

# Package ‘SURF’

November 9, 2017

**Type** Package

**Title** Some Useful R Functions

**Version** 0.0.0.9001

**Date** 2017-11-09

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**Description** These are several useful functions that I find myself using often (read: frequently re-implementing), so I will package them for easy access/dissemination.

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**Depends** mvtnorm

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SURF-package	<i>Some Useful R Functions</i>
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## Description

These are several useful functions that I find myself using often (read: frequently re-implementing), so I will package them for easy access/dissemination.

**Details**

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**Author(s)**

Kyle M. Lang

Maintainer: Kyle M. Lang <k.m.lang@uvt.nl>

**Examples**

```
## Simulate regression data:
testData <- simRegData(nObs = 100,
                      nPreds = 10,
                      r2 = 0.5,
                      collin = 0.2,
                      beta = matrix(c(0.25, rep(0.75, 10)))
                      )

## Impose missing data
missData <- imposeMissData(data = testData,
                           targets = list(mar = c("y", "x1"),
                                           mcar = c("x2", "x3"),
                                           mnar = c("x4", "x5")
                                           ),
                           preds = c("x8", "x9", "x10"),
                           pm = list(mar = 0.2, mcar = 0.1, mnar = 0.1),
                           snr = list(mar = 5, mnar = 2.5),
                           pattern = "random")

## Plot imputed vs. observed values:
data(testImps)

plotImps(implist = testImps$implist,
         rMat = testImps$rMat,
         typeVec = testImps$typeVec)
```

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calcMode

*Find the Modal Value of a Vector*


---

**Description**

This function will find the most commonly occurring value (i.e., the mode) in a vector.

**Usage**

```
calcMode(x)
```

**Arguments**

x                      A vector for which to find the mode.

**Details**

In the event of multiple modes, ties are broken randomly. When x is numeric, the return value will be a length one numeric vector, otherwise, the return value will be a length one character vector.

**Value**

The modal value in x.

**Author(s)**

Kyle M. Lang

**Examples**

```
## Find mode of a numeric vector:
x1 <- sample(c(1 : 5), 100, FALSE)
calcMode(x1)

## Find mode of a factor:
x2 <- factor(sample(c(1 : 5), 100, FALSE))
calcMode(x2)

## Find mode of a character vector:
x3 <- sample(letters[1 : 5], 100, FALSE)
calcMode(x3)
```

---

f2n*Safely Cast a Factor to a Numeric Vector*

---

**Description**

This function will type-cast a factor to a numeric vector without mangling the levels when those levels are zero-indexed integers.

**Usage**

```
f2n(x)
```

**Arguments**

x                      A factor to be converted.

**Details**

R indexes factor levels from 1, so type-casting factors that have zero-indexed integer labels using `as.numeric` can produce unanticipated results. This function will cast such factors to zero-indexed numeric vectors wherein the original factor *labels* are mapped to numeric values (rather than the inherent factor *levels* being so mapped).

**Value**

A numeric vector containing the type-cast version of `x`.

**Author(s)**

Kyle M. Lang

**Examples**

```
## Generate a factor:
x1 <- factor(c(0 : 5))
x1

## Naive type-casting:
as.numeric(x1)

## Safe type-casting:
f2n(x1)
```

---

<code>imposeMissData</code>	<i>Impose Missing Data</i>
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**Description**

Impose missing data according to MAR, MCAR, and MNAR mechanisms.

**Usage**

```
imposeMissData(data,
                targets,
                preds,
                pm,
                snr,
                pattern = "random")
```

**Arguments**

<code>data</code>	A <code>data.frame</code> wherein missing data are to be imposed.
<code>targets</code>	A named list with slots “mar”, “mcar”, and “mnar” containing character vectors giving the column labels for variables onto which missing at random, missing completely at random, and missing not at random data, respectively, shall be imposed.

preds	A character vector giving the column labels for predictors of the MAR missingness.
pm	A named list with slots “mar”, “mcar”, and “mnar” containing real numbers in [0, 1) giving the proportions of missing at random, missing completely at random, and missing not at random data, respectively, to generate.
snr	A named list with slots “mar” and “mnar” containing real numbers giving the signal-to-noise ratios of the probit regression models used to impose missing at random and missing not at random data, respectively.
pattern	A character vector indicating in what parts of the missing data predictors’ distributions MAR and MNAR missing data should be imposed. Legal keywords are: “low” = impose missing in the negative tail of the predictor, “high” = impose missing in the positive tail of the predictor, “center” = impose missing in the center of the predictor, “tails” = impose missing in both tails of the predictor. The pattern argument can also be the special keyword “random” which will cause the function to randomly sample from the four preceding possibilities for each target variable.

### Details

MCAR missing data is imposed by generating a random Bernoulli flag variable for each target variable with probability of success equal to `pm$mcar`.

MAR missing data is imposed via a noisy probit regression model wherein the weighted sum of the columns listed in `preds` are used to predict the response propensity.

MNAR missing data is imposed via the same procedure as MAR missing data but the missing data predictor is taken to be the target variable itself.

### Value

A two-element list with the following slots:

**data:** The incomplete version of data

**pattern:** A character vector showing which pattern was used for each target variable.

### Note

Due to the stochastic nature of the missing data simulation, the actual proportions of missing data will only equal the values provided for `pm` asymptotically.

