Package 'GDILM.ME'

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Title Spatial Modeling of Infectious Diseases with Co-Variate Error

Version 1.2.1

Description Provides tools for simulating from spatial modeling of individual level of infectious disease transmission when co-variates measured with error, and carrying out infectious disease data analyses with the same models. The epidemic models considered are distance-based model within Susceptible-Infectious-Removed (SIR) compartmental frameworks.

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Encoding UTF-8

RoxygenNote 7.3.1

Imports MASS, corpcor, mvtnorm, ngspatial, numDeriv, stats, psych

Depends R (>= 2.10)

LazyData true

NeedsCompilation no

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Repository CRAN

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Contents

Areal_level_data *Areal level data*

Description

The data which describes the areal level data (proportion of indigenous people and population) for 25 regions.

Usage

```
Areal_level_data
```

Format

A data frame with 25 rows and 2 columns:

Region Region number

Pop Population of each region

Ind percentage of indigenous people in each region ...

Estimation *Estimating parameters along with corresponding variances based on the proposed model.*

Description

Estimating parameters along with corresponding variances based on the proposed model.

Usage

```
Estimation(
  ITER,
  MHiteration,
  eps,
  d,
  nSample,
  mm,
  time,
  MuxStar0,
  MuxInd0,
  SigmaxStar0,
  SigmaxInd0,
  Sigmav0,
  Sigmaw0,
  lambda0,
```

```
  sigma0,
  delta0,
  alpha0,
  beta10,
  beta20,
  beta30,
  beta40,
  InfPeriod,
  g
)
```

Arguments

ITER	The number of simulation runs
MHiteration	The number of iterations in Metropolis–Hastings algorithm
eps	Stopping value for MCECM algorithm
d	distance between cells
nSample	number of sample in each cell
mm	Number of areas.
time	Maximum time.
MuxStar0	Mean of unobserved areal level covariates.
MuxInd0	Mean of unobserved individual level covariates.
SigmaxStar0	Variance of unobserved areal level covariates.
SigmaxInd0	Variance of unobserved individual level covariates.
Sigmav0	Variance of areal level measurement error variable.
Sigmaw0	Variance of individual level measurement error variable.
lambda0	Spatial dependency parameter.
sigma0	Over dispersion parameter.
delta0	The spatial parameter.
alpha0	Initial value for intercept.
beta10	Initial value for coefficient of observed individual level covariates.
beta20	Initial value for coefficient of observed areal level covariates.
beta30	Initial value for coefficient of unobserved individual level covariates.
beta40	Initial value for coefficient of unobserved areal level covariates.
InfPeriod	The infectious period length.
g	grid dimension

Value

the result of the function

Examples

```
Estimation(1,5,0.05,2,4,4,20,0,0,1,1,0.3,0.3,0.5,0.5,2.5,0,1,1,1,
1,3,2)
```

`Estimation_RealData` *Estimating parameters along with corresponding variances based on the proposed model with real data.*

Description

Estimating parameters along with corresponding variances based on the proposed model with real data.

Usage

```
Estimation_RealData(
  ITER,
  MHiteration,
  eps,
  mm,
  time,
  MuxStar0,
  MuxInd0,
  SigmaxStar0,
  SigmaxInd0,
  Sigmav0,
  Sigmaw0,
  lambda0,
  sigma0,
  delta0,
  alpha0,
  beta10,
  beta20,
  beta30,
  beta40,
  InfPeriod,
  Di,
  D,
  Nlabel,
  n,
  cov1,
  cov2,
  ww,
  vv,
  tau
)
```

Arguments

`ITER`	The number of simulation runs
`MHiteration`	The number of iterations in Metropolis–Hastings algorithm

eps	Stopping value for MCECM algorithm
mm	Number of areas.
time	Maximum time.
MuxStar0	Mean vector of unobserved areal level covariates.
MuxInd0	Mean vector of unobserved individual level covariates.
SigmaxStar0	Variance of unobserved areal level covariates.
SigmaxInd0	Variance of unobserved individual level covariates.
Sigmav0	Variance of areal level measurement error variable.
Sigmaw0	Variance of individual level measurement error variable.
lambda0	Spatial dependency parameter.
sigma0	Over dispersion parameter.
delta0	The spatial parameter.
alpha0	Initial value for intercept.
beta10	Initial value for coefficient of observed individual level covariates.
beta20	Initial value for coefficient of observed areal level covariates.
beta30	Initial value for coefficient of unobserved individual level covariates.
beta40	Initial value for coefficient of unobserved areal level covariates.
InfPeriod	The infectious period length.
Di	Euclidean distance between individuals
D	Neibourhood structure
Nlabel	Label for each sample from the area
n	Total number of individuals
cov1	observed individual level covariates
cov2	observed areal level covariates
ww	Unobserved individual level covariates
vv	unobserved areal level covariates
tau	tau

Value

the result of the function

Examples

```
Estimation_RealData(1,5,0.05,4,20,0.1,0.1,0.15,0.8,0.6,0.6,0.85,
1.1,2.7,0,1,0,1,1,3,
matrix(runif(900,min = 4,max = 20),nrow=30, byrow = TRUE),
matrix(c(2,-1,-1,0,-1,2,0,-1,-1,0,2,-1,0,-1,-1,2),nrow=4,byrow=TRUE),
rep(1:4,c(7,6,8,9)),30,runif(30, 0, 1),
runif(4,0,1),runif(30,-2,2),runif(4,0,1),sample(c(0,1),replace = TRUE, size = 30))
```

Individual_level_data *Individual level data*

Description

The data which describes the Individual level data (average age below 5, average age above 65 and SEFI factor) for 758 individuals.

