Package 'regions'

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Title Processing Regional Statistics

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Description Validating sub-national statistical typologies, re-coding across standard typologies of sub-national statistics, and making valid aggregate level imputation, re-aggregation, re-weighting and projection down to lower hierarchical levels to create meaningful data panels and time series.

License GPL-3

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Language en-US

URL https://regions.dataobservatory.eu/

BugReports https://github.com/rOpenGov/regions

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R topics documented:

`all_valid_nuts_codes` *European Union: All Valid NUTS Codes*

Description

A dataset containing all recognised geo codes in the EU NUTS correspondence tables. This is re-arranged from `nuts_changes`.

Usage

```
all_valid_nuts_codes
```

Format

A data frame with 3 variables:

geo NUTS geo identifier

typology country, NUTS1, NUTS2 or NUTS3

nuts The NUTS definition where the geo code can be found.

Source

https://ec.europa.eu/eurostat/web/nuts/history/

See Also

nuts_recoded, nuts_changes, nuts_exceptions

`australia_states` *Australia: States And Territories*

Description

A dataset containing the states and territories of Australia.

Usage

```
australia_states
```

Format

A data frame with 8 rows and 3 variables:

country_code ISO 3166-1 country codes

geo_code subdivision codes within Australia (states and territories)

geo_name subdivision names within Australia (states and territories)

Source

The Online Browsing Platform of the International Organization for Standardization https://www.iso.org/obp/ui/#iso:code:3166:AU

`create_nuts_lau_2019` *Create the nuts_lau_2019 correspondence table May be used to create similar historical correspondence tables.*

Description

Create the nuts_lau_2019 correspondence table May be used to create similar historical correspondence tables.

Usage

```
create_nuts_lau_2019()
```

Value

A data.frame which is also saved and can be retrieved with `data(nuts_lau_2019)`. Use this function as a template to obtain historical correspondence tables.

daily_internet_users *Daily Internet Users*

Description

A dataset containing the percentage of individuals who used the Internet on a daily basis in the European countries and regions.

Usage

```
daily_internet_users
```

Format

A data frame with 3 variables:

geo National and sub-national geographical codes from Eurostat

time Time, coded as a numeric variable of the year, 2006-2019

values The numeric statistical values

Details

The fresh version of this statistic can be obtained by `eurostat::get_eurostat("isoc_r_iuse_i", time_format = "num")` and filtered for the `indic_is = "I_IDAY"` indicator and the `unit="PC_IND"` unit.

Source

The eventual source of the data is the Eurostat table `isoc_r_iuse_i` https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_r_iuse_i&lang=en

get_country_code *Get Country Code Of Regions*

Description

The function identifies the sub-national geographical identifiers from known typologies and returns the ISO 3166-1 alpha-2 country codes.

Usage

```
get_country_code(geo, typology = "NUTS")
```

Arguments

geo	A character variable with geo codes.
typology	Currently the following typologies are supported: "NUTS1", "NUTS2", "NUTS3" or "NUTS" for any of the NUTS typologies. The technical typology "NUTS0" can be used to translate Eurostat country codes to ISO 3166-1 alpha-2 country codes.

Value

The ISO 3166-1 alpha-2 codes of the countries as a character vector.

See Also

Other recode functions: recode_nuts()

Examples

```
{
get_country_code (c("EL", "GR", "DED", "HU102"))
}
```

---

google_nuts_matchtable

Google Mobility Report European Correspondence Table

Description

A dataset containing the correspondence table between the EU NUTS 2016 typology and the typology used by Google in the Google Mobility Reports.

Usage

```
google_nuts_matchtable
```

Format

A data frame with 817 rows and 6 variables:

country_code ISO 3166-1 alpha2 code

google_region_level Hierarchical level in the Google Mobility Reports

google_region_name The name used by Google.

code_2016 NUTS code in the 2016 definition

typology country, NUTS1, NUTS2 or NUTS3, nuts_level_3_lau, nuts_level_3_iso-3166-2

valid_2016 Logical variable, if the coding is valid in NUTS2016

Details

In some cases only a full correspondence is not possible. In these cases we created pseudo-NUTS codes, which have a `FALSE` `valid_2016` value. These pseudo-NUTS codes can help approximation for the underlying regions.

