.

demo an n by p matrix (or dataframe) where n is the total number of subject (n=184). The first column must include the unique person id, which equals to `unique(label[,1])`. From the second column to p-th column, one may include the demographic variables of intrest, for example, age, sex, body mass index, and race. These variables will be used as covariates in the imputation model.

Source

http://wwwn.cdc.gov/nchs/nhanes/search/nhanes03_04.aspx

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.

See Also

`acceldata`, `valid.subjects`

Examples

```
data(acceldata2)
ls(acceldata2)
```

accelimp *Accelerometer Data Example with Imputations*

Description

Imputed Data example from 2003-4 National Health and Nutrition Examination Survey dataset. This data example includes 184 individuals to give 1288 daily profiles, as a result of `accel.impute()`.

Usage

```
data(accelimp)
```

Format

List with multiple matrix objects. `accelimp` includes a single dataset a result of `accel.impute(..., m=1, ...)`. You may produce multiple datasets by setting m=5 (default).

- `accelimp$imp1`: matrix
- `...`
- `accelimp$imp5`: matrix

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.

See Also

`accel.impute`

Examples

```
data(accelimp)
ls(accelimp)
```

create.flag *Create a Missing Flag Matrix*

Description

Defines the missing interval by detecting consecutive zeros for a while (20 minutes as a default), and create a flag matrix with the binary indicator for wearing vs. nonwearing time.

Usage

```
create.flag(PA, window = 20, mark.missing = 0)
```

Arguments

PA	an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (T=1440).
window	Minimum minutes of missing interval. The default is 20, which means that we define the missing interval when the exact zeros continues more than 20 minutes. 30 or 60 minutes are also commonly used.
mark.missing	If mark.missing = 0 (default), the nonwearing time is marked by 0 while the wearing time is marked by 1. If mark.missing = 1, it is the opposite.

Value

an N by T matrix with the elements of 0 or 1.

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods and Medical Research.
[2] Catellier DJ, Hannan PJ, Murray DM, Addy CL, Conway TL, Yang S, Rice JC (2005). Imputation of missing data when measuring physical activity by accelerometry. Medicine and Science in Sports and Exercise; 37 (11 Suppl).

See Also

missing.rate, wear.time.plot.

Examples

```
data(acceldata)  # read data
PA = acceldata$PA

# create a missing flag matrix with 60 minutes criterion
flag60 = create.flag(PA, window=60, mark.missing=0)

# create a missing flag matrix with 30 minutes criterion
flag30 = create.flag(PA, window=30, mark.missing=0)
```

`mice.impute.2l.zip.pmm`

Imputation by PMM under ZIP model.

Description

Imputes univariate missing data using the predictive mean matching (PMM) under the zero-inflated Poisson (ZIP) model.

Usage

```
mice.impute.2l.zip.pmm(y, ry, x, wy=NULL, type, K, D)
```

Arguments

`y`	Incomplete data vector of length n
`ry`	Vector of missing data pattern (`FALSE`=missing, `TRUE`=observed)
`x`	Matrix (n by p) of complete covariates
`wy`	defalut wy=NULL
`type`	If `type=1`, covariates are included in both logit and poisson models. If `type=2`, covariates are included only in poisson part. If `type=3`, covariates are included only in logit part.
`K`	The number of the lag and lead variables. `K=3` is default.
`D`	The number of donors to be drawn by predictive mean matching. `D=5` is default.

Value

A vector of length `nmis` with imputations

Note

This function is called when you set `accel.impute(..., method = "zip.pmm"`; internally, it then calls `mice(..., method="2l.zip.pmm",...)`.

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.
[2] van Buuren S, Groothuis-Oudshoorn K (2011). mice: Multivariate imputations by chained equations in R. Journal of Statistical Software.
[3] Kleinke K, Reinecke J (2013). Multiple imputation of incomplete zero-infated count data. Statistica Neerlandica.

See Also

mice, accel.impute

`mice.impute.2l.zipln` *Imputation by Bayesian ZIPLN model.*

Description

Imputes univariate missing data using Bayesian model under the zero-inflated Poisson Log-normal (ZIPLN) distribution.

