

Package ‘swt’

July 3, 2025

Type Package

Title Swisstransplant R Package

Version 0.3

Description This R package provides tools for data analysis and visualization by Swisstransplant--the national organisation for organ donation and transplantation in Switzerland.

Imports ggplot2, grDevices, utils, hms, data.table, testit, segmented, lubridate

LazyData true

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Encoding UTF-8

RoxygenNote 7.3.2

Depends R (>= 3.5.0)

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date2num	<i>Convert date to Excel numeric days</i>
----------	---

Description

Convert POSIXct data type (date/time) to Excel days since origin.

Usage

```
date2num(dates)
```

Arguments

dates	character string in the form of YYYY-mm-dd
-------	--

Value

number of days

egfr_ckd_epi	<i>CKD-EPI Creatinine Equation (2021)</i>
--------------	---

Description

Calculates eGFR according to the 2021 formula.

Usage

```
egfr_ckd_epi(SCr, age, sex, units = "SI")
```

Arguments

SCr	serum creatinine in mg/dL (US) or umol/L (S)
age	age in years
sex	either "F" for female, or "M" for male
units	unit for SCr, either "SI" (umol/L; default) or "US" (mg/dL)

Details

See equation and references at <https://www.kidney.org/ckd-epi-creatinine-equation-2021>.

Value

eGFR in mL/min/1.73m2

egfr_schwartz	<i>Revised Schwartz Equation (2009)</i>
---------------	---

Description

Calculates eGFR for pediatric patients.

Usage

```
egfr_schwartz(SCr, height, units = "SI")
```

Arguments

SCr	serum creatinine in mg/dL (US) or umol/L (S)
height	height in cm
units	unit for SCr, either "SI" (umol/L; default) or "US" (mg/dL)

Details

See equation and examples at <https://www.mdcalc.com/calc/10008/revised-schwartz-equation-glomerular-filtration-rate-evidence>.

Value

eGFR in mL/min/1.73m2

exam.device	<i>EXAM device data</i>
-------------	-------------------------

Description

Example data form the LifePort kidney transporter.

Usage

```
exam.device
```

Format

A data frame with self explaining variable names:

SerialNumber serial number of the device

Type type note

SubType subtype note

UnitID name given to the device

FirmwareVersion firmware version

FileID file id

StartTime start date and time of machine

DataState data state, if it is complete

HasGaps whether data has haps

Runtime run time of the machine

StopTime time and date of machine stop

Filename file name#'

Source

<https://data.swisstransplant.org/>

exam.organ

EXAM organ data

Description

Example data form the LifePort kidney transporter.

Usage

exam.organ

Format

A data frame with self explaining variable names:

OrganID identifier entered into the machine

KidneySide left or right kidney

BloodType self explaining

CrossClampTime.Date self explaining

CrossClampTimezone self explaining

TotalIschemicTime self explaining

PerfusateLot self explaining

PerfusateExpirationDate self explaining

PerfusateUsed self explaining

Cannula self explaining

CannulaExpirationDate self explaining
CassetteLot. self explaining
CasetteExpirationDate self explaining
ID self explaining
DonorID self explaining

Source

<https://data.swisstransplant.org/>

exam.sumstats

EXAM summary statistics

Description

Example data form the LifePort kidney transporter.

Usage

exam.sumstats

Format

A data frame with self explaining variable names:

perfusion.dur perfusion duration in minutes
perfusion.dur.str perfusion duration in HH:MM:SS
systolicPressure.md self explaining
diastolicPressure.mean self explaining
flowRate.mean self explaining
organResistance.mean self explaining
organResistance.sd self explaining
organResistance.x1 self explaining
organResistance.y1 self explaining
organResistance.x2 self explaining
organResistance.y2 self explaining
organResistance.delta self explaining
organResistance.slope self explaining
iceContainerTemperature.mean self explaining
iceContainerTemperature.sd self explaining
iceContainerTemperature.minAbove self explaining
iceContainerTemperature.minAbove.str self explaining
infuseTemperature.mean self explaining
infuseTemperature.sd self explaining
infuseTemperature.start self explaining

infuseTemperature.minAbove self explaining
infuseTemperature.minAbove.str self explaining
D2temp self explaining
Ptemp self explaining
D2perf self explaining
Pperf self explaining

Source

<https://data.swisstransplant.org/>

exam.timeseries	<i>EXAM time series data</i>
-----------------	------------------------------

Description

Example data form the LifePort kidney transporter.

