Package ‘survCurve’

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**Title**  Plots Survival Curves Element by Element

**Version**  1.0

**Description**  Plots survival models from the 'survival' package. Additionally, it plots curves of multistate models from the 'mstate' package. Typically, a plot is drawn by the sequence `survplot()`, `confIntArea()`, `survCurve()` and `nrAtRisk()`. The separation of the plot in this 4 functions allows for great flexibility to make a custom plot for publication.

**Imports**  survival (>= 3.1)

**Depends**  R (>= 3.6)

**License**  MIT + file LICENSE

**Encoding**  UTF-8

**LazyData**  true

**RoxygenNote**  7.1.0

**Suggests**  knitr, mstate, rmarkdown

**VignetteBuilder**  knitr

**Collate**  'confIntArea.R' 'nrAtRisk.R' 'oneGroupOneEvent.R'

'    'survCurve.R' 'survPlot.R'

**NeedsCompilation**  no

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**R topics documented:**

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Add a confident interval area of a survival model to a plot.

Description
This function adds the confident interval area of one group (strata) of a survfit object to an existing plot. For competitive risk models, it draws the confidence interval of one group and one event; the event-number needs to be specified. If two overlapping confidence intervals are drawn (by two function calls) in one plot, the use of transparent color is recommended, for example “adjustcolor("red",0.1).

Usage
confIntArea(x, group, event, col = "grey", invert = FALSE)

Arguments
x
A survfit (survival-package) or a Cuminc (mstate-package) object.
group
Number of the group (=strata) of which the confidence interval should be plotted. If the survfit-object has only one strata, this parameter can be omitted.
event
If the model-object is a multistate-model, the number of the event-type needs to be specified.
col
Color of the confident interval area. Default is "grey". A transparent value is recommended, for example “adjustcolor("red",0.1).”
invert
Inverts the area if TRUE, default is FALSE.

Value
Draws an area for the confidence interval.

Examples
require(survival)
aml_model <- with(aml, survfit(Surv(time, status)~x))
col1 <- adjustcolor("red",0.2); col2 <- adjustcolor("blue",0.2)
survPlot(xmax=50, space.nrAtRisk=0.32)
confIntArea(aml_model, col=col1, group=1)
confIntArea(aml_model, col=col2, group=2)
survCurve(aml_model, group=1)
survCurve(aml_model, group=2, lty=2)
nrAtRisk(aml_model, group=1, y=-0.17, bgcol.flag=col1, label="maintain")
nrAtRisk(aml_model, group=2, y=-0.24, bgcol.flag=col2, lty.flag=2, label="non-maint.")
**extractOneGroupOneEvent**

*Extracts one group and one event of a survfit model as a data frame.*

**Description**

This function is a helper function for the package and is not exported.

**Usage**

```
extractOneGroupOneEvent(model, group = NA, event = NA, firstRow = TRUE)
```

**Arguments**

- `model`: A survfit object.
- `group`: Number of the chosen group. If the model-object has only one Strata (Group), this parameter can be NA.
- `event`: If the model-object is a multistate-model, the event-type needs to be specified, otherwise it can be NA.
- `firstRow`: Typically, a survfit-model does not include data of time=0, if true this function tries to add a column time=0 as a first row.

**Value**

Returns a data frame with the times, estimate, upper and lower CI and the n.Risk of one group and one event of a Kaplan Meier estimator or a competitive risk analysis

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**nrAtRisk**

*Adds number at risk of a survival model to a plot.*

**Description**

This function adds the number at risk of one group (strata) of a survfit object to an existing plot. If label is specified, it draws a label for the group right to the number at risks. If any elements of the "flag" is specified, it also draws a small identifier, with which the corresponding curves / confidence intervals of the plot can be identified near to the label.

**Usage**

```
nrAtRisk(
  x,
  group,
  ypos = 0.08,
  times,
  interval.times,
```

---
zero.adjust = TRUE,  
zero.value,  
font.text = 1,  
cex.text = 1,  
col.text = "black",  
cex.nr,  
col.nr,  
font.nr,  
label,  
xpos.lab,  
cex.lab,  
col.lab,  
font.lab,  
lty.flag,  
lwd.flag,  
bgcol.flag,  
lncol.flag,  
xlim.flag  
)  