Pseudo-NUTS codes were used in Estonia, Italy, Portugal, Slovenia and in parts of Latvia.

In Latvia and Slovenia, the pseudo NUTS code is a combination of the the containing NUTS3 code and the municipality's LAU code.

In Estonia, they are a combination of the NUTS3 code and the `ISO-3166-2` LAU code (county level.) This is the case in most of Portugal and the United Kingdom, too. In these cases the pseudo-codes refer to a quasi-NUTS4 code, which are smaller than the containing NUTS3 region, therefore they should be aggregated.

A special case is `ITD_IT-32`, which is is a combination of two NUTS2 statistical regions, but it forms under the `ISO-3166-2` `ITD_IT-32` a single unit, the autonomous region of Trentino and South Tyrol. In this case, they should be disaggregated.

A similar solution is required for the United Kingdom.

Author(s)

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Source

https://ec.europa.eu/eurostat/web/nuts/history/

`impute_down` *Imputing Data From Larger To Smaller Units*

Description

Imputing Data From Larger To Smaller Units

Usage

```
impute_down(
  upstream_data = NULL,
  downstream_data = NULL,
  country_var = "country_code",
  regional_code = "geo_code",
  values_var = "values",
  time_var = NULL,
  upstream_method_var = NULL,
  downstream_method_var = NULL
)
```

Arguments

upstream_data	An upstream data frame to project on containing smaller geographical units, for example, country-level data.
downstream_data	A downstream data frame containing the smaller level missing data observations. It must contain all the necessary structural information for imputation.
country_var	The geographical ID of the upstream data, defaults to "country_code".
regional_code	The geographical ID of the downstream data, defaults to "geo_code".
values_var	The variable that contains the upstream data to be imputed to the downstream data, defaults to "values".
time_var	The time component, if present, defaults to "year".
upstream_method_var	The name of the variable that contains the potentially applied imputation methods. Defaults to NULL.
downstream_method_var	The name of the variable that will contain the metadata of the potentially applied imputation methods. Defaults to NULL in which case a variable called 'method' will be created. If possible, avoid using upstream_data or downstream_data that contains a variable called 'method' for other purposes.

Value

The upstream data frame (containing data of a larger unit) and the downstream data (containing data of smaller sub-divisional units) are joined; whenever data is missing in the downstream sub-divisional column, it is imputed with the corresponding values from the upstream data frame. The 'method' metadata column explains if the actual downstream data or the imputed data can be found in the downstream value column.

See Also

Other impute functions: impute_down_nuts()

Examples

```
{
upstream <- data.frame ( country_code =  rep( "AU", 3),
                         year = c(2018:2020),
                         my_var  = c(10,12,11),
                         description = c("note1", NA_character_,
                         "note3")
                        )

downstream <- australia_states

impute_down ( upstream_data  = upstream,
              downstream_data = downstream,
              country_var = "country_code",
              regional_code = "geo_code",
```

```
                values_var = "my_var",
                time_var = "year" )
}
```

`impute_down_nuts` *Imputing Data From Larger To Smaller Units in the EU NUTS*

Description

This is a special case of `impute_down` for the EU NUTS hierarchical typologies. All valid actual rows will be projected down to all smaller constituent typologies where data is missing.