### Author(s)

Kyle M. Lang

### See Also

[simRegData](#)

## Examples

```
## Simulate some data:
testData <- simRegData(nObs = 100,
                      nPreds = 10,
                      r2 = 0.5,
                      collin = 0.2,
                      beta = matrix(c(0.25, rep(0.75, 10)))
                      )

## Impose missing data:
missData <- imposeMissData(data = testData,
                           targets = list(mar = c("y", "x1"),
                                           mcar = c("x2", "x3"),
                                           mnar = c("x4", "x5")
                                           ),
                           preds = c("x8", "x9", "x10"),
                           pm = list(mar = 0.2, mcar = 0.1, mnar = 0.1),
                           snr = list(mar = 5, mnar = 2.5),
                           pattern = "random")
```

---

plotImps	<i>Plot Imputed vs. Observed Values</i>
----------	---

---

## Description

This function will generate plots of imputed versus observed values in multiply imputed data. These plots can be examined to “sanity-check” the imputation procedure.

## Usage

```
plotImps(impList,
         rMat,
         typeVec,
         targetVar = NULL,
         interactive = FALSE)
```

## Arguments

impList	A list of multiply imputed datasets.
rMat	A logical pattern matrix flagging missing values in the original data used to generate the imputed datasets in impList. Note that TRUE flags missing cells and FALSE flags observed cells.
typeVec	A character vector with <code>length(typeVec) = ncol(impList[[1]])</code> giving the measurement levels of the variables in impList. Two values are recognized: “cat” = a categorical variable (i.e., nominal or ordinal) and “con” = a continuous variable (i.e., interval or ratio).
targetVar	An optional character vector giving the column names for variables to plot. When <code>targetVar = NULL</code> all variables with imputed values are plotted.

**interactive**      A logical flag: Should the cycle through all plotted variables by prompting the user to continue after generating each plot?

**Value**

Used for its side-effects.

**Author(s)**

Kyle M. Lang

**Examples**

```
data(testImps)

plotImps(implist = testImps$implist,
         rMat     = testImps$rMat,
         typeVec  = testImps$typeVec)
```

---

rangeNorm

*Range Normalize a Vector*

---

**Description**

This function will standardize a vector so that all transformed values exist between user-defined minimum and maximum values.

**Usage**

```
rangeNorm(x, oldMin = min(x), oldMax = max(x), newMin = 0.0, newMax = 1.0)
```

**Arguments**

x	A numeric vector to be standardized.
oldMin	An optional real number giving the minimum possible value of x.
oldMax	An optional real number giving the maximum possible value of x.
newMin	An optional real number giving the minimum possible value of the transformed input vector.
newMax	An optional real number giving the maximum possible value of the transformed input vector.

**Value**

A numeric vector containing the range-normalized version of x.

**Author(s)**

Kyle M. Lang

## Examples

```
x0 <- runif(100, -3, 5)
x1 <- rangeNorm(x = x0)

range(x1)
```

---

simRegData

*Simulate Regression Data*


---

## Description

This function will simulation regression data with known R-Squared, inter-predictor correlation, and latent grouping structure among the predictors.

## Usage

```
simRegData(nObs,
           nPreds,
           r2,
           collin,
           beta,
           means      = 0.0,
           scales     = 1.0,
           itemsPerPred = 1,
           predReliability = 0.8)
```

## Arguments

nObs	An integer giving the number of rows to simulate.
nPreds	An integer giving the number of (possibly latent) predictor variables to simulate.
r2	A real number in [0, 1]. The R-Squared of the data generating model. That is, what proportion of variability in the outcome should be explained by the predictors.
collin	A real number in [-1, 1]. The correlation between the predictors (i.e., the degree of collinearity).
beta	An numeric matrix of regression coefficients with $\dim(\text{beta}) = c(\text{nPreds}, 1)$ . Note that the first element is taken to be the intercept.
means	A numeric vector of predictor means. Recycled, as necessary, to match nPreds.
scales	A numeric vector of predictor scales. Recycled, as necessary, to match nPreds.
itemsPerPred	An integer giving the number of observed items used to define each latent predictor. When itemsPerPred = 1, no latent structure is imposed on the predictors.
predReliability	A real number in [0, 1]. When itemsPerPred > 1, predReliability defines the proportion of reliable variance among the indicators of each latent predictor. That is, the proportion of shared variance among each latent predictor's observed indicators.



**Value**

An `nObs` by `nPreds * itemsPerPred + 1` data.frame of simulated data.

**Note**

The column labels of the simulated data will be `c("y", paste0("x", c(1 : nPreds * itemsPerPred)))`.

**Author(s)**

Kyle M. Lang

**See Also**

[imposeMissData](#)

**Examples**

```
testData <- simRegData(nObs = 100,
                      nPreds = 10,
                      r2 = 0.5,
                      collin = 0.2,
                      beta = matrix(c(0.25, rep(0.75, 10)))
                      )
```

---

testImps

---

*List of Example Data Elements*


---

**Description**

This data object is a list of data elements meant to demonstrate usage of the `plotImps` function.

**Usage**

```
data("testImps")
```

**Format**

A list with the following three elements.

**impList:** A list containing 10 multiply imputed datasets.

**rMat:** A logical pattern matrix flagging missing values in the data that were imputed to generate `impList`.

**typeVec:** A character vector giving the measurement level of each variable in `impList`.

**See Also**

[plotImps](#)

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