

# Package ‘geoSAE’

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**Type** Package

**Title** Geoadditive Small Area Model

**Version** 0.1.0

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**Description** This function is an extension of the Small Area Estimation (SAE) model. Geoadditive Small Area Model is a combination of the geoadditive model with the Small Area Estimation (SAE) model, by adding geospatial information to the SAE model. This package refers to J.N.K Rao and Isabel Molina (2015, ISBN: 978-1-118-73578-7), Bocci, C., & Petrucci, A. (2016)<[doi:10.1002/9781118814963.ch13](https://doi.org/10.1002/9781118814963.ch13)>, and Ardiansyah, M., Djuraidah, A., & Kurnia, A. (2018)<[doi:10.21082/jpptp.v2n2.2018.p101-110](https://doi.org/10.21082/jpptp.v2n2.2018.p101-110)>.

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.1.1

**Imports** MASS, nlme, stats

**URL** <https://github.com/ketutdika/geoSAE>

**BugReports** <https://github.com/ketutdika/geoSAE/issues>

**Depends** R (>= 2.10)

**NeedsCompilation** no

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**Repository** CRAN

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dataArea	<i>Data Unit Level Mean of Rice Field Productivity</i>
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### Description

This dataset is unit level data which is averaged by area.

### Usage

dataArea

### Format

A data frame with 15 areas on the following 15 variables:

**area** domain codes

**name** name of the small area

**x1** mean of proportion of paddy rice harvested area to total harvested area

**x2** mean of latitude

**x3** mean of longitude

**population** total rice harvested area

**z1** mean of z1 in Unit Level

**z2** mean of z2 in Unit Level

**z3** mean of z3 in Unit Level

**z4** mean of z4 in Unit Level

**z5** mean of z5 in Unit Level

**z6** mean of z6 in Unit Level

**ni** the number of samples per area is small (sample size in area)

**ybar\_direct** mean of rice field productivity

**v.ybar\_direct** varians of rice field productivity

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dataUnit	<i>Data Unit Level of Rice Field Productivity</i>
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**Description**

This dataset is data on rice productivity in 15 sub-districts from 3 districts (Seruyan, East Kotawaringin, and West Kotawaringin) in Central Kalimantan obtained from the Ubinan Survey conducted routinely by BPS. This data will be implemented with the Geoadditive Small Area Model

**Usage**

dataUnit

**Format**

A data frame with 210 observations on the following 7 variables:

**number** order of observation

**area** domain codes

**name** name of the small area

**y** rice field productivity

**x1** proportion of paddy rice harvested area to total harvested area

**x2** latitude

**x3** longitude

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eblupgeo	<i>EBLUP's for domain means using Geoadditive Small Area Model</i>
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**Description**

This function calculates EBLUP's based on unit level using Geoadditive Small Area Model

**Usage**

eblupgeo(formula, zspline, dom, xmean, zmean, data)

**Arguments**

formula	the model that to be fitted
zspline	n*k matrix that used in model for random effect of spline-2 (n is the number of observations, and k is the number of knots used)
dom	a*1 vector with domain codes (a is the number of small areas)
xmean	a*p matrix of auxiliary variables means for each domains (a is the number of small areas, and p is the number of auxiliary variables)
zmean	a*k matrix of spline-2 means for each domains
data	data unit level that used as data frame that containing the variables named in formula and dom

**Value**

This function returns a list of the following objects:

eblup	A Vector with a list of EBLUP with Geoadditive Small Area Model
fit	A list of components of the formed Geoadditive Small Area Model that containing the following objects such as model structure of the model, coefficients of the model, method, and residuals
sigma2	Variance (sigma square) of random effect and error with Geoadditive Small Area Model

**Examples**

```
#Load the dataset for unit level
data(dataUnit)

#Load the dataset for spline-2
data(zspline)

#Load the dataset for area level
data(dataArea)

#Construct the data frame
y      <- dataUnit$y
x1     <- dataUnit$x1
x2     <- dataUnit$x2
x3     <- dataUnit$x3
formula <- y~x1+x2+x3
zspline <- as.matrix(zspline[,1:6])
dom     <- dataUnit$area
xmean  <- cbind(1,dataArea[,3:5])
zmean  <- dataArea[,7:12]
number <- dataUnit$number
area   <- dataUnit$area
data   <- data.frame(number, area, y, x1, x2, x3)

#Estimate EBLUP
eblup_geosae <- eblupgeo(formula, zspline, dom, xmean, zmean, data)
```

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pbmsegeo	<i>Parametric Bootstrap Mean Squared Error of EBLUP's for domain means using Geoadditive Small Area Model</i>
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### Description

This function calculates MSE of EBLUP's based on unit level using Geoadditive Small Area Model

### Usage

```
pbmsegeo(formula, zspline, dom, xmean, zmean, data, B = 100)
```

### Arguments

formula	the model that to be fitted
zspline	n*k matrix that used in model for random effect of spline-2 (n is the number of observations, and k is the number of knots used)
dom	a*1 vector with domain codes (a is the number of small areas)
xmean	a*p matrix of auxiliary variables means for each domains (a is the number of small areas, and p is the number of auxiliary variables)
zmean	a*k matrix of spline-2 means for each domains
data	data unit level that used as data frame that containing the variables named in formula and dom
B	the number of iteration bootstrapping

### Value

This function returns a list of the following objects:

est                    A list containing the following objects:

- eblup: A Vector with a list of EBLUP with Geoadditive Small Area Model
- fit: A list of components of the formed Geoadditive Small Area Model that containing the following objects such as model structure of the model, coefficients of the model, method, and residuals
- sigma2: Variance (sigma square) of random effect and error with Geoadditive Small Area Model

mse                    A vector with a list of estimated mean squared error of EBLUPs estimators

**Examples**

```

#Load the dataset for unit level
data(dataUnit)

#Load the dataset for spline-2
data(zspline)

#Load the dataset for area level
data(dataArea)

#Construct data frame
y      <- dataUnit$y
x1     <- dataUnit$x1
x2     <- dataUnit$x2
x3     <- dataUnit$x3
formula <- y~x1+x2+x3
zspline <- as.matrix(zspline[,1:6])
dom     <- dataUnit$area
xmean  <- cbind(1,dataArea[,3:5])
zmean  <- dataArea[,7:12]
number <- dataUnit$number
area   <- dataUnit$area
data   <- data.frame(number, area, y, x1, x2, x3)

#Estimate MSE
mse_geosae <- pbmsegeo(formula,zspline,dom,xmean,zmean,data,B=100)

```

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zspline

*Z-Spline*


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**Description**

This dataset is obtained from the calculation of the optimum GCV (Generalized Cross Validation), where there are 6 knots that have the lowest GCV value.

**Usage**

```
zspline
```

**Format**

A data frame with 210 observations on the following 6 variables (number of knots used)

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