Usage

```
impute_down_nuts(
  dat,
  geo_var = "geo",
  values_var = "values",
  method_var = NULL,
  nuts_year = 2016
)
```

Arguments

`dat`	A data frame with exactly two or three columns: `geo` for the geo codes of the units, `values` for the values, and optionally `method` for describing the data source.
`geo_var`	The variable that contains the geographical codes in the NUTS typologies, defaults to code"geo_var".
`values_var`	The variable that contains the upstream data to be imputed to the downstream data, defaults to `"values"`.
`method_var`	The variable that contains the metadata on various processing information, defaults to `NULL` in which case it will be returned as `'method'`.
`nuts_year`	The year of the NUTS typology to use, it defaults to the currently valid `2016`. Alternative values can be any of these: `1999`, `2003`, `2006`, `2010`, `2013` and the already announced and defined `2021`. For example, use `2013` for `NUTS2013` data.

Details

The more general function requires typology information from the higher and lower level typologies. This is not needed when the EU vocabulary is used, and the hierarchy can be established from the EU vocabularies.

Be mindful that while all possible imputations are made, imputations beyond one hierarchical level will result in very crude estimates.

The imputed dataset `dat` must refer to a single time unit, i.e. panel data is not supported.

Value

An augmented version of the `dat` imputed data frame with all possible projections to valid smaller units, i.e. `NUTS0` = `country` values imputed to all missing `NUTS1` units, `NUTS1` values imputed to all missing `NUTS2` units, `NUTS2` values imputed to all missing `NUTS3` units.

See Also

Other impute functions: `impute_down()`

Examples

```
data(mixed_nuts_example)
impute_down_nuts(mixed_nuts_example, nuts_year = 2016)
```

`mixed_nuts_example` *Example Data Frame: Mixed EU Typologies.*

Description

This data frame is a fictious example that contains in a small, easy-to-review example many potential typological problems. It is used to test imputation functions and to create examples with them.

Usage

```
mixed_nuts_example
```

Format

A data frame with 22 rows and 3 variables:

geo NUTS geo identifier, mixed from 4 typology levels.

values Random numbers.

method Descriptive metadata.

Source

https://ec.europa.eu/eurostat/web/nuts/history/

See Also

nuts_changes, all_valid_nuts_codes, impute_down_nuts

`nuts_changes` *European Union: Recoded NUTS units 1995-2021.*

Description

A dataset containing the joined correspondence tables of the EU NUTS typologies.

Usage

```
nuts_changes
```

Format

A data frame with 3097 rows and 22 variables:

typology country, NUTS1, NUTS2 or NUTS3
start_year The year when the code was first used
end_year The year when the code was last used
code_1999 NUTS code in the 2003 definition
code_2003 NUTS code in the 2003 definition
code_2006 NUTS code in the 2006 definition
code_2010 NUTS code in the 2010 definition
code_2013 NUTS code in the 2013 definition
code_2016 NUTS code in the 2016 definition
code_2021 NUTS code in the 2021 definition
geo_name_2003 NUTS territorial name in the 2003 definition
geo_name_2006 NUTS territorial name in the 2006 definition
geo_name_2010 NUTS territorial name in the 2010 definition
geo_name_2013 NUTS territorial name in the 2013 definition
geo_name_2016 NUTS territorial name in the 2016 definition
geo_name_2021 NUTS territorial name in the 2021 definition
change_2003 Change described in the 2003 correspondence table
change_2006 Change described in the 2006 correspondence table
change_2010 Change described in the 2010 correspondence table
change_2013 Change described in the 2013 correspondence table
change_2016 Change described in the 2016 correspondence table
change_2021 Change described in the 2021 correspondence table

Source

https://ec.europa.eu/eurostat/web/nuts/history/

See Also

nuts_recoded, all_valid_nuts_codes

nuts_exceptions *NUTS Coding Exceptions*

Description

A dataset containing exceptions to the NUTS geographical codes.

Usage

```
nuts_exceptions
```

Format

A data frame with 2 variables:

geo National and sub-national geographical codes from Eurostat

typology Short description of exception

Details

They contains non-EU regions that are consistent with NUTS, but not defined within the NUTS.

The also contain European country codes that do not conform with NUTS.

