Package 'tongfen'

July 23, 2021

Type Package

Title Make Data Based on Different Geographies Comparable

Version 0.3.3

Description Several functions to allow comparisons of data across different geographies, in particular for Canadian census data from different censuses.

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Encoding UTF-8

ByteCompile yes

LazyData true

NeedsCompilation no

Imports dplyr (>= 1.0),
tidyr (>= 1.0),
PROJ,
sf,
tibble,
rlang,
purrr,
stringr,
readr,
utils,
lifecycle

RoxygenNote 7.1.1

Suggests knitr,
rmarkdown,
RColorBrewer,
ggplot2,
geojsonsf,
cancensus,
tidycensus,
spelling,
readxl,
scales

VignetteBuilder knitr

URL https://github.com/mountainMath/tongfen, https://mountainmath.github.io/tongfen/

BugReports https://github.com/mountainMath/tongfen/issues

Language en-US

RdMacros lifecycle

Depends R (>= 2.10)

R topics documented:

`add_census_ca_base_variables`

Generate metadata from Candian census vectors

Description

[Maturing]

Add Population, Dwellings, and Household counts to metadata

Usage

```
add_census_ca_base_variables(meta)
```

Arguments

`meta`	ribble with metadata as for example provided by ‘meta_for_ca_census_vectors‘

Value

tibble with metadata

`aggregate_data_with_meta` *Aggregate variables in grouped data*

Description

[Maturing]

Aggregate census data up, assumes data is grouped for aggregation Uses data from meta to determine how to aggregate up

Usage

```
aggregate_data_with_meta(data, meta, geo = FALSE, na.rm = TRUE, quiet = FALSE)
```

Arguments

`data`	census data as obtained from get_census call, grouped by TongfenID
`meta`	list with variables and aggregation information as obtained from meta_for_vectors
`geo`	logical, should also aggregate geographic data
`na.rm`	logical, should NA values be ignored or carried through.
`quiet`	logical, don't emit messages if set to 'TRUE'

Value

data frame with variables aggregated to new common geography

Examples

```
# Aggregate population from DA level to grouped by CT_UID
## Not run:
geo <- cancensus::get_census("CA06",regions=list(CSD="5915022"),level='DA')
meta <- meta_for_additive_variables("CA06","Population")
result <- aggregate_data_with_meta(geo %>% group_by(CT_UID),meta)

## End(Not run)
```

check_tongfen_areas *Check geographic integrety*

Description

[Maturing]

Sanity check for areas of estimated tongfen correspondence. This is useful if for example the total extent of geo1 and geo2 differ and there are regions at the edges with large difference in overlap.

Usage

```
check_tongfen_areas(data, correspondence)
```

Arguments

data	alist of geogrpahic data of class sf
correspondence	Correspondence table with columns the unique geographic identifiers for each of the geographies and the TongfenID (and optionally TongfenUID and TongfenMethod) returned by 'estimate_tongfen_correspondence'.

Value

A table with columns 'TongfenID', geo_identifiers, the areas of the aggregated regions corresponding to each geographic identifier column, the tongfen estimation method and the maximum log ratio of the areas.

Examples

```
# Estimate a common geography for 2006 and 2016 dissemination areas in the City of Vancouver
# based on the geographic data and check estimation errors
## Not run:
regions <- list(CSD="5915022")

data_06 <- cancensus::get_census("CA06",regions=regions,geo_format='sf',level="DA") %>%
  rename(GeoUID_06=GeoUID)
data_16 <- cancensus::get_census("CA16",regions=regions,geo_format="sf",level="DA") %>%
  rename(GeoUID_16=GeoUID)

correspondence <- estimate_tongfen_correspondence(list(data_06, data_16),
                                                  c("GeoUID_06","GeoUID_16"))

area_check <- check_tongfen_areas(list(data_06, data_16),correspondence)

## End(Not run)
```

check_tongfen_single_areas

Check geographic integrety

Description

[Deprecated]

Sanity check for areas of estimated tongfen correspondence. This is useful if for example the total extent of geo1 and geo2 differ and there are regions at the edges with large difference in overlap.

Usage

```
check_tongfen_single_areas(geo1, geo2, correspondence)
```

Arguments

geo1	input geometry 1 of class sf
geo2	input geometry 2 of class sf
correspondence	Correspondence table between ‘geo1‘ and ‘geo2‘ as e.g. returned by ‘estimate_tongfen_correspondence‘.

