

Package ‘TestDataImputation’

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Type Package

Title Missing Item Responses Imputation for Test and Assessment Data

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Description Functions for imputing missing item responses for dichotomous and polytomous test and assessment data. This package enables missing imputation methods that are suitable for test and assessment data, including: listwise (LW) deletion, treating as incorrect (IN), person mean imputation (PM), item mean imputation (IM), two-way imputation (TW), logistic regression imputation (LR), and EM imputation.

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EMimpute

EM Imputation

Description

This function imputes for all missing responses using EM imputation. Integrated scores are obtained by rounding imputed values to the closest possible response value.

Usage

```
EMimpute(test.data, Mvalue = "NA", max.score = 1)
```

Arguments

test.data	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).
Mvalue	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
max.score	The max possible response value in test data. By default max.score=1 (i.e., binary test data).

Value

A data frame with all missing responses replaced by integrated imputed values.

Examples

```
EMimpute(test.data, Mvalue="8",max.score=1)
```

ImputeTestData	<i>This main function imputes for missing responses using selected method</i>
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Description

This function imputes for all missing responses using selected imputation methods. Integrated scores are obtained by rounding imputed values to the closest possible response value.

Usage

```
ImputeTestData(test.data, Mvalue = "NA", max.score = 1,  
              method = "LW")
```

Arguments

test.data	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).
Mvalue	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
max.score	The max possible response value in test data. By default max.score=1 (i.e., binary test data).
method	Missing response imputation methods. "LW" (by default) represents listwise that deletes all examinees who reported missing responses; "IN" means treating all missing responses as incorrect; "PM" imputes for all missing responses of an examinee by his/her mean on the available items; "IM" imputes for all missing responses of an item by its mean on the available responses; "TW" imputes for all missing responses using two-way imputation (if an examinee has no response to all items, the missing responses are replaced by item means first); "LR" imputes for all missing responses using logistic regression; "EM" imputes for all missing responses using EM imputation.

Value

A data frame with all missing responses replaced by integrated imputed values.

Examples

```
ImputeTestData(test.data, Mvalue="8", max.score=1, method ="TW")
```

ItemMean	<i>Item Mean (IM) Imputation</i>
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Description

This function imputes for all missing responses of an item by its mean (i.e., IM) on the available responses. Integrated scores for items are obtained by rounding their means to the closest possible response value.

Usage

```
ItemMean(test.data, Mvalue = "NA", max.score = 1)
```

Arguments

test.data	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).
Mvalue	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
max.score	The max possible response value in test data. By default max.score=1 (i.e., binary test data).

Value

A data frame with all missing responses replaced by Integrated item means.

Examples

```
ItemMean(test.data, Mvalue="8",max.score=1)
```

Listwise	<i>Listwise Deletion (LW)</i>
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Description

This function deletes examinees who report missing responses.

Usage

```
Listwise(test.data, Mvalue = "NA")
```

Arguments

<code>test.data</code>	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).#’ @param Mvalue Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
<code>Mvalue</code>	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.

Value

A data frame with no missing responses.

Examples

```
Listwise(test.data, Mvalue="8")
```

LogsticReg

Logistic Regression (LR) Imputation

Description

This function imputes for all missing responses using logistic regression. Integrated scores are obtained by rounding imputed values to the closest possible response value.

Usage

```
LogsticReg(test.data, Mvalue = "NA", max.score = 1)
```

Arguments

<code>test.data</code>	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).
<code>Mvalue</code>	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
<code>max.score</code>	The max possible response value in test data. By default max.score=1 (i.e., binary test data).

Value

A data frame with all missing responses replaced by integrated imputed values.

Examples

```
LogsticReg(test.data, Mvalue="8",max.score=1)
```

PersonMean	<i>Person Mean Imputation (PM)</i>
------------	------------------------------------

Description

This function imputes for all missing responses of an examinee by his/her mean (i.e., PM) on the available items. Integrated scores for examinees are obtained by rounding their means to the closest possible response value.

Usage

```
PersonMean(test.data, Mvalue = "NA", max.score = 1)
```

Arguments

test.data	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).#’ @param Mvalue Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
Mvalue	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
max.score	The max possible response value in test data. By default max.score=1 (i.e., binary test data).

Value

A data frame with all missing responses replaced by person means.

References

Sijtsma, K., & Van der Ark, L. A. (2003). "Investigation and treatment of missing item scores in test and questionnaire data." *Multivariate Behavioral Research*, 38(4), 505-528.

Examples

```
PersonMean(test.data, Mvalue="8", max.score=1)
```

`test.data`*Example test data*

Description

This dataset contains binary responses of 775 participants to 20 items. Missing responses are coded as NA.

Usage

```
data("test.data")
```

Format

A data frame with 775 observations on the following 20 items.

Item_1 a numeric vector

Item_2 a numeric vector

Item_3 a numeric vector

Item_4 a numeric vector

Item_5 a numeric vector

Item_6 a numeric vector

Item_7 a numeric vector

Item_8 a numeric vector

Item_9 a numeric vector

Item_10 a numeric vector

Item_11 a numeric vector

Item_12 a numeric vector

Item_13 a numeric vector

Item_14 a numeric vector

Item_15 a numeric vector

Item_16 a numeric vector

Item_17 a numeric vector

Item_18 a numeric vector

Item_19 a numeric vector

Item_20 a numeric vector

Details

A test data that contain binary responses of 775 participants to 20 items. Missing responses are coded as NA.

Examples

```
data(test.data)
## maybe str(test.data) ; plot(test.data) ...
```

TreatIncorrect	<i>Treat missing responses as incorrect (IN)</i>
----------------	--

Description

This function replaces all missing responses by zero.

Usage

```
TreatIncorrect(test.data, Mvalue = "NA")
```

Arguments

test.data	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).#’ @param Mvalue Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.
Mvalue	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). Mvalue="NA" by default.

Value

A data frame with all missing responses imputed.

Examples

```
TreatIncorrect(test.data, Mvalue="8")
```

Twoway	<i>Two-Way Imputation (TW)</i>
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Description

This function imputes for all missing responses using two-way imputation. Integrated responses are obtained by rounding imputed values to the closest possible response value. If a case showed missingness on all the variables (i.e., empty record), the missing values are replaced by item means first.

Usage

```
Twoway(test.data, Mvalue = "NA", max.score = 1)
```


Arguments

<code>test.data</code>	Test data set (a data frame or a matrix) containing missing responses. Missing values are coded as NA or other values (e.g., 8, 9).#
<code>Mvalue</code>	Missing response indicators in the data (e.g. "NA", "8", "9", etc.). <code>Mvalue="NA"</code> by default.
<code>max.score</code>	The max possible response value in test data. By default <code>max.score=1</code> (i.e., binary test data).

Value

A data frame with all missing responses replaced by integrated two-way imputed values.

References

Bernaards, C. A., & Sijtsma, K. (2000). " Influence of imputation and EM methods on factor analysis when item nonresponse in questionnaire data is nonignorable." *Multivariate Behavioral Research*, 35(3), 321-364.

Examples

```
Tway(test.data, Mvalue="8",max.score=1)
```

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