Source

Eurostat NUTS history: https://ec.europa.eu/eurostat/web/nuts/history/

See Also

nuts_recoded, nuts_changes, all_valid_nuts_codes

nuts_lau_2019 *European Union: NUTS And LAU Correspondence*

Description

A dataset containing the joined correspondence tables of the EU NUTS and local administration units (LAU) typologies.

Usage

```
nuts_lau_2019
```

Format

A data frame with 99140 rows and 22 variables:

code_2016 NUTS3 code of the local administrative unit, 2016 definition

lau_code Local Administrative Unit code

lau_name_national LAU name, official in national language(s)

lau_name_latin LAU name, official Latin alphabet version

name_change_last_year Change in name in the year before?

population Population

total_area_m2 Area in square meters

degurba Degree of urbanization

degurba_change_last_year Change in degree of urbanization?

coastal_area Part of coastal area classification?

coastal_change_last_year Change in coastal area classification

city_id NUTS territorial name in the 2006 definition

city_id_change_last_year NUTS territorial name in the 2010 definition

city_name Name of the city

greater_city_id Containing metro area ID, if applicable

greater_city_id_change_last_year Change in metro area ID

greater_city_name Name of containing greater city (metropolitan) area, if applicable

fua_id FUA ID

fua_id_change_last_year Change of FUA ID since last year

fua_name Name in FUA database

country NUTS country code with exceptions: EL for Greece, UK for United Kingdom

gisco_id GISCO ID

Details

This is also the authoritative vocabulary for local administration, names, including city and metropolitan area names.

Source

https://ec.europa.eu/eurostat/web/nuts/local-administrative-units

See Also

nuts_recoded, all_valid_nuts_codes

nuts_recoded *European Union: Recoded NUTS units 1995-2021.*

Description

Containing all recoded NUTS units from the European Union. This is re-arranged from `nuts_changes`.

Usage

```
nuts_recoded
```

Format

A data frame with 8 rows and 3 variables:

geo NUTS geo identifier

typology country, NUTS1, NUTS2 or NUTS3

nuts_year year of the NUTS definition or version

change_year when the geo code changed

iso2c Two character ISO standard country codes.

Source

https://ec.europa.eu/eurostat/web/nuts/history/

See Also

nuts_changes, all_valid_nuts_codes

recode_nuts *Recode Region Codes From Source To Target NUTS Typology*

Description

Validate your geo codes, pair them with the appropriate standard typology, look up potential causes of invalidity in the EU correspondence tables, and look up the appropriate geographical codes in the other (target) typology. For example, validate geo codes in the `'NUTS2016'` typology and translate them to the now obsolete the `'NUTS2010'` typology to join current data with historical data sets.

Usage

```
recode_nuts(dat, geo_var = "geo", nuts_year = 2016)
```

Arguments

dat	A data frame with a 3-5 character geo_var variable to be validated.
geo_var	Defaults to "geo". The variable that contains the 3-5 character geo codes to be validated.
nuts_year	The year of the NUTS typology to use. You can select any valid NUTS definition, i.e. 1999, 2003, 2006, 2010, 2013, the currently used 2016 and the already announced and defined 2021. Defaults to the current typology in force, which is 2016.

Value

The original data frame with a 'geo_var' column is extended with a 'typology' column that states in which typology is the 'geo_var' a valid code. For invalid codes, looks up potential reasons of invalidity and adds them to the 'typology_change' column, and at last it adds a column of character vector containing the desired codes in the target typology, for example, in the NUTS2013 typology.

See Also

Other recode functions: get_country_code()

Examples

```
{
foo <- data.frame (
  geo  =  c("FR", "DEE32", "UKI3" ,
            "HU12", "DED",
            "FRK"),
  values = runif(6, 0, 100 ),
  stringsAsFactors = FALSE )

recode_nuts(foo, nuts_year = 2013)
}
```

---

regional_rd_personnel *R&D Personnel by NUTS 2 Regions*

Description

A subset of the Eurostat dataset R&D personnel and researchers by sector of performance, sex and NUTS 2 regions.