Value

A table with columns ‘TongfenID‘, ‘area1‘ and ‘area2‘, where each row corresponds to a unique ‘TongfenID‘ from them ‘correspondence‘ table and the other columns hold the areas of the regions aggregated from ‘geo1‘ and ‘geo2‘.‘

estimate_tongfen_correspondence

Generate togfen correspondence for list of geographies

Description

[Maturing]

Get correspondence data for arbitrary congruent geometries. Congruent means that one can obtain a common tiling by aggregating several sub-geometries in each of the two input geo data. Worst case scenario the only common tiling is given by unioning all sub-geometries and there is no finer common tiling.

Usage

```
estimate_tongfen_correspondence(
  data,
  geo_identifiers,
  method = "estimate",
  tolerance = 50,
  computation_crs = NULL
)
```

Arguments

data	list of geometries of class sf
geo_identifiers	vector of unique geographic identifiers for each list entry in data.
method	aggregation method. Possible values are "estimate" or "identifier". "estimate" estimates the correspondence purely from the geographic data. "identifier" assumes that regions with identical geo_identifiers are the same, and uses the "estimate" method for the remaining regions. Default is "estimate".
tolerance	tolerance (in projected coordinate units of 'computation_crs') for feature matching
computation_crs	optional crs in which the computation should be carried out, defaults to crs of the first entry in the data parameter.

Value

A correspondence table linking geo1_uid and geo2_uid with unique TongfenID and TongfenUID columns that enumerate the common geometry.

Examples

```
# Estimate a common geography for 2006 and 2016 dissemination areas in the City of Vancouver
# based on the geographic data.
## Not run:
regions <- list(CSD="5915022")

data_06 <- cancensus::get_census("CA06",regions=regions,geo_format='sf',level="DA") %>%
 rename(GeoUID_06=GeoUID)
data_16 <- cancensus::get_census("CA16",regions=regions,geo_format="sf",level="DA") %>%
  rename(GeoUID_16=GeoUID)

correspondence <- estimate_tongfen_correspondence(list(data_06, data_16),
                                                  c("GeoUID_06","GeoUID_16"))


## End(Not run)
```

---

estimate_tongfen_single_correspondence

Generate togfen correspondence for two geographies

Description

[Maturing]

Get correspondence data for arbitrary congruent geometries. Congruent means that one can obtain a common tiling by aggregating several sub-geometries in each of the two input geo data. Worst case scenario the only common tiling is given by unioning all sub-geometries and there is no finer common tiling.

Usage

```
estimate_tongfen_single_correspondence(
  geo1,
  geo2,
  geo1_uid,
  geo2_uid,
  tolerance = 1,
  computation_crs = NULL,
  robust = FALSE
)
```

Arguments

geo1	input geometry 1 of class sf
geo2	input geometry 2 of class sf
geo1_uid	(unique) identifier column for geo1
geo2_uid	(unique) identifier column for geo2
tolerance	tolerance (in projected coordinate units) for feature matching
computation_crs	optional crs in which the computation should be carried out, defaults to crs of geo1
robust	boolean parameter, will ensure geometries are valid if set to TRUE

Value

A correspondence table linking geo1_uid and geo2_uid with unique TongfenID and TongfenUID columns that enumerate the common geometry.

---

get_correspondence_ca_census_for

Get StatCan DA or DB level correspondence file

Description

[Deprecated] Joins the StatCan correspodence files for several census years

Usage

```
get_correspondence_ca_census_for(years, level, refresh = FALSE)
```

Arguments

years	list of census years
level	geographic level, DA or DB
refresh	reload the correspondence files, default is 'FALSE'

Value

tibble with correspondence table'spanning all years

get_single_correspondence_ca_census_for *Get StatCan DA or DB level correspondence file*

Description

[Maturing]

Usage

```
get_single_correspondence_ca_census_for(
  year,
  level = c("DA", "DB"),
  refresh = FALSE
)
```

Arguments

year	census year
level	geographic level, DA or DB
refresh	reload the correspondence files, default is 'FALSE'

Value

tibble with correspondence table'

get_tongfen_ca_census *Togfen data from several Canadian censuses*

Description

[Maturing]

Get data from several Candian censuses on a common geography. Requires sf and cancensus package to be available