Usage

exam.timeseries

Format

A list of data frames with time series data:

SerialNumber serial number of the device

FlowRate flow rate ...

Source

<https://data.swisstransplant.org/>

fmt_hla	<i>Format HLA</i>
---------	-------------------

Description

Helper function to format strings for broads, e.g. A(10) becomes A10 and A becomes NA.

Usage

fmt_hla(v_char)

Arguments

v_char character vector

Value

formatted character vector

freq_perc	<i>Returns frequency count and percentage</i>
-----------	---

Description

Helper function for tidy formatting.

Usage

```
freq_perc(x, count.na = TRUE, d2 = 1)
```

Arguments

x	logical vector
count.na	count NAs in denominator
d2	number of digits

Value

character object

get_days_in_year	<i>Get the number of days in a year</i>
------------------	---

Description

Helper function useful in survival analysis to convert event times.

Usage

```
get_days_in_year()
```

Value

number of days

hla_mismatch	<i>Calculates HLA mismatches.</i>
--------------	-----------------------------------

Description

The function calculates HLA mismatches for SOAS data.

Usage

```
hla_mismatch(
  D.A1,
  D.A2,
  D.B1,
  D.B2,
  D.DR1,
  D.DR2,
  R.A1,
  R.A2,
  R.B1,
  R.B2,
  R.DR1,
  R.DR2
)
```

Arguments

D.A1	donor HLA Antigen on allele 1 locus A
D.A2	donor HLA Antigen on allele 2 locus A
D.B1	donor HLA Antigen on allele 1 locus B
D.B2	donor HLA Antigen on allele 2 locus B
D.DR1	donor HLA Antigen on allele 1 locus DR
D.DR2	donor HLA Antigen on allele 2 locus DR
R.A1	recipient HLA Antigen on allele 1 locus A
R.A2	recipient HLA Antigen on allele 2 locus A
R.B1	recipient HLA Antigen on allele 1 locus B
R.B2	recipient HLA Antigen on allele 2 locus B
R.DR1	recipient HLA Antigen on allele 1 locus DR
R.DR2	recipient HLA Antigen on allele 2 locus DR

Details

The serological nomenclature in SOAS as follows: L[p, q] with L is the locus A B or DR, p and q are the two alleles of the locus L, and the convention is $p \leq q$. The case $p \neq q$ is known as heterozygote, A[2, 25]. Homozygote, if $p = q$, such as in DR[11,11].

The HLA-matching process has to handle broad and splits. Two alleles p and r on the same locus L match if they are equal or if one of the allele is the broad of the other allele. Two different splits of same broad do not match. To calculate mismatch, we look up donor antigens and match them in the recipient. In other words, how many unknown antigens are transferred to the donor?

Value

data frame with mismatch information

hla_parse	<i>Parse HLA data</i>
-----------	-----------------------

Description

Parser to convert unstructured SOAS HLA information into structured data.

Usage

```
hla_parse(D_HLA, R_HLA)
```

Arguments

D_HLA	donor HLA antigens; character string from SOAS variable D HLA Ag.
R_HLA	recipient HLA antigens; character string from SOAS variable R HLA Ag.

Value

data frame with structured HLA information

kidmo_hr2rank	<i>KIDMO rank</i>
---------------	-------------------

Description

Conversion of hazard ratio into percentile rank.

Usage

```
kidmo_hr2rank(hr)
```

Arguments

hr	hazard ratio
----	--------------

Value

percentile

kidmo_model	<i>KIDMO prediction model</i>
-------------	-------------------------------

Description

Returns KIDMO prediction model fit.

Usage

```
kidmo_model()
```

Value

model fit

lifeport_d2	<i>D-squared for LifePort data</i>
-------------	------------------------------------

Description

Calculate Mahalanobis distance D-squared for LifePort temperature and perfusion data.

Usage

```
lifeport_d2(data, type)
```

Arguments

data	data frame or matrix with temperature or perfusion data
type	string, type of D-square either "temp" or "perf"

Value

vector with D-squared

lifeport_d2toRank	<i>Rank of D-squared for LifePort data</i>
-------------------	--

Description

Returns the percentile rank of the temperature or perfusion D-squared.

