Package 'iqtigprm'

September 17, 2021

Type Package

Title Illustration of the IQTIG analysis methodology for patient related measures

Version 1.0.0

Description An implementation of IQTIG methodology for processing and analysing patient survey data on hospital and ambulant care.

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Encoding UTF-8

LazyData true

Depends R (>= 2.10)

RoxygenNote 7.1.1

Suggests rmarkdown,
knitr

VignetteBuilder knitr

Imports iqtigfunctions,
dplyr,
rlang,
purrr,
fs,
tidyselect,
withr,
haven,
ggplot2,
labelled

R topics documented:

`apply_precomputations` *Apply precomputations to data*

Description

Apply a specified set of precomputation rules to preprocessed patient survey data

Usage

```
apply_precomputations(data, precomputations_list)
```

Arguments

`data`	A `data.frame` containing the preprocessed patient survey data.
`precomputations_list`	A `list` of named precomputations. Each component is also a `list` containing a computation rule `.$expr` and value labels `.$label`.

Value

This takes the patient survey data and performs the specified precomputations by adding new columns equal to the number of precomputations to the data set. Each new column is named after one precomputation and filled with values as obtained from the corresponding expression `.$expr` applied (rowwise) to the data set. The extended survey data set is returned as a `data.frame`.

`compute_results` *Compute all QIs in a QIDB data pair.*

Description

Applies the Bayesian computation method to all QIs in a QIDB-data-pair, separately to all LEs as identified through the `meta_unit` column in the data.

Usage

```
compute_results(
  qidb_data_pair,
  conf_level = 0.95,
  a = 0.5,
  b = 0.5,
  nMC = 1e+05
)
```

Arguments

qidb_data_pair	A list of QIs with linked data (of class qi)
conf_level	Confidence level of the resulting uncertainty interval
a	first prior parameter of Beta distribution for each QI Merkmal
b	second prior parameter of Beta distribution for each QI Merkmal
nMC	Number of Monte Carlo Samples (needed for QIs with >1 Merkmale)

Value

A data.frame containing all computation results, one row per result

Fields

KN_ID the idenifier of the QI

meta_unit the identifier of the Leistungserbringer (LE)

QI_hat Posterior mean estimate for QI value

J overall number of patients in the data set.

lower lower border of the uncertainty interval.

upper upper border of the uncertainty interval.

Auff_stat indicates if result is "statistisch auffaellig"

RefVal reference value for computation of "statistisch auffaellig"

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connect_qidb2data *Construct a QIDB data pair*

Description

Generate a full set of computable QIs joined by corresponding data.

Usage

```
connect_qidb2data(qidb, data)
```

Arguments

qidb	A list containing specification of multiple QIs. Each list component represents the raw information to one QI.
data	A data.frame containing the pre-processed patient survey data the QI should be evaluated on.

Value

The patient survey data is joined to every qi from the provided qidb, resulting in a list of objects of class qi.

`evaluateQI` *Computation of one QI with attached data and LE*

Description

Apply Bayesian computation method to one QI with an attached data set for one LE. Each individual merkmal of the QI is computed separately. Overall QI results are computed by MC-sampling from the Merkmal-specific posteriors. The seed for MC-sampling is fixed such that repeated evaluation of the QI yields the same results with respect to the credibility interval.

Usage

```
evaluateQI(
  qi,
  meta_unit = NULL,
  conf_level = 0.95,
  a = 0.5,
  b = 0.5,
  nMC = 1e+05
)
```

Arguments

`qi`	The QI to compute (object of class `qi`).
`meta_unit`	The meta_unit (i.e. LE) to compute results for. Default (`NULL`) means that all data are used for computation of overall results.
`conf_level`	Confidence level of the resulting uncertainty interval
`a`	first prior parameter of Beta distribution for each Merkmal
`b`	second prior parameter of Beta distribution for each Merkmal
`nMC`	Number of Monte Carlo Samples (needed for QIs with >1 Merkmale)

Value

A list containing the point estimate and the uncertainty interval.

Fields

`QI_hat` Posterior mean estimate for QI value.

`J` Number of patients in the data set for the LE.

`interval` A vector of length two containing the uncertainty interval.

join_data2qi *Make a QI data pair*

Description

Generate a pair of QI specifications and corresponding data and compute some meta information.

Usage

```
join_data2qi(qi, data)
```

Arguments

qi	a list containing necessary QI specifications
data	a data.frame containing the pre-processed patient survey data the QI should be evaluated on

Value

The function takes the QI specifications and data and generates a more extensive list object of class `qi` to be used for computation of the QI result. For instance, the output contains some meta-information such as number of Merkmale or item categories. The output is ready to use for QI evaluation, i.e. can serve as input for the function `evaluateQI`.

mappings_pci *PCI response category mappings*

Description

A list of item category mapping rules applied to patient survey data for the quality assurance domain PCI (percutaneous coronary intervention and coronary angiography).

Usage

```
mappings_pci
```

Format

A `list` containing two objects. The object `point_mappings`, which is itself a list containing four unnamed list components specifying remapping rules for the answer categories. Each of these four lists contains two objects:

mapping A named `numeric` vector. The categories provided by the names are mapped onto the corresponding values between 0 and 100.

felder A `character` vector providing the column names, which the `mapping` should be applied on.

The second object `ausweichkategorien` is also a list containing specifications of non-informative values given through five lists of the form:

value A `numeric` value, which should be mapped to NA

felder A `character` vector providing the column names, for which the NA replacement should be applied.

precomputations_pci *PCI precomputations*

Description

A list of precomputations applied to patient survey data for the quality assurance domain PCI (percutaneous coronary intervention and coronary angiography). Each precomputation generates a new column within the data.

