Package 'scDECO'

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Type Package

Title Estimating Dynamic Correlation

Version 0.1.0

Description Implementations for two different Bayesian models of differential co-expression. scdeco.cop() fits the bivariate Gaussian copula model from Zichen Ma, Shannon W. Davis, Yen-Yi Ho (2023) <doi:10.1111/biom.13701>, while scdeco.pg() fits the bivariate Poisson-Gamma model from Zhen Yang, Yen-Yi Ho (2022) <doi:10.1111/biom.13457>.

Imports MASS, rjags, msm

License GPL (>= 3)

Encoding UTF-8

RoxygenNote 7.3.1

URL https://github.com/YenYiHo-Lab/scDECO

BugReports https://github.com/YenYiHo-Lab/scDECO/issues

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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scdeco.cop *Copula dynamic correlation fitting function*

Description

Copula dynamic correlation fitting function

Usage

```
scdeco.cop(y, x, marginals, w = NULL, n.mcmc = 5000, burn = 1000, thin = 10)
```

Arguments

y	2-column matrix of observations
x	covariates
marginals	length-2 vector with strings of the two marginals
w	(optional)
n.mcmc	number of mcmc iterations to run
burn	how many of the mcmc iterations to burn
thin	how much to thin the mcmc iterations

Value

matrix with mcmc samples as rows and columns corresponding to the different parameters

Examples

```
n <- 1000
x.use = rnorm(n)
w.use = runif(n,-1,1)
eta1.use = c(-2.2, 0.7)
eta2.use = c(-2, 0.8)
beta1.use = c(1,0.5)
beta2.use = c(1,1)
alpha1.use = 7
alpha2.use = 3
tau.use = c(-0.2, .3)

marginals.use <- c("ZINB", "ZIGA")

y.use <- scdeco.sim.cop(marginals=marginals.use, x=x.use,
                    eta1.true=eta1.use, eta2.true=eta2.use,
                    beta1.true=beta1.use, beta2.true=beta2.use,
                    alpha1.true=alpha1.use, alpha2.true=alpha2.use,
                    tau.true=tau.use, w=w.use)
mcmc.out <- scdeco.cop(y=y.use, x=x.use, marginals=marginals.use, w=w.use,
                      n.mcmc=10, burn=0, thin=1) # n.mcmc=1000, burn=100, thin=5)
```

```
lowerupper <- t(apply(mcmc.out, 2, quantile, c(0.025, 0.5, 0.975)))
estmat <- cbind(lowerupper[,1],
            c(eta1.use, eta2.use, beta1.use, beta2.use, alpha1.use, alpha2.use, tau.use),
                lowerupper[,c(2,3)])
colnames(estmat) <- c("lower", "trueval", "estval", "upper")
estmat
```

---

scdeco.pg *ZENCO Poisson Gamma dynamic correlation fitting function*

Description

ZENCO Poisson Gamma dynamic correlation fitting function

Usage

```
scdeco.pg(
  dat,
  b0,
  b1,
  adapt_iter = 100,
  update_iter = 100,
  coda_iter = 1000,
  coda_thin = 5,
  coda_burnin = 100
)
```

Arguments

dat	matrix containing expression values as first two columns and covariate as third column
b0	intercept of zinf parameter
b1	slope of zinf parameter
adapt_iter	number of adaptation iterations in the jags.model function
update_iter	update iterations in the update function
coda_iter	number of iterations for the coda.sample function
coda_thin	how much to thin the resulting MCMC output
coda_burnin	how many iterations to burn before beginning coda sample collection

