Package 'DescriptiveRepresentationCalculator'

December 14, 2025

Title Characterizing Observed and Expected Representation

Version 1.1.1

Description A system for analyzing descriptive representation, especially for comparing the composition of a political body to the population it represents. Users can compute the expected degree of representation for a body under a random sampling model, the expected degree of representation variability, as well as representation scores from observed political bodies. The package is based on Gerring, Jerzak, and Oncel (2024) <doi:10.1017/S0003055423000680>.

URL https://github.com/cjerzak/DescriptiveRepresentationCalculator-software/

BugReports https://github.com/cjerzak/DescriptiveRepresentationCalculator-software/issues

Depends R (>= 3.3.3)

License GPL-3

Encoding UTF-8

LazyData false

Imports stats

Suggests knitr,
testthat (>= 3.0.0)

VignetteBuilder knitr

RoxygenNote 7.3.3

Contents

ExpectedRepresentation

Compute the expected degree of representation for any group in a political body

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Description

Finds the degree of expected representation for any group in a political body under a random sampling model as described in Gerring, Jerzak and Oncel (2024).

Usage

```
ExpectedRepresentation(PopShares, BodyN, a = -0.5, b = 1)
```

Arguments

PopShares	A numeric vector containing the group-level population proportions.
BodyN	A positive integer denoting the size of the political body in question.
a, b	The a and b parameters control the affine transformation for how the representation measure is summarized. That is, a and b control how the expected L1 deviation of the population shares from the body shares is re-weighted. The expected L1 deviation is the average value of the absolute deviation of the population from body shares under a random sampling model. This expected L1 deviation is multiplied by a; b is as an additive re-scaling term: a*E[L1]+b. By default, a=-0.5 and b=1 so that the expected Rose Index of Proportionality is returned.

Value

The expected degree of representation (a scalar).

References

- John Gerring, Connor T. Jerzak, Erzen Oncel. (2024), The Composition of Descriptive Representation, *American Political Science Review*, 118(2): 784-801. doi:10.1017/S0003055423000680

See Also

- ObservedRepresentation for calculating representation scores from observed data.
- SDRepresentation for calculating representation unexplained under the random sampling model.

Examples

```
ExpectedRep <- ExpectedRepresentation(PopShares = c(1/4, 2/4, 1/4),
                                      BodyN = 50)

print( ExpectedRep )
```

```
ObservedRepresentation
```
Compute the observed degree of representation for any group in a political body

Description

Finds the degree of observed representation for any group in a political body.

Usage

```
ObservedRepresentation(BodyMemberCharacteristics, PopShares, BodyShares, a = -0.5, b = 1)
```

Arguments

BodyMemberCharacteristics

A vector specifying the characteristics for members of a political body.

PopShares   A numeric vector specifying population shares of identities specified in the body-member characteristics input. The names of the entries in `PopShares` should correspond to identities in that body-member characteristics input (see Example).

BodyShares   (optional) A numeric vector with same structure as `PopShares` specifying group population shares of a given body. If supplied with names, they are matched to `PopShares`; otherwise, the order is assumed to correspond to that of `PopShares`.

a, b   Parameters controlling the affine transformation for how the representation measure is summarized. That is, a and b control how the L1 deviation of the population shares from the body shares is re-weighted. This expected L1 deviation is multiplied by a; b is as an additive re-scaling term: `a*L1+b`. By default, `a=-0.5` and `b=1` so that the Rose Index of Proportionality is returned.

Value

The observed degree of representation (a scalar). By default, this quantity is the Rose Index of Proportionality.

See Also

- [ExpectedRepresentation](#) for calculating expected representation scores under random sampling.
- [SDRepresentation](#) for calculating representation unexplained under the random sampling model.

Examples

```
ObsRep <- ObservedRepresentation(
                    BodyMemberCharacteristics = c("A","A","C","A","C","A"),
                    PopShares = c("A"=1/4,"B"=2/4, "C"=1/4))

print( ObsRep )
```

RelativeRepresentation

Compute relative representation compared to random sampling

Description

Calculates the difference between observed and expected representation. Optionally standardizes this difference using the standard deviation of representation under the random sampling model.

Usage

```
RelativeRepresentation(BodyMemberCharacteristics,
                       PopShares,
                       a = -0.5, b = 1,
                       standardize = FALSE,
                       nMonte = 10000)
```

Arguments

BodyMemberCharacteristics

A vector specifying characteristics for each member of a political body.

PopShares   A numeric vector of population group proportions. Names must correspond to identities in BodyMemberCharacteristics.

a, b   Parameters controlling the affine transformation of the representation index, passed to ObservedRepresentation and ExpectedRepresentation.

standardize   Logical. If TRUE, the difference between observed and expected representation is divided by the standard deviation of representation under random sampling.

nMonte   A positive integer denoting number of Monte Carlo iterations used for estimating the standard deviation when standardize = TRUE.

Value

A scalar giving the difference between observed and expected representation. If standardize = TRUE, the difference is divided by the standard deviation under the random sampling model.

See Also

ObservedRepresentation, ExpectedRepresentation, SDRepresentation

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SDRepresentation   *Compute the amount of representation left unexplained by a random sampling model.*

Description

Finds the residual standard deviation when using the expected representation for any group in a political body to predict observed representation as described in Gerring, Jerzak and Oncel (2024).

Usage