Usage

```
get_tongfen_ca_census(
  regions,
  meta,
  level = "CT",
  method = "statcan",
  base_geo = NULL,
  na.rm = FALSE,
  tolerance = 50,
  area_mismatch_cutoff = 0.1,
  quiet = FALSE,
  refresh = FALSE,
  crs = NULL,
  data_transform = function(d) d
)
```

Arguments

regions	census region list, should be inclusive list of GeoUIDs across censuses
meta	metadata for the census veraiables to aggregate, for example as returned by meta_for_ca_census_vectors.
level	aggregation level to return data on (default is "CT")
method	tongfen method, options are "statcan" (the default), "estimate", "identifier". * "statcan" method builds up the common geography using Statistics Canada correspondence files, at this point this method only works for "DB", "DA" and "CT" levels. * "estimate" uses 'estimate_tongfen_correspondence' to build up the common geography from scratch based on geographies. * "identifier" assumes regions with identical geographic identifier are identical, and builds up the the correspondence for regions with unmatched geographic identifiers.
base_geo	base census year to build up common geography from, 'NULL' (the default) to not return any geographi data
na.rm	logical, determines how NA values should be treated when aggregating variables
tolerance	tolerance for 'estimate_tongen_correspondence' in metres, default value is 50 metres, only used when method is 'estimate' or 'identifier'
area_mismatch_cutoff	discard areas returned by 'estimate_tongfen_correspondence' with area mismatch (log ratio) greater than cutoff, only used when method is 'estimate' or 'identifier'
quiet	suppress download progress output, default is 'FALSE'
refresh	optional character, refresh data cache for this call, (default 'FALSE')
crs	optional CRS to transform data to, and use for spatial intersections if method is 'identifier' or 'estimate'
data_transform	optional transform function to be applied to census data after being returned from cancensus

Value

dataframe with variables on common geography

Examples

```
# Get rent data for census years 2001 through 2016
## Not run:
rent_variables <- c(rent_2001="v_CA01_1667",rent_2016="v_CA16_4901",
                    rent_2011="v_CA11N_2292",rent_2006="v_CA06_2050")
meta <- meta_for_ca_census_vectors(rent_variables)

regions=list(CMA="59933")
rent_data <- get_tongfen_ca_census(regions=regions, meta=meta, quiet=TRUE,
                                   method="estimate", level="CT", base_geo = "CA16")


## End(Not run)
```

`get_tongfen_ca_census_ct_from_da` *Canadian census CT level tongfen via DA correspondence*

Description

[Deprecated]

Grab variables from several censuses on a common geography. Requires sf package to be available Will return CT level data

Usage

```
get_tongfen_ca_census_ct_from_da(
  regions,
  vectors,
  geo_format = NA,
  use_cache = TRUE,
  na.rm = TRUE,
  quiet = TRUE
)
```

Arguments

`regions`	census region list, should be inclusive list of GeoUIDs across censuses
`vectors`	List of cancensus vectors, can come from different census years
`geo_format`	'NA' to only get the variables or 'sf' to also get geographic data
`use_cache`	logical, passed to 'cancensus::get_census' to regulate caching
`na.rm`	logical, determines how NA values should be treated when aggregating variables
`quiet`	suppress download progress output, default is 'TRUE'

Value

dataframe with variables on common geography

`get_tongfen_census_ct` *Canadian census CT level tongfen*

Description

[Deprecated]

Grab variables from several censuses on a common geography. Requires sf package to be available Will return CT level data

Usage

```
get_tongfen_census_ct(
  regions,
  vectors,
  geo_format = NA,
  na.rm = TRUE,
  quiet = TRUE,
  refresh = FALSE
)
```

Arguments

regions	census region list, should be inclusive list of GeoUIDs across censuses
vectors	List of cancensus vectors, can come from different census years
geo_format	geographic format for returned data, 'sf' for sf format and 'NA"
na.rm	remove NA values when aggregating up values, default is 'TRUE'
quiet	suppress download progress output, default is 'FALSE'
refresh	optional character, refresh data cache for this call

Value

dataframe with census variables on common geography

---

get_tongfen_census_da *Canadian Census DA level tongfen*

Description

[Deprecated]

Grab variables from several censuses on a common geography. Requires sf package to be available Will return CT level data

Usage

```
get_tongfen_census_da(
  regions,
  vectors,
  geo_format = NA,
  use_cache = TRUE,
  na.rm = TRUE,
  quiet = TRUE
)
```