Usage

```
mice.impute.2l.zipln(y, ry, x, wy=NULL, type, K, zs = zs)
```

Arguments

`y`	Incomplete data vector of length n
`ry`	Vector of missing data pattern (`FALSE`=missing, `TRUE`=observed)
`x`	Matrix (n by p) of complete covariates
`wy`	defalut wy=NULL
`type`	If `type=1`, covariates are included in both logit and poisson. If `type=2`, covariates are included only in poisson part. If `type=3`, covariates are included only in logit part.
`K`	The number of the lag and lead variables. `K=3` is default.
`zs`	Matrix (N by 2K+1) with the elements of log(yhat)-log(lambda) (See Lee and Gill, 2016)

Value

A vector of length `nmis` with imputations

Note

This function is called when you set `accel.impute(..., method = "zipln"`; interally, it then calls `mice(..., method="2l.zipln",...)`.

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.
[2] van Buuren S, Groothuis-Oudshoorn K (2011). mice: Multivariate imputations by chained equations in R. Journal of Statistical Software.
[3] Kleinke K, Reinecke J (2013). Multiple imputation of incomplete zero-infated count data. Statistica Neerlandica.

See Also

mice, accel.impute

`mice.impute.2l.zipln.pmm`

Imputation by PMM under ZIPLN model.

Description

Imputes univariate missing data using the predictive mean matching (PMM) under the zero-inflated Poisson Log-normal (ZIPLN) model.

Usage

```
mice.impute.2l.zipln.pmm(y, ry, x, wy=NULL, type, K, zs = zs, D)
```

Arguments

`y`	Incomplete data vector of length n
`ry`	Vector of missing data pattern (`FALSE`=missing, `TRUE`=observed)
`x`	Matrix (n by p) of complete covariates
`wy`	defalut wy=NULL
`type`	If `type=1`, covariates are included in both logit and poisson models. If `type=2`, covariates are included only in poisson part. If `type=3`, covariates are included only in logit part.
`K`	The number of the lag and lead variables. `K=3` is default.
`zs`	Matrix (N by 2K+1) with the elements of log(yhat)-log(lambda) (See Lee and Gill, 2016)
`D`	The number of donors to be drawn by predictive mean matching. `D=5` is default.

Value

A vector of length `nmis` with imputations

Note

This function is called when you set `accel.impute(..., method = "zipln.pmm"`; internally, it then calls `mice(..., method="2l.zipln.pmm",...)`.

Author(s)

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References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.
[2] van Buuren S, Groothuis-Oudshoorn K (2011). mice: Multivariate imputations by chained equations in R. Journal of Statistical Software.
[3] Kleinke K, Reinecke J (2013). Multiple imputation of incomplete zero-infated count data. Statistica Neerlandica.

See Also

mice, accel.impute

`missing.rate` *Computing Missing Rate*

Description

Computes the missing rate from acceleromater data.

Usage

```
missing.rate(label, flag, mark.missing = 0, time.range = c("09:00", "20:59"))
```

Arguments

`label`	an N by 2 matrix including the labels corresponding to `PA` matrix. The first column, `label[,1]`, includes the person id, and the second column, `label[,2]`, includes the day label of 1 to 7, indicating Sunday to Saturday.
`flag`	an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from `create.flag()`.
`mark.missing`	If `mark.missing = 0` (default), the nonwearing time is marked by 0 while the wearing time is marked by 1 in flag matrix. If `mark.missing = 1`, it is the opposite.
`time.range`	Define the time range during which the missing rate is computed. Default is 9am-9pm, coded by `time.range = c("09:00", "20:59")`.

Value

Numeric value of a missing rate between 0 to 1. The output is a list of

`total`	total missing rate during the time range
`table`	missing rate on days by subject
`table.wh`	wearing hours on days by subject
`label`	wearing hours by subject id and day, same information as table.wh but different data frame

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.

See Also

`create.flag`, `wear.time.plot`

Examples

```
## missing rate calculation: uncomment and run the code below
# data(acceldata); attach(acceldata)
# missing.rate(label, flag, mark.missing=0, time.range=c("09:00", "20:59"))$total

## create missing flag by 60 min criterion
# flag60 = create.flag(PA, window=60, mark.missing=0)
# mr = missing.rate(label, flag60, mark.missing=0, time.range=c("09:00", "20:59"))
# mr$total  #28.1 percent

## missing proportion by days
# mean(mr$table < 0.1)   # 45.8 percent
```

`valid.days` *Select the Valid Days*

Description

Selects the complete (valid) days that include sufficient wearing time.

Usage

```
valid.days(PA, label, flag, wear.hr = 10, time.range = c("09:00", "20:59"),
mark.missing = 0)
```

Arguments

PA	an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (T=1440).
label	an N by 2 matrix including the labels corresponding to PA matrix. The first column, label[,1], includes the person id, and the second column, label[,2], includes the day label of 1 to 7, indicating Sunday to Saturday.
flag	an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from create.flag().
wear.hr	Minimum wearing hours during the time range. If wear.hr=10 (default), select the valid days that include more than 10 hours of wearing.
time.range	Define the time range for the standard measurment day. Default is time.range = c("09:00", "20:59").
mark.missing	If mark.missing = 0 (default), the nonwearing time is marked by 0 while the wearing time is marked by 1 in flag matrix. If mark.missing = 1, it is the opposite.