Arguments  

x        A survfit (survival-package) or a Cuminc (mstate-package) object.  
group    The number of the group (=strata) of which the confidence interval should be plotted. If the survfit-object has only one strata, this argument can be omitted.  
ypos     A numeric value for the position at the y-axis.  
times    An optional vector of numeric values specifying at which times (x-axis) the number at risk are calculated and plotted. If not specified, the defaults depends on "interval.times" value if available, or the size of the plot.  
interval.times An optional numeric value which specifies the interval at which the number at risk values are plotted. Is overwritten by times. If not specified, the value depends on the size of the plot.  
zero.adjust A logical value. If true, the number at risk at time 0 is not plotted at the precise position, but slightly adjusted to the left to prevent the value to be cut-off by the plot margins. Also, the value at x=0 is plotted if true. Default is TRUE.  
zero.value A numeric value or string that overwrites the nr at risk value at x=0 if specified (only if zero.adjust is TRUE).  
font.text  Font of the text (nr at risk and label). Default is 1.  
cex.text   Font-size of the text (nr at risk and label). Default is 1.  
col.text   Colour of the text (nr at risk and label). Default is "black".  
cex.nr     Overwrites cex.text for the number-part.  
col.nr     Overwrites col.text for the number-part.  
font.nr    Overwrites font.text for the number-part.  
label     String for the group name.  
xpos.lab   x-position of the label, default is near the right border of the plot.
survCurve

Draws the number at risk to an existing plot.

Examples

```r
require(survival)
aml_model <- with(aml, survfit(Surv(time, status)~x))
col1 <- adjustcolor("red",0.2); col2 <- adjustcolor("blue",0.2)
survPlot(xmax=50, space.nrAtRisk=0.32)
confIntArea(aml_model, col=col1, group=1)
confIntArea(aml_model, col=col2, group=2)
survCurve(aml_model, group=1)
survCurve(aml_model, group=2, lty=2)
nrAtRisk(aml_model, group=1, y=-0.17, bgcol.flag=col1, label="maintain")
nrAtRisk(aml_model, group=2, y=-0.24, bgcol.flag=col2, lty.flag=2, label="non-maint.")
```

SurvCurve

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draws a survival curve for one group and one event.</td>
</tr>
</tbody>
</table>

Usage

```r
survCurve(
  x,
  group,
  event,
  conf.int = FALSE,
  mark.time = FALSE,
  col = "black",
  lty = 1,
)```
lwd = 1,
cex.markTime = 1,
pch.markTime = 3,
col.confInt = 1,
lty.confInt = 2,
lwd.confInt = 1,
invert = FALSE
)

Arguments

x A survfit or a Cuminc object.

group Number of the chosen group. If the model-object has only one Strata (Group), this parameter can be omitted.

event If the model-object is a multistate-model, the event-type needs to be specified.
conf.int The confidence-interval is plotted as lines if TRUE. Default is FALSE
mark.time The times of censoring are marked if TRUE. Default is FALSE
col Color of the line. Default is "black".
lty Line-type of the line. Default is 1.
lwd Line-wide of the line. Default is 1.
cex.markTime Size of the marks for censoring. Default is 1.
pch.markTime Character of the marks for censoring. Default is 1 (stroke).
col.confInt Color of the line for the confidence interval. Default is "black".
lty.confInt Line-type of the line for the confidence interval. Default is 2.
lwd.confInt Line-wide of the line for the confidence interval. Default is 1.
invert Inverts the curve if TRUE. Default is FALSE.

Value

Draws the survival curve for one group / one event.

Examples

require(survival)
aml_model <- with(aml, survfit(Surv(time, status)~x))
col1 <- adjustcolor("red",0.2); col2 <- adjustcolor("blue",0.2)
survPlot(xmax=50, space.nrAtRisk=0.32)
confIntArea(aml_model, col=col1, group=1)
confIntArea(aml_model, col=col2, group=2)
survCurve(aml_model, group=1)
survCurve(aml_model, group=2, lty=2)
nrAtRisk(aml_model, group=1, y=-0.17, bgcol.flag=col1, label="maintain")
nrAtRisk(aml_model, group=2, y=-0.24, bgcol.flag=col2, lty.flag=2, label="non-maint.")
survLable

Add number at risk of a survival model to a plot. Adds label to plot.

Description

This function adds a text label to the plot, which is preceded by a small identifier, similar to the function nrAtRisk.

Usage

survLable(
  text,
  x,
  y,
  font = 1,
  cex = 1,
  col.text = "black",
  len.flag,
  lty.flag = 1,
  lwd.flag = 1,
  bgcol.flag,
  lncol.flag = "black"
)

Arguments

text String, content of the label.

x A numeric value for the position at the x-axis.

y A numeric value for the position at the y-axis.

font Font of the label.

cex Font size of the label.
col.text Color of the label.

len.flag Length of the flag.

lty.flag Line-typ of the flag. Value is 1 if not specified.

lwd.flag Line-wide of the flag. Value is 1 if not specified.

bgcol.flag Background-color of the flag (corresponding to the color of the confidence interval in the plot). No color if not value is specified.

lncol.flag Color of the line of the flag. Default is "black".

Value

Draws the number at risk to an existing plot.
Examples