Usage

```
precomputations_pci
```

Format

A `list` containing two named precomputations. The component names will be used as name of the new data column that will be generated by the precomputation. Each precomputation is itself a list containing 3 objects:

expr The computation rule expression. This commonly refers to specific columns in the underlying data set and utilizes operators from the `iqtigfunctions` package.

prototype An optional reference column. Value labels for the newly computed field are inherited from this reference column.

labels (optional) A set of labels for the newly computed column values

prepareData *Prepare data for the QI-computation.*

Description

Data preparation includes restricting to the GG, defining the static part of the weights, etc. We introduce this data preparation step in order to be able to do subsequent bootstrap resampling faster.

Usage

```
prepareData(qi, clean_data)
```

Arguments

`qi`	A qi (i.e. class `qi`)
`clean_data`	A `data.frame` containing the cleaned patient survey data (all non-missing values are relevant for computation)

Value

Takes the cleaned data set, applies GG condition, restricts to relevant columns and returns the resulting data set as a `data.frame`.

preprocess_data *Apply category mappings*

Description

Create a new data set from raw survey data by applying specified mappings of certain variables

Usage

```
preprocess_data(raw_data, mappings = NULL)
```

Arguments

raw_data	A data.frame containing the raw patient survey data.
mappings	A list containing the mapping specifications, i.e. points value mappings and affected data fields.

Value

Takes the survey data dat and applies the point mappings as listed in mappings$point_mappings and the replacement mappings in mappings$ausweichkategorien. Additional ID and meta_unit columns are also added to the output.

qidb_pci *PCI quality indicator data base*

Description

A list of quality indicator specifications for the quality assurance domain PCI (percutaneous coronary intervention and coronary angiography).

Usage

```
qidb_pci
```

Format

A list containing a set of quality indicators. Each quality indicator is itself list containing 7 objects:

Name The indicator name

KN_ID The indicator ID

GG The patient population ('Grundgesamtheit') to be included in the quality indicator, provided as a filter expression.

RefArt The type of reference value. Possible values are "Fest" (fixed) or "Kein Referenzwert" (no reference value).

RefVal The reference value to be used for indicator result classification

RefOp The reference operator indicating, wether results greater (">=") or lower ("<=") than the reference value are desirable.

Merkmale A list of attributes, that constitute the quality indicator. Each attribute is a list containing the attribute's Name and the underlying Items.

`raw_data_pci` *PCI patient survey data*

Description

An artificial dataset containing patient characteristics and raw survey answers for the quality assurance domain PCI (percutaneous coronary intervention and coronary angiography). Each data entry refers to one patient. Patient responses to survey items can take prespecified values between 0 and 100, where 0 generally refers to "complete disagreement" or "not at all" and 100 refers to "full agreement" or "completely", depending on the item. All survey items allow one or more special response categories for cases, in which the patient cannot or does not want to answer the survey question. These special categories are "-99: no statement", "-98: I do not know or cannot remember", "-97: does not apply due to erroneous questionnaire filter" and "-96: question does not apply for me", "-90: I could not do that, because of other reasons".

Usage

```
raw_data_pci
```

Format

A `data.frame` with 109 rows and 21 variables, which include 14 survey items:

ID ID of data entry

ID_LE ID of the patient's care provider

Fragebogen Questionnaire type

FB_Sent Date of questionnaire submission

Gebdatum Date of birth

Geschlecht Sex

BMI Body mass index

ARermutigtn Survey item: "Doctors encouraged me to ask questions during a consultation."

ARernstn Survey item: "My concerns were taken seriously."

ARrespektn Survey item: "Doctors treated me with respect."

ARgelegenheitn Survey item: "I was given the opportunity to talk to a doctor, if I had any question."

ARInfverstn Survey item: "The information I was given by doctors were comprehensible.

ARfachwortn Survey item: "When talking to me doctors used medical terms that I did not comprehend."

ARdeutschn Survey item: "Sometimes I cound not communicate with doctors, because they did not speak german."

ARgesprochenn Survey item: "In my presence doctors talked about me as if I was not there."

PAvoranginan Survey item: "Did you have any angina pectoris related problems or shortness of breath in advance of the procedure?"

Anginaruhen Survey item: "Angina pectoris related problems: while resting."

Anginaleichtn Survey item: "Angina pectoris related problems: during light everyday activities."

PAvorbeeintrn Survey item: "How much was your everyday life affected by angina pectoris related problems or shortness of breath in advance of the procedure?"

Anginaschwern Survey item: "Angina pectoris related problems: during heavy everyday activities."

Anginaaussergn Survey item: "Angina pectoris related problems: during extraordinary physical efforts."

`theta_bayes` *Bayesian inference for theta for one Merkmal*

Description

This is a helper function for the Bayesian QI computation function. The function computes the parameters of the Beta posterior for the underlying merkmals parameter theta as well as a credibility interval for theta.

Usage

```
theta_bayes(y, nClass, a, b, conf_level)
```

Arguments

`y`	Observed input of all Items of the Merkmal with points
`nClass`	Number of Item categories (supposed do be the same for each Item)
`a`	Prior shape parameter of Beta distribution
`b`	Prior scale parameter of Beta distribution
`conf_level`	Confidence level of the resulting uncertainty interval.

Value

A `list` containing the prior and posterior parameters of the Beta distribution, the corresponding posterior mean value for theta and a credibility interval.

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