Value

MCMC samples that have been adapted, burned, and thinned

Examples

```
phi1_use <- 4
phi2_use <- 4
phi3_use <- 1/7
mu1_use <- 15
mu2_use <- 15
mu3_use <- 7
b0_use <- -3
b1_use <- 0.1
tau0_use <- -2
tau1_use <- 0.4

simdat <- scdeco.sim.pg(N=1000, b0=b0_use, b1=b1_use,
                        phi1=phi1_use, phi2=phi2_use, phi3=phi3_use,
                        mu1=mu1_use, mu2=mu2_use, mu3=mu3_use,
                        tau0=tau0_use, tau1=tau1_use)

zenco_out <- scdeco.pg(dat=simdat,
                       b0=b0_use, b1=b1_use,
                       adapt_iter=1, # 500,
                       update_iter=1, # 500,
                       coda_iter=5, # 5000,
                       coda_thin=1, # 10,
                       coda_burnin=0) # 1000

boundsmat <- cbind(zenco_out$quantiles[,1],
                   c(1/phi1_use, 1/phi2_use, 1/phi3_use,
                   mu1_use, mu2_use, mu3_use,
                   tau0_use, tau1_use),
                   zenco_out$quantiles[,c(3,5)])

colnames(boundsmat) <- c("lower", "true", "est", "upper")

boundsmat
```

`scdeco.sim.cop` *Simulating from copula model*

Description

Simulating from copula model

Usage

```
scdeco.sim.cop(
  marginals,
  x,
  eta1.true,
```

```
  eta2.true,
  beta1.true,
  beta2.true,
  alpha1.true,
  alpha2.true,
  tau.true,
  w = NULL
)
```

Arguments

marginals	provide vector of length 2 of which marginals to use
x	covariate matrix
eta1.true	zero-inflation parameters for marginal 1
eta2.true	zero-inflation parameters for marginal 2
beta1.true	mean coefficients for marginal 1
beta2.true	mean coefficients for marginal 2
alpha1.true	second parameter coefficients for marginal 1
alpha2.true	second parameter coefficients for marginal 2
tau.true	coefficients for correlation
w	(optional) covariate matrix for zero-inflation portion

Value

matrix with values simulated from copula model

Examples

```
n <- 2500
x.use = rnorm(n)
w.use = runif(n,-1,1)
eta1.use = c(-2.2, 0.7)
eta2.use = c(-2, 0.8)
beta1.use = c(1,0.5)
beta2.use = c(1,1)
alpha1.use = 7
alpha2.use = 3
tau.use = c(-0.2, .3)

marginals.use <- c("ZINB", "ZIGA")

y.use <- scdeco.sim.cop(marginals=marginals.use, x=x.use,
                    eta1.true=eta1.use, eta2.true=eta2.use,
                    beta1.true=beta1.use, beta2.true=beta2.use,
                    alpha1.true=alpha1.use, alpha2.true=alpha2.use,
                    tau.true=tau.use, w=w.use)

y.use[1:10,]
```

scdeco.sim.pg *Simulating from ZENCO Model*

Description

Simulating from ZENCO Model

Usage

```
scdeco.sim.pg(
  N,
  b0,
  b1,
  phi1,
  phi2,
  mu1,
  mu2,
  tau0,
  tau1,
  mu3,
  phi3,
  tau2 = NULL,
  tau3 = NULL,
  xc = NULL
)
```

Arguments

N	size of sample to be generated
b0	intercept of zinf parameter
b1	slope of zinf parameter
phi1	over-dispersion parameter of first marginal
phi2	over-dispersion parameter of second marginal
mu1	mean parameter of first marginal
mu2	mean parameter of second marginal
tau0	intercept of correlation
tau1	slope of of correlation
mu3	mean parameter of covariate vector
phi3	over-dispersion parameter of covariate vector
tau2	(optional) correlation coefficient on optional xc covariate vector
tau3	(optional) correlation coefficient on interaction between x3 and xc
xc	(optional) secondary covariate to be regressed

Value

a matrix with expressions as first two columns and covariates as remaining columns

Examples

```
phi1_use <- 4
phi2_use <- 4
phi3_use <- 1/6
mu1_use <- 15
mu2_use <- 15
mu3_use <- 7
b0_use <- 0.6882
b1_use <- -0.2995
tau0_use <- 0.07
tau1_use <- 0.05

simdat <- scdeco.sim.pg(N=1000, b0=b0_use, b1=b1_use,
                        phi1=phi1_use, phi2=phi2_use, phi3=phi3_use,
                        mu1=mu1_use, mu2=mu2_use, mu3=mu3_use,
                        tau0=tau0_use, tau1=tau1_use)
simdat[1:10,]
```

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