Arguments

regions	census region list, should be inclusive list of GeoUIDs across censuses
vectors	List of cancensus vectors, can come from different census years
geo_format	'NA' to only get the variables or 'sf' to also get geographic data
use_cache	logical, passed to 'cancensus::get_census' to regulate caching
na.rm	logical, determines how NA values should be treated when aggregating variables
quiet	suppress download progress output, default is 'TRUE'

Value

dataframe with variables on common geography

`get_tongfen_correspondence_ca_census` *Get StatCan correspondence data*

Description

[Maturing]

Get correspondence file for several Candian censuses on a common geography. Requires sf and cancensus package to be available

Usage

```
get_tongfen_correspondence_ca_census(
  geo_datasets,
  regions,
  level = "CT",
  method = "statcan",
  tolerance = 50,
  area_mismatch_cutoff = 0.1,
  quiet = FALSE,
  refresh = FALSE
)
```

Arguments

`geo_datasets`	vector of census geography dataset identifiers
`regions`	census region list, should be inclusive list of GeoUIDs across censuses
`level`	aggregation level to return data on (default is "CT")
`method`	tongfen method, options are "statcan" (the default), "estimate", "identifier". * "statcan" method builds up the common geography using Statistics Canada correspondence files, at this point this method only works for "DB", "DA" and "CT" levels. * "estimate" uses 'estimate_tongfen_correspondence' to build up the common geography from scratch based on geographies. * "identifier" assumes regions with identical geographic identifier are identical, and builds up the the correspondence for regions with unmatched geographic identifiers.
`tolerance`	tolerance for 'estimate_tongen_correspondence' in metres, default value is 50 metres.
`area_mismatch_cutoff`	discard areas returned by 'estimate_tongfen_correspondence' with area mismatch (log ratio) greater than cutoff.
`quiet`	suppress download progress output, default is 'FALSE'
`refresh`	optional character, refresh data cache for this call, (default 'FALSE')

Value

dataframe with the multi-census correspondence file

Examples

```
# Get correspondance files between CTs in 2006 and 2016 censuses in Vancouver CMA
## Not run:
correspondence <- get_tongfen_correspondence_ca_census(geo_datasets=c('CA06','CA16'),
                                                       regions=list(CMA="59933"),level='CT')

## End(Not run)
```

`get_tongfen_us_census` *Get US census data for 2000 and 2010 census on common census tract based geography*

Description

[Maturing]

This wraps data acquisition via the tidycensus package and tongfen on a common geography into a single convenience function.

Usage

```
get_tongfen_us_census(
  regions,
  meta,
  level = "tract",
  survey = "census",
  base_geo = NULL
)
```

Arguments

`regions`	list with regions to query the data for. At this stage, the only valid list is a vector of states, i.e. 'regions = list(state=c("CA","OR"))"
`meta`	metadata for variables to retrieve
`level`	aggregation level to return the data on. At this stage, the only valid levels are 'tract' and 'county subdivision'.
`survey`	survey to get data for, supported options is "census"
`base_geo`	census year to use as base geography, default is '2010'.

Value

sf object with (wide form) census variables with census year as suffix (separated by underdcore "_").

Examples

```
# Get US census data on population and households for 2000 and 2010 censuses on a uniform geography
# based on census tracts.
## Not run:
variables=c(population="H011001",households="H013001")
```

```
meta <- c(2000,2010) %>%
  lapply(function(year){
    v <- variables %>% setNames(paste0(names(.),"_",year))
    meta_for_additive_variables(paste0("dec",year),v)
  }) %>%
  bind_rows()
census_data <- get_tongfen_us_census(regions = list(state="CA"), meta=meta, level="tract") %>%
  mutate(change=population_2010/households_2010-population_2000/households_2000)


## End(Not run)
```

`meta_for_additive_variables` *Generate tongfen metadata for additive variables*

Description

[Maturing]

Generates metadata to be used in tongfen_aggregate. Variables need to be additive like counts.