Usage

```
regional_rd_personnel
```

Format

A data frame with 956 observations of 7 variables:

geo National and sub-national geographical codes from Eurostat

time Time, coded as a numeric variable of the year, 2006-2019

values The numeric statistical values

unit Unit of measurement, contains only FTE

sex Sex of researchers, contains only both sexes as T

prof_pos Professional position, contains all R&D employees not only researchers

sectperf Sector of performance, filtered for all sectors as TOTAL

Details

Mapping Regional Data, Mapping Metadata Problem

The fresh version of this statistic can be obtained by `eurostat::get_eurostat_json(id = "rd_p_persreg",filters = list(sex = "T", prof_pos = "TOTAL",sectperf = "TOTAL", unit = "FTE"))`

Source

https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_p_persreg&lang=en

See Also

recode_nuts

`regions` *regions: A package for working with regional statistics.*

Description

The regions package provides four categories of functions: validate, recode, impute and aggregate.

validate functions

The validate functions validate the conformity of a typological (geographical) label with a certain typology. Currently the EU statistical NUTS typologies and countries are implemented.

recode functions

These functions correct the geo coding of sub-national statistics, or bring them to a consistent format.

impute functions

The impute functions impute data from one regional unit to a different level of regional unit, such as a country level data to a province / state level data. `impute_down` and provides imputation functions from higher aggregation hierarchy levels to lower ones, for example from `ISO-3166-1` to `ISO-3166-2`. `impute_down_nuts` provides the same functionality with the EU typologies, but with far less work, because they rely on the internal hierarchical structure of these metadata, for example, from `NUTS1` to `NUTS2`.

aggregate functions

Aggregation function from lower hierarchy levels to higher ones, for example from NUTS3 to `NUTS1` or from `ISO-3166-2` to `ISO-3166-1`. Disaggregation functions from higher hierarchy levels to lower ones, for example from `NUTS1` to `NUTS2` or from `ISO-3166-1` to `ISO-3166-2`.

`validate_geo_code` *Validate Conformity with NUTS Geo Codes (vector)*

Description

Validate that `geo` is conforming with the `NUTS1`, `NUTS2`, or `NUTS3` typologies. While country codes are technically not part of the NUTS typologies, Eurostat de facto uses a `NUTS0` typology to identify countries. This de facto typology has three exception which are handled by the validate_nuts_countries function.

Usage

```
validate_geo_code(geo, nuts_year = 2016)
```

Arguments

`geo`	A vector of geographical code to validate.
`nuts_year`	A valid NUTS edition year.

Details

NUTS typologies have different versions, therefore the conformity is validated with one specific versions, which can be any of these: `1999`, `2003`, `2006`, `2010`, `2013`, the currently used `2016` and the already announced and defined `2021`.

The NUTS typology was codified with the `NUTS2003`, and the pre-1999 NUTS typologies may confuse programmatic data processing, given that some NUTS1 regions were identified with country codes in smaller countries that had no `NUTS1` divisions.

Currently the `2016` is used by Eurostat, but many datasets still contain `2013` and sometimes earlier metadata.

Value

A character list with the valid typology, or 'invalid' in the cases when the geo coding is not valid.

Examples

```
my_reg_data <- data.frame (
  geo = c("BE1", "HU102", "FR1",
          "DED", "FR7", "TR", "DED2",
          "EL", "XK", "GB"),
  values = runif(10))

validate_geo_code(my_reg_data$geo)
```

`validate_nuts_countries`
Validate Conformity with NUTS Country Codes

Description

This function is mainly a wrapper around the well-known countrycode function, with three exception that are particular to the European Union statistical nomenclature.

EL Treated valid, because NUTS uses EL instead of GR for Greece since 2010.

UK Treated valid, because NUTS uses UK instead of GB for the United Kingdom.

XK XK is used for Kosovo, because Eurostat uses this code, too.

All ISO-3166-1 country codes are validated, and also the three exceptions.

Usage

```
validate_nuts_countries(dat, geo_var = "geo")
```

Arguments

`dat`	A data frame with a 2-character geo variable to be validated
`geo_var`	Defaults to `"geo"`. The variable that contains the 2 character geo codes to be validated.

Value

The original data frame extended with the column `'typology'`. This column states `'country'` for valid country typology coding, or appropriate label for invalid ISO-3166-alpha-2 and ISO-3166-alpha-3 codes.

See Also

Other validate functions: `validate_nuts_regions()`

Examples

```
{
my_dat <- data.frame (
 geo = c("AL", "GR", "XK", "EL", "UK", "GB", "NLD", "ZZ" ),
 values = runif(8)
 )

 ## NLD is an ISO 3-character code and is not validated.
 validate_nuts_countries(my_dat)
}
```

`validate_nuts_regions` *Validate Conformity With NUTS Geo Codes*

Description

Validate that `geo_var` is conforming with the `NUTS1`, `NUTS2`, or `NUTS3` typologies. While country codes are technically not part of the NUTS typologies, Eurostat de facto uses a `NUTS0` typology to identify countries. This de facto typology has three exception which are handled by the validate_nuts_countries function.

Usage

```
validate_nuts_regions(dat, geo_var = "geo", nuts_year = 2016)
```

Arguments

`dat`	A data frame with a 3-5 character `geo_var` variable to be validated.
`geo_var`	Defaults to `"geo"`. The variable that contains the 3-5 character geo codes to be validated.
`nuts_year`	The year of the NUTS typology to use. Defaults to `2016`. You can select any valid NUTS definition, i.e. `1999`, `2003`, `2006`, `2010`, `2013`, the currently used `2016` and the already announced and defined `2021`.

Details

NUTS typologies have different versions, therefore the conformity is validated with one specific versions, which can be any of these: `1999`, `2003`, `2006`, `2010`, `2013`, the currently used `2016` and the already announced and defined `2021`.

The NUTS typology was codified with the `NUTS2003`, and the pre-1999 NUTS typologies may confuse programmatic data processing, given that some NUTS1 regions were identified with country codes in smaller countries that had no `NUTS1` divisions.

Currently the `2016` is used by Eurostat, but many datasets still contain `2013` and sometimes earlier metadata.

Value

Returns the original dat data frame with a column that specifies the comformity with the NUTS definition of the year nuts_year.

See Also

Other validate functions: validate_nuts_countries()

Examples

```
my_reg_data <- data.frame (
  geo = c("BE1", "HU102", "FR1",
          "DED", "FR7", "TR", "DED2",
          "EL", "XK", "GB"),
  values = runif(10))

validate_nuts_regions (my_reg_data)

validate_nuts_regions (my_reg_data, nuts_year = 2013)

validate_nuts_regions (my_reg_data, nuts_year = 2003)
```

---

validate_parameters *Assertion for Correct Function Calls*

Description

Assertions are made to give early and precise error messages for wrong API call parameters.

Usage

```
validate_parameters(typology = NULL, param = NULL, param_name = NULL)
```

Arguments

typology	Currently the following typologies are supported: "NUTS1", "NUTS2", "NUTS3" or "NUTS" for any of the NUTS typologies. The technical typology "NUTS0" can be used to translate Eurostat country codes to ISO 3166-1 alpha-2 country codes.
param	A parameter value that must not be NULL.
param_name	The name of the parameter that must not have a value of NULL.

Details

These assertions are called from various wrapper functions. However, you can also call this function directly to make sure that you are adding (programmatically) the correct parameters to a call.

All `validate_parameters` parameters default to `NULL`. Asserts the correct parameter values for any values that are not `NULL`.

Value

A boolean, logical variable if the parameter calls are valid.

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