Value

List with the updated PA, label and flag matrix objects.

Author(s)

Jung Ae Lee <jungaeleeb@gmail.com>

References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.

See Also

valid.subjects

Examples

```
data(acceldata); attach(acceldata) # read data

# filtering data for valid days
valid.days.out = valid.days(PA, label, flag, wear.hr=8,  time.range=c("09:00","20:59"))
ls(valid.days.out)
```

`valid.subjects` *Include or Exclude Subjects by Criteria*

Description

Select the subjects that have at least 3 complete days (or other criteria). By such criteria, some complete days are dropped if one has only one or two completed days, although some incomplete days are included if the subject has already three or more complete days.

Usage

```
valid.subjects(data1, data2, valid.days = 3, valid.week.days = NA,
valid.weekend.days = NA, mark.missing = 0, keep.7days=TRUE)
```

Arguments

`data1`	A list with three data matrix objects, `PA`, `label`, and `flag`, from the initial dataset before any filtering. Check these objects by typing `ls(data1)`.
`data2`	A list with three data matrix objects, `PA`, `label`, and `flag`, from the output of `valid.days()`. Check these objects by typing `ls(data2)`.
`valid.days`	Minimum number of complete days that the subject should have. `valid.days=3` is default.
`valid.week.days`	Minimum number of complete weekdays that the subject should have.
`valid.weekend.days`	Minimum number of complete weekend days that the subject should have.
`mark.missing`	If `mark.missing = 0` (default), the nonwearing time is marked by 0 while the wearing time is marked by 1 in flag matrix. If `mark.missing = 1`, it is the opposite.
`keep.7days`	If `keep.7days = TRUE` (default), include all 7 days for a valid subject although some days are incomplete. If `FALSE`, the dataset only includes valid days of valid subjects.

Value

List with the updated PA, label and flag matrix objects.

Author(s)

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References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.

See Also

valid.days

Examples

```
data(acceldata); attach(acceldata) # read original data

# filtering data for valid days
valid.days.out = valid.days(PA, label, flag, wear.hr=8,  time.range=c("09:00","20:59"))
ls(valid.days.out)

# filtering data for valid subjects
x1 = list(PA=PA, label=label, flag=flag) # original data
x2 = valid.days.out                                    # output of valid.days()
valid.sub.out = valid.subjects(data1=x1, data2=x2, valid.days=3)
ls(valid.sub.out)
```

---

wear.time.plot *Proportion of Wearing over Time*

Description

Displays the proportion of wearing over time among the daily profiles.

Usage

```
wear.time.plot(PA, label, flag, mark.missing = 0)
```

Arguments

PA	an N by T matrix including activity counts, where N is the total number of daily profiles, and T is the total minutes of a day (T=1440).
label	an N by 2 matrix including the labels corresponding to PA matrix. The first column, label[,1], includes the person id, and the second column, label[,2], includes the day label of 1 to 7, indicating Sunday to Saturday.
flag	an N by T matrix with the values of either 1 or 0 which indicating wearing or missing. This matrix can be created from create.flag().
mark.missing	If mark.missing = 0 (default), the nonwearing time is marked by 0 while the wearing time is marked by 1 in flag matrix. If mark.missing = 1, it is the opposite.

Value

Plot with the proportion of wearing in y-axis and the time index in x-axis, also displaying the standard measurement day.

Note

By looking at the plot, we may decide the standard measurement day, which is the time range that exhibits the sufficiently large portion of wearing (60 or 70 percent).

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References

[1] Lee JA, Gill J (2016). Missing value imputation for physical activity data measured by accelerometer. Statistical Methods in Medical Research.
[2] Catellier, D. J., Hannan, P. J., Murray, D. M., Addy, C. L., Conway, T. L., Yang, S., and Rice, J. C. (2005). Imputation of missing data when measuring physical activity by accelerometry. Medicine and Science in Sports and Exercise, 37(11 Suppl).

See Also

missing.rate

Examples

```
data(acceldata) # read data
ls(acceldata)     # list with four data matrix objects, PA, label, flag, and demo
attach(acceldata)

# plot the proportion of wearing over time
wear.time.plot(PA, label, flag)
```

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