

Package ‘ProgVine’

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Type Package

Title Progressive Regularized Vine Copula for Masked Competing Risks

Version 0.1.0

Description Implements Progressive Regularized Vine Copula (Prog-Vine) frameworks for high-dimensional dependent competing risks with masked failure causes under Progressive Type-II Censoring. Fits Weibull marginals, estimates pair-copula trees using Expectation-Maximization (EM) algorithms, computes Louis observed information confidence intervals, and implements Data Augmentation Gibbs Samplers for Bayesian credible intervals.

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Contents

dweibull_prog	2
fit_em_vine	2
gibbs_prog_vine	3
pweibull_prog	4
Index	5

dweibull_prog	<i>Weibull Density for Progressive Censoring</i>
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Description

Weibull Density for Progressive Censoring

Usage

```
dweibull_prog(t, alpha, beta)
```

Arguments

t	Numeric vector of failure times.
alpha	Numeric scale parameter (> 0).
beta	Numeric shape parameter (> 0).

Value

Numeric vector of density values.

Examples

```
dweibull_prog(c(1.2, 2.5), alpha = 2.0, beta = 1.5)
```

fit_em_vine	<i>Fit Progressive Masked Vine Copula via EM Algorithm</i>
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Description

Implements Algorithm 5 (EM-Vine MLE Engine) for high-dimensional dependent competing risks with masked causes under Progressive Type-II Censoring.

Usage

```
fit_em_vine(t, C, R, d = 2, max_iter = 50, tol = 1e-05)
```

Arguments

t	Numeric vector of failure times.
C	Matrix or list of masking sets (binary matrix or indicator list).
R	Numeric vector of progressive removal counts.
d	Integer specifying number of competing risks.
max_iter	Integer specifying maximum EM iterations.
tol	Numeric tolerance convergence criterion.

Value

List containing estimated Weibull parameters, weights, and log-likelihood.

Examples

```
set.seed(42)
n <- 20
t_sim <- runif(n, 0.5, 5.0)
R_sim <- rep(0, n)
C_sim <- matrix(sample(c(0, 1), n * 2, replace = TRUE, prob = c(0.3, 0.7)), ncol = 2)
fit <- fit_em_vine(t = t_sim, C = C_sim, R = R_sim, d = 2, max_iter = 10)
print(fit$alpha)
```

gibbs_prog_vine	<i>Data Augmentation Gibbs Sampler for Prog-Vine Bayesian Credible Intervals</i>
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Description

Implements Algorithm 6 for Prog-Vine Bayesian Inference.

Usage

```
gibbs_prog_vine(t, C, R, d = 2, n_mc = 100, burn_in = 20)
```

Arguments

t	Numeric vector of failure times.
C	Binary matrix indicating cause masking sets.
R	Vector of progressive removals.
d	Integer number of competing risks.
n_mc	Total MCMC samples.
burn_in	MCMC burn-in length.

Value

List of posterior chains for alpha and beta parameters.

Examples

```
set.seed(42)
t_sim <- runif(15, 0.5, 3.0)
R_sim <- rep(0, 15)
C_sim <- matrix(1, nrow = 15, ncol = 2)
gibbs_res <- gibbs_prog_vine(t_sim, C_sim, R_sim, d = 2, n_mc = 30, burn_in = 5)
summary(gibbs_res$alpha_chain)
```

pweibull_prog

Weibull Cumulative Distribution for Progressive Censoring

Description

Weibull Cumulative Distribution for Progressive Censoring

Usage

```
pweibull_prog(t, alpha, beta)
```

Arguments

t	Numeric vector of failure times.
alpha	Numeric scale parameter (> 0).
beta	Numeric shape parameter (> 0).

Value

Numeric vector of cumulative probability values.

Examples

```
pweibull_prog(c(1.2, 2.5), alpha = 2.0, beta = 1.5)
```

Index

dweibull_prog, [2](#)

fit_em_vine, [2](#)

gibbs_prog_vine, [3](#)

pweibull_prog, [4](#)