Usage

```
Individual_level_data
```

Format

A data frame with 758 rows and 4 columns:

Index Index for individual

Ave_Age_5 Average of age smaller than 5

Ave_Age_65 Average of age higher 65

SEFI SEFI factor ...

NaiveEstimation *Estimating parameters along with corresponding variances based on Naive model.*

Description

Estimating parameters along with corresponding variances based on Naive model.

Usage

```
NaiveEstimation(
  ITER,
  MHiteration,
  eps,
  d,
  nSample,
  mm,
  time,
  MuxStar0,
  MuxInd0,
  SigmaxStar0,
  SigmaxInd0,
  Sigmav0,
  Sigmaw0,
```

```
  lambda0,
  sigma0,
  delta0,
  alpha0,
  beta10,
  beta20,
  beta30,
  beta40,
  InfPeriod,
  g
)
```

Arguments

ITER	The number of simulation runs
MHiteration	The number of iterations in Metropolis–Hastings algorithm
eps	Stopping value for MCECM algorithm
d	distance between cells
nSample	number of sample in each cell
mm	Number of areas.
time	Maximum time.
MuxStar0	Mean of unobserved areal level covariates.
MuxInd0	Mean of unobserved individual level covariates.
SigmaxStar0	Variance of unobserved areal level covariates.
SigmaxInd0	Variance of unobserved individual level covariates.
Sigmav0	Variance of areal level measurement error variable.
Sigmaw0	Variance of individual level measurement error variable.
lambda0	Spatial dependency parameter.
sigma0	Over dispersion parameter.
delta0	The spatial parameter.
alpha0	Initial value for intercept.
beta10	Initial value for coefficient of observed individual level covariates.
beta20	Initial value for coefficient of observed areal level covariates.
beta30	Initial value for coefficient of unobserved individual level covariates.
beta40	Initial value for coefficient of unobserved areal level covariates.
InfPeriod	The infectious period length.
g	grid dimension

Value

The results of the function

Examples

```
NaiveEstimation(1,5,0.05,2,4,4,20,0,0,1,1,0.3,0.3,0.5,0.5,2.5,0,1,
1,1,1,3,2)
```

`NaiveEstimation_RealData` *Estimating parameters along with corresponding variances based on Naive model with real data.*

Description

Estimating parameters along with corresponding variances based on Naive model with real data.

Usage

```
NaiveEstimation_RealData(
  ITER,
  MHiteration,
  eps,
  mm,
  time,
  MuxStar0,
  MuxInd0,
  SigmaxStar0,
  SigmaxInd0,
  Sigmav0,
  Sigmaw0,
  lambda0,
  sigma0,
  delta0,
  alpha0,
  beta10,
  beta20,
  beta30,
  beta40,
  InfPeriod,
  Di,
  D,
  Nlabel,
  n,
  cov1,
  cov2,
  ww,
  vv,
  tau
)
```

Arguments

ITER	The number of simulation runs
MHiteration	The number of iterations in Metropolis–Hastings algorithm
eps	Stopping value for MCECM algorithm
mm	Number of areas.
time	Maximum time.
MuxStar0	Mean vector of unobserved areal level covariates.
MuxInd0	Mean vector of unobserved individual level covariates.
SigmaxStar0	Variance of unobserved areal level covariates.
SigmaxInd0	Variance of unobserved individual level covariates.
Sigmav0	Variance of areal level measurement error variable.
Sigmaw0	Variance of individual level measurement error variable.
lambda0	Spatial dependency parameter.
sigma0	Over dispersion parameter.
delta0	The spatial parameter.
alpha0	Initial value for intercept.
beta10	Initial value for coefficient of observed individual level covariates.
beta20	Initial value for coefficient of observed areal level covariates.
beta30	Initial value for coefficient of unobserved individual level covariates.
beta40	Initial value for coefficient of unobserved areal level covariates.
InfPeriod	The infectious period length.
Di	Euclidean distance between individuals
D	Neibourhood structure
Nlabel	Label for each sample from the area
n	Total number of individuals
cov1	observed individual level covariates
cov2	observed areal level covariates
ww	Unobserved individual level covariates
vv	unobserved areal level covariates
tau	tau

Value

The results of the function

Examples

```
NaiveEstimation_RealData(1,5,0.05,4,20,0.1,0.1,0.15,0.8,0.6,0.6,
0.85,1.1,2.7,0,1,0,1,1,3,
matrix(runif(900,min = 4,max = 20),nrow=30, byrow = TRUE),
matrix(c(2,-1,-1,0,-1,2,0,-1,-1,0,2,-1,0,-1,-1,2),nrow=4,byrow=TRUE),
rep(1:4,c(7,6,8,9)),30,runif(30, 0, 1),
runif(4,0,1),runif(30,-2,2),runif(4,0,1),
sample(c(0,1),replace = TRUE, size = 30))
```

`Regional_data` *Regional data*

Description

The data which describes the individual level data and areal data for 758 individuals.

Usage

```
Regional_data
```

Format

A data frame with 758 rows and 7 columns:

Index Index for individual

Lat Latitude of the area

Long Longitude of the area

Population Population of each area

SEFI SEFI factor

Age_5 Number of individuals age below 5

Age_65 Number of individuals age above 65 ...

Index