Usage

```
lifeport_d2toRank(d2, type)
```

Arguments

d2	D-squared
type	string, type of D-square either "temp" or "perf"

Value

percentile rank

lifeport_process	<i>Process LifePort data</i>
------------------	------------------------------

Description

Processing of LifPort data adds runtime, clock time, and smoothed time series.

Usage

```
lifeport_process(lpdat, window_size = 15)
```

Arguments

lpdat	list with data from lifeport_read()
window_size	rolling window size for filtering

Value

list with LifePort data

lifeport_read	<i>Read LifePort raw data</i>
---------------	-------------------------------

Description

Function to read LifePort binary as well as ASCII raw data files.

Usage

```
lifeport_read(file, format = "guess")
```

Arguments

file	data file with path
format	guess (default), binary or plaintext

Value

list with LifePort data

lifeport_sumstats	<i>Summary statistics for LifePort data</i>
-------------------	---

Description

Adds summary statistics for pressure, flow, resistance, and temperature time series.

Usage

```
lifeport_sumstats(lpdat, ice_threshold = 2.5, infuse_threshold = 10)
```

Arguments

lpdat	list with data from lifeport_process()
ice_threshold	threshold for ice temperature in degrees Celsius
infuse_threshold	threshold for infuse temperature in degrees Celsius

Value

list with LifePort data

mean_sd	Returns mean and SD as string
---------	-------------------------------

Description

Helper function for tidy formatting.

Usage

```
mean_sd(x, d1 = 1, d2 = 1)
```

Arguments

x	numeric vector
d1	number of digits
d2	number of digits

Value

character object

median_iqr	Returns median and interquartile range <i>IQR</i>
------------	---

Description

Helper function for tidy formatting.

Usage

```
median_iqr(x, d1 = 1, d2 = 1, d3 = 1, compact = FALSE)
```

Arguments

x	numeric vector
d1	number of digits
d2	number of digits
d3	number of digits
compact	use en dash instead of "from X to Y"

Value

character object

miss_perc	<i>Returns frequency count and percentage of missing data.</i>
-----------	--

Description

Helper function for tidy formatting.

Usage

```
miss_perc(x, d2 = 1)
```

Arguments

x	vector
d2	number of digits

Value

character object

nearest	<i>Nearest element</i>
---------	------------------------

Description

Nearest element in vector for a given set of values.

Usage

```
nearest(y, q)
```

Arguments

y	vector to be searched
q	vector of values of interest

Value

indices of the nearest elements in y for a set of values in q

num2date	<i>Convert Excel numeric days to date</i>
----------	---

Description

Convert Excel days since origin to POSIXct data type (date/time).

Usage

```
num2date(  
  days,  
  origin = "1899-12-30",  
  tz = "CET",  
  filter = TRUE,  
  pattern = "[0-9]{2}\\.[0-9]{2}\\.[0-9]{4}",  
  format = "%d.%m.%Y",  
  round = TRUE  
)
```

Arguments

- days days since origin as numeric or string
- origin origin, default in excel is 1899-12-30
- tz time zone to be forced upon
- filter apply fix for dates not recognized (default is TRUE)
- pattern the pattern to find dates not recognized
- format format to convert dates not recognized, e.g. %d.%m.%Y %H:%M:%OS
- round recommended when format has no time, only date information

Value

date of the type POSIXct

optn_kdri	<i>OPTN KDRI</i>
-----------	------------------

Description

Calculates the OPTN KDRI according to the 2024 version.

Usage

```
optn_kdri(  
  D_age,  
  D_height,  
  D_weight,  
  D_hypertension,  
  D_diabetes,  
  D_CVA,  
  D_SCr,  
  D_DCD,  
  scaling = 1.40436817065005  
)
```

Arguments

D_age	donor age in years
D_height	donor height in cm
D_weight	donor weight in kg
D_hypertension	donor hypertension
D_diabetes	donor diabetes
D_CVA	donor cause of death is cardiovascular accident
D_SCr	serum creatinine in mg/dL
D_DCD	donation after cardiac death
scaling	scaling factor that is published every year by the OPTN

Details

See details under "Learn about KDPI" at <https://optn.transplant.hrsa.gov/data/allocation-calculators/kdpi-calculator/>.