Usage

```
meta_for_additive_variables(dataset, variables)
```

Arguments

`dataset`	identifier for the dataset contianing the variable
`variables`	(named) vecotor with additive variables

Value

a tibble to be used in tongfen_aggregate

Examples

```
# Get metadata for additive variable Population for the CA16 and CA06 datasets
## Not run:
meta <- meta_for_additive_variables(c("CA06","CA16"),"Population")

## End(Not run)
```

meta_for_ca_census_vectors

Generate metadata from Candian census vectors

Description

[Maturing]

Build tibble with information on how to aggregate variables given vectors Queries list_census_variables to obtain needed information and add in vectors needed for aggregation

Usage

```
meta_for_ca_census_vectors(vectors)
```

Arguments

vectors	list of variables to query

Value

tidy dataframe with metadata information for requested variables and additional variables needed for tongfen operations

Examples

```
# Build metadata for vectors
## Not run:
meta <- meta_for_ca_census_vectors("v_CA16_4836","v_CA16_4838","v_CA16_4899")

## End(Not run)
```

proportional_reaggregate

Dasymetric downsampling

Description

[Maturing]

Proportionally re-aggregate hierarchical data to lower-level w.r.t. values of the *base* variable Also handles cases where lower level data may be available but blinded at times by filling in data from higher level

Data at lower aggregation levels may not add up to the more accurate aggregate counts. This function distributes the aggregate level counts proportionally (by population) to the containing lower level geographic regions.

Usage

```
proportional_reaggregate(
  data,
  parent_data,
  geo_match,
  categories,
  base = "Population"
)
```

Arguments

data	The base geographic data
parent_data	Higher level geographic data
geo_match	A named string informing on what column names to match data and parent_data
categories	Vector of column names to re-aggregate
base	Column name to use for proportional weighting when re-aggregating

Value

dataframe with downsampled variables from parent_data

Examples

```
# Proportionally reaggregate visible minority data from dissemination area 2016
# census data to dissemination block geography, proportionally based on dissemination
# block population
## Not run:
regions <- list(CSD="5915022")
variables <- cancensus::child_census_vectors("v_CA16_3954")

da_data <- cancensus::get_census("CA16",regions=regions,
                                 vectors=setNames(variables$vector,variables$label),
                                 level="DA")
geo_data <- cancensus::get_census("CA16",regions=regions,geo_format="sf",level="DB")

db_data <- geo_data %>% proportional_reaggregate(da_data,c("DA_UID"="GeoUID"),variables$label)


## End(Not run)
```

---

tongfen_aggregate *Perform tongfen according to correspondence*

Description

[Maturing]

Aggregate variables secified in meta for several datasets according to correspondence.

Usage

```
tongfen_aggregate(data, correspondence, meta = NULL, base_geo = NULL)
```

Arguments

data	list of datasets to be aggregated
correspondence	correspondence data for gluing up the datasets
meta	metadata containing aggregation rules as for example returned by ‘meta_for_ca_census_vectors‘
base_geo	identifier for which data element to base the final geography on, uses the first data element if ‘NULL‘ (default), expects that ‘base_geo‘ is an element of ‘names(data)‘.

Value

aggregated dataset of class sf if base_geo is not NULL and data is of type sf or tibble otherwise.

Examples

```
# aggregate census tract level 2006 population data on common gepgraphy build through
# correspondence from 2006 and 2016 census tracts in the City of Vancouver.
## Not run:
regions <- list(CSD="5915022")
geo1 <- cancensus::get_census("CA06",regions=regions,geo_format='sf',level='CT')
geo2 <- cancensus::get_census("CA16",regions=regions,geo_format='sf',level='CT')
meta <- meta_for_additive_variables("CA06","Population")
correspondence <- get_tongfen_correspondence_ca_census(geo_datasets=c('CA06','CA16'),
                                                       regions=regions,level='CT')
result <- tongfen_aggregate(list(geo1 %>% rename(GeoUIDCA06=GeoUID),
                                 geo2 %>% rename(GeoUIDCA16=GeoUID)),correspondence,meta)

## End(Not run)
```

---

tongfen_ca_census_ct *Canadian census CT level tongfen via identifier matching*

Description

[Deprecated]

Aggregate variables to common CTs, returns data2 on new tiling matching data1 geography

Usage

```
tongfen_ca_census_ct(
  data1,
  data2,
  data2_sum_vars,
  data2_group_vars = c(),
  na.rm = TRUE
)
```

Arguments

data1	cancensus CT level datatset for year1 < year2 to serve as base for common geography
data2	cancensus CT level datatset for year2 to be aggregated to common geography
data2_sum_vars	vector of variable names to by summed up when aggregating geographies
data2_group_vars	optional vector of grouping variables
na.rm	optional parameter to remove NA values when summing, default = 'TRUE'

