Package 'ReliaGrowR'

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Title Reliability Growth Analysis

Version 0.1.5

Description Modeling and plotting functions for Reliability Growth Analysis (RGA). Models include the Duane (1962) <doi:10.1109/TA.1964.4319640>, Non-Homogeneous Poisson Process (NHPP) by Crow (1975) <https://apps.dtic.mil/sti/citations/ADA020296>, Piecewise Weibull NHPP by Guo et al. (2010) <doi:10.1109/RAMS.2010.5448029>, and Piecewise Weibull NHPP with Change Point Detection based on the 'segmented' package by Muggeo (2024) <https://cran.r-project.org/package=segmented>.

Imports stats, graphics, segmented

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Encoding UTF-8

RoxygenNote 7.3.2

Suggests knitr, rmarkdown, spelling, testthat (>= 3.0.0)

Language en-US

URL https://paulgovan.github.io/ReliaGrowR/,
https://github.com/paulgovan/ReliaGrowR

Config/testthat/edition 3

VignetteBuilder knitr

BugReports https://github.com/paulgovan/ReliaGrowR/issues

NeedsCompilation no

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Contents

`duane_plot` *Duane Analysis.*

Description

This function performs a Duane analysis (1962) doi:10.1109/TA.1964.4319640 on the provided failure data.

Usage

```
duane_plot(
  times,
  failures,
  plot = TRUE,
  log = TRUE,
  point_col = "black",
  line_col = "black",
  xlab = "Cumulative Time",
  ylab = "Cumulative MTBF",
  main = "Duane Plot with Cumulative MTBF"
)
```

Arguments

`times`	A vector of cumulative times at which failures occurred.
`failures`	A vector of the number of failures at each corresponding time in times.
`plot`	Show Duane plot (TRUE) or hide plot (FALSE).
`log`	Logical indicating whether to use logarithmic scale for the plot (default: TRUE).
`point_col`	Color for the data points (default: "black").
`line_col`	Color for the fitted line (default: "black").
`xlab`	Label for the x-axis (default: "Cumulative Time").
`ylab`	Label for the y-axis (default: "Cumulative MTBF").
`main`	Title for the plot (default: "Duane Plot with Cumulative MTBF").

Value

A list containing the fitted model, AIC, and BIC.

Examples

```
times <- c(100, 200, 300, 400, 500)
failures <- c(1, 2, 1, 3, 2)
fit <- duane_plot(times, failures)
print(fit)
```

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plot_rga *Plot Reliability Growth Analysis Results*

Description

This function generates a plot for the results of a Reliability Growth Analysis (RGA).

Usage

```
plot_rga(
  rga_obj,
  point_col = "black",
  line_col = "black",
  xlab = "Cumulative Time",
  ylab = "Cumulative Failures",
  main = "Reliability Growth Analysis",
  conf_bounds = TRUE,
  legend = TRUE,
  log = FALSE,
  legend_pos = "bottomright"
)
```

Arguments

rga_obj	An object of class rga, which contains the results from the RGA model.
point_col	Color for the data points (default: "black").
line_col	Color for the fitted line (default: "black").
xlab	Label for the x-axis (default: "Cumulative Time").
ylab	Label for the y-axis (default: "Cumulative Failures").
main	Title for the plot (default: "Reliability Growth Analysis").
conf_bounds	Logical indicating whether to include confidence bounds (default: TRUE).
legend	Logical indicating whether to show the legend (default: TRUE).
log	Logical indicating whether to use a log-log scale (default: FALSE).
legend_pos	Position of the legend (default: "bottomright").

Value

The function does not return a value.

Examples

```
times <- c(100, 200, 300, 400, 500)
failures <- c(1, 2, 1, 3, 2)
result <- rga(times, failures)
plot_rga(result)
```

`print.duane` *Print method for duane objects.*

Description

This function prints a summary of the Duane analysis result.

Usage

```
## S3 method for class 'duane'
print(x, ...)
```

Arguments

`x`	An object of class "duane" returned by the duane_plot function.
`...`	Additional arguments (not used).

`print.rga` *Print method for rga objects.*

Description

This function prints a summary of the RGA analysis result.

Usage

```
## S3 method for class 'rga'
print(x, ...)
```

Arguments

`x`	An object of class `rga`.
`...`	Additional arguments (not used).

`rga` *Reliability Growth Analysis.*

Description

This function performs reliability growth analysis using the Crow-AMSAA model by Crow (1975) https://apps.dtic.mil/sti/citations/ADA020296 or piecewise NHPP model by Guo et al. (2010) doi:10.1109/RAMS.2010.5448029.

Usage

```
rga(
  times,
  failures,
  model_type = "Crow-AMSAA",
  breaks = NULL,
  conf_level = 0.95
)
```

Arguments

`times`	A vector of cumulative times at which failures occurred.
`failures`	A vector of the number of failures at each corresponding time in times.
`model_type`	The model type. Either `Crow-AMSAA` (default) or `Piecewise NHPP` with change point detection.
`breaks`	An optional vector of breakpoints for the `Piecewise NHPP` model.
`conf_level`	The desired confidence level, which defaults to 95%.

Value

The function returns an object of class `rga` that contains the results for the model.

Examples

```
times <- c(100, 200, 300, 400, 500)
failures <- c(1, 2, 1, 3, 2)
result <- rga(times, failures)
print(result)
```

`weibull_to_rga` *Weibull to RGA*

Description

This function converts Weibull data (failure and suspension times) into a format suitable for reliability growth analysis (RGA).

Usage

```
weibull_to_rga(failures, suspensions = NULL)
```

Arguments

`failures`	A vector of failure times.
`suspensions`	A vector of suspension (censoring) times.

Value

A data frame with times and failure counts suitable for reliability growth analysis.

Examples

```
failures <- c(100, 200, 200, 400)
suspensions <- c(250, 350, 450)
result <- weibull_to_rga(failures, suspensions)
print(result)
```

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