```r
require(survival)
aml_model <- with(aml, survfit(Surv(time, status)~x))
col1 <- adjustcolor("red",0.2); col2 <- adjustcolor("blue",0.2)
survPlot(xmax=50)
confIntArea(aml_model, col=col1, group=1)
confIntArea(aml_model, col=col2, group=2)
survCurve(aml_model, group=1)
survCurve(aml_model, group=2, lty=2)
survLable("maintain", 1, 0.2, bgcol.flag=col1)
survLable("non-maint.", 1, 0.1, bgcol.flag=col2, lty.flag=2)
```

**survPlot**

Setup for a plot for survival data without the curves.

**Description**

This function draws the confident interval area of one group of a survfit object. For Competitive risk analysis, the event number needs to be specified. To get a nice graph, the function should be runned after one made an empty plot, and before drawing the actual curves (Thus the area is underlining to the curves). If two curves are drawn which confident intervals overlap transparency should be added to the colors.

**Usage**

```r
survPlot(
  main = "",
  title.xaxis = "",
  title.yaxis = "",
  xmin = 0,
  xmax,
  ymin = -0.02,
  ymax = 1.02,
  ypercent = TRUE,
  title.nrAtRisk = "number at risk",
  space.nrAtRisk = 0,
  interval.xaxis,
  interval.yaxis,
  las.xaxis = 1,
  las.yaxis = 1,
  font.xaxis = 1,
  font.yaxis = 1,
  cex.xaxis = 1,
  cex.yaxis = 1,
  points.xaxis,
  points.yaxis,
  labels.xaxis,
)```
labels.yaxis,
font.nrAtRiskTitle = 1,
cex.nrAtRiskTitle = 1
}

Arguments

main
Title of the plot, Default is "".
title.xaxis
Title of the x-axis. Default is "".
title.yaxis
Title of the y-axis. Default is "".
xmin
Minimum for the x (Time) - axis. Default is 0.
xmax
Maximum of the x (time) axis. No default, must be specified.
ymin
Minimum of the y-axis. Default is -0.02
ymax
Maximum of the y-axis. Default is 1.02
ypercent
Specifies if the Unit of the y-axis is ratio (usually 0-1) or percentage (0-100),
Default is TRUE (0-100). Equals yscale=100.
title.nrAtRisk
Label for the number at risk region. Default is "number at risk", other meaning-
ful value is "patients at risk", or translations in any language for example. Not
plotted if space.nrAtRisk is 0
space.nrAtRisk
Space (usually around 0.2-0.5) below the plot to draw the values of number at
risk. Default is 0.
interval.xaxis
Interval at which the ticks of the x-axis are drawn. Default depends on the size
of the plot.
interval.yaxis
Interval at which the ticks of the y-axis are drawn. Default depends on the size
of the plot.
las.xaxis
Orientation of the labels of the x-axis. Default is 1 (horizontal).
las.yaxis
Orientation of the labels of the y-axis. Default is 1 (horizontal).
font.xaxis
Font-type for the labels of the x-axis. Default is 1.
font.yaxis
Font-type for the labels of the y-axis. Default is 1.
cex.xaxis
Font-size for the labels of the x-axis. Default is 1.
cex.yaxis
Font-size for the labels of the y-axis. Default is 1.
points.xaxis
Exact position of the ticks of the x-axis. Overwrites the values of interval.xaxis.
Usually not required.
points.yaxis
Exact position of the ticks of the y-axis. Overwrites the values of interval.yaxis.
Usually not required.
labels.xaxis
Label for the ticks of the x-axis. Only valid if points are specified. Must be same
length like points.
labels.yaxis
Label for the ticks of the y-axis. Only valid if points are specified. Must be same
length like points.
font.nrAtRiskTitle
Font type of the title of the nr-at-Risk Space Default is 1.
cex.nrAtRiskTitle
Font size of the title of the nr-at-Risk Space Default is 1.
survPlot

Value

Draws an empty plot optimized for survival-curves.

Examples

```r
require(survival)
aml_model <- with(aml, survfit(Surv(time, status)-x))
col1 <- adjustcolor("red",0.2); col2 <- adjustcolor("blue",0.2)
survPlot(xmax=50, space.nrAtRisk=0.32)
confIntArea(aml_model, col=col1, group=1)
confIntArea(aml_model, col=col2, group=2)
survCurve(aml_model, group=1)
survCurve(aml_model, group=2, lty=2)
nrAtRisk(aml_model, group=1, y=-0.17, bgcol.flag=col1, label="maintain")
nrAtRisk(aml_model, group=2, y=-0.24, bgcol.flag=col2, lty.flag=2, label="non-maint.")
```
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