Value

KDRI hazard ratio

swt_colors	<i>SWT colors</i>
------------	-------------------

Description

Easy access to official SWT color scheme.

Usage

```
swt_colors()
```

Value

a SWT color object

Examples

```
mycolors = swt_colors()
mycolors$red.liver
```

swt_skeleton	<i>SWT skeleton</i>
--------------	---------------------

Description

This internal function enables a Swisstransplant Document in Quarto for RStudio projects.

Usage

```
swt_skeleton(path)
```

Arguments

path	project path
------	--------------

swt_style	<i>SWT theme for ggplot</i>
-----------	-----------------------------

Description

This function allows you to add the SWT theme to your ggplot graphics.

Usage

```
swt_style(
  title_size = 14,
  subtitle_size = 14,
  font_size = 10,
  grey_theme = FALSE,
  legend_position = "top"
)
```

Arguments

title_size	font size of the title
subtitle_size	font size of the subtitle
font_size	font font size of the legend, axis text, and axis titles
grey_theme	whether to use the grey theme instead (TRUE or FALSE)
legend_position	position of the legend (top, bottom, left or right)

Examples

```
library(ggplot2)
ggplot(mtcars, aes(wt, mpg)) +
  geom_point() +
  swt_style()
```

tidy_missing	<i>Tidy missing data summary</i>
--------------	----------------------------------

Description

Calculates missing data for each variable in data frame.

Usage

```
tidy_missing(df)
```

Arguments

df data frame with raw data

Value

data frame with summary data

tidy_pvalues	<i>Formats p-values.</i>
--------------	--------------------------

Description

Helper function for tidy formatting.

Usage

```
tidy_pvalues(x, compact = FALSE)
```

Arguments

x numerical vector with p-values
compact logical, no asterisks when TRUE

Value

formatted p-values as character vector

tidy_rmsfit	<i>Tidy rms model fit results</i>
-------------	-----------------------------------

Description

Shows tidy regression table with results as data frame.

Usage

```
tidy_rmsfit(fit, ...)
```

Arguments

fit	model fit from rms
...	optional arguments to summary of the rms fit object.

Value

formatted data.frame

uk_dcd_score	<i>UK DCD Risk Score</i>
--------------	--------------------------

Description

Calculates the UK DCD Risk Score that can range between 0 and 27.

Usage

```
uk_dcd_score(D_age, D_BMI, fWIT, CIT, R_age, R_MELD, retpx)
```

Arguments

D_age	donor age in years
D_BMI	donor BMI in kg/m^2
fWIT	functional warm ischemia time in minutes
CIT	cold ischemia time in hours
R_age	recipient age in years
R_MELD	recipient lab MELD score
retpx	whether the aim is a retransplant

Details

Reference: Schlegel A, Kalisvaart M, Scalera I, et al. The UK DCD Risk Score: A new proposal to define futility in donation-after-circulatory-death liver transplantation. J Hepatol. 2018;68(3):456-464. doi:10.1016/j.jhep.2017.10.034

Value

UK DCD Risk Score

`uk_kdri`*UK KDRI 2019*

Description

Calculates the UK KDRI version from 2019.

Usage

```
uk_kdri(D_age, D_height, D_hypertension, D_female, D_CMV, D_eGFR, D_days_hosp)
```

Arguments

<code>D_age</code>	donor age in years
<code>D_height</code>	donor height in cm
<code>D_hypertension</code>	donor hypertension
<code>D_female</code>	donor is female
<code>D_CMV</code>	donor cytomegalovirus positive
<code>D_eGFR</code>	estimated glomerular filtration rate (eGFR) in mL/min/1.73m ²
<code>D_days_hosp</code>	days in hospital

Details

Reference: Kim JJ, Curtis RMK, Reynolds B, et al. The UK kidney donor risk index poorly predicts long-term transplant survival in paediatric kidney transplant recipients. *Front Immunol.* 2023;14:1207145. doi:10.3389/fimmu.2023.1207145

Calculator at <https://www.glasgowtransplant.com/tools/ukkdri.html>.

Value

UK KDRI 2019 hazard ratio

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