---

tongfen_estimate *Estimate variable values for custom geography*

Description

[Maturing]

Estimates data from source geometry onto target geometry

Usage

```
tongfen_estimate(target, source, meta, na.rm = FALSE)
```

Arguments

target	custom geography to estimate values for
source	input geography with values
meta	metadata for variable aggregation
na.rm	remove NA values when aggregating, default is FALSE

Examples

```
# Estimate 2006 Populatino in the City of Vancouver dissemination ares on 2016 census geoographies
## Not run:
geo1 <- cancensus::get_census("CA06",regions=list(CSD="5915022"),geo_format='sf',level='DA')
geo2 <- cancensus::get_census("CA16",regions=list(CSD="5915022"),geo_format='sf',level='DA')
meta <- meta_for_additive_variables("CA06","Population")
result <- tongfen_estimate(geo2 %>% rename(Population_2016=Population),geo1,meta)

## End(Not run)
```

tongfen_estimate_ca_census *Tongfen estimate data for given geometry*

Description

[Maturing]

Estimates values for the given census vectors for the given geometry using data from the specified level range

Usage

```
tongfen_estimate_ca_census(
  geometry,
  meta,
  level,
  intersection_level = level,
  downsample_level = NULL,
  na.rm = FALSE,
  quiet = FALSE
)
```

Arguments

geometry	geometry
meta	metadata for the census variables to aggregate, for example as returned by 'meta_for_ca_census_vecto At this point this function only accepts variables from the same census geography year. We will expand this to also allow estimates across multiple census geography years, but this requires further attention to detail. It is recommended to apply due caution when running this function separately across several census geography years with the purpose of comparing data across time as a naive application can lead to systematic biases.
level	level to use for tongfen
intersection_level	level to use for geometry intersection, if different from tongfen level by meta_for_ca_census_vecto This can be set at a higher aggregation level to conserve API points for the 'get_intersecting_geometries' call.
downsample_level	default 'NULL', can be a geographic level lower than 'level', in which case the data is downsamples to that geography level proportionally using the value of the 'downsample' column (must be supplied) in the 'meta' argument before intersecting the geometries. This can lead to more accurate results. At this point the only allowed variables for the 'downsample' column in 'meta' are "Population", "Households" or "Dwellings", and it can only be one of these for all variables.
na.rm	how to deal with NA values, default is FALSE.
quiet	suppress progress messages

Examples

```
# Estimate a common geography for 2006 and 2016 dissemination areas in the City of Vancouver
# based on the geographic data and check estimation errors
## Not run:
toronto_city_hall <- sf::st_point(c(-79.3839,43.6534)) %>%
  sf::st_sfc(crs=4326) %>%
  sf::st_transform(3348) %>%
  sf::st_buffer(1000) %>%
  sf::st_sf()

meta <- meta_for_additive_variables("CA16","Population")

data <- tongfen_estimate_ca_census(toronto_city_hall,meta,level="DA",intersection_level="CT")

print(paste0("Approximately ",scales::comma(data$Population,accuracy=100),
             " people live within a 1 km radius of Toronto City."))


## End(Not run)
```

`vancouver_elections_data_2015`

A dataset with polling station votes data from the 2015 federal election in the Vancouver area

---

Description

A dataset with polling station votes data from the 2015 federal election in the Vancouver area

Author(s)

Elections Canada

References

https://www.elections.ca/content.aspx?section=res&dir=rep/off&document=index&lang=e#42GE

`vancouver_elections_data_2019`

A dataset with polling station votes data from the 2019 federal election in the Vancouver area

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Description

A dataset with polling station votes data from the 2019 federal election in the Vancouver area

Author(s)

Elections Canada

References

https://www.elections.ca/content.aspx?section=res&dir=rep/off&document=index&lang=e#43GE

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vancouver_elections_geos_2015

A dataset with polling district geographies from the 2015 federal election in the Vancouver area

---

Description

A dataset with polling district geographies from the 2015 federal election in the Vancouver area

Author(s)

Elections Canada

References

https://www.elections.ca/content.aspx?section=res&dir=rep/off&document=index&lang=e#42GE

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vancouver_elections_geos_2019

A dataset with polling district geographies from the 2019 federal election in the Vancouver area

---

Description

A dataset with polling district geographies from the 2019 federal election in the Vancouver area

Author(s)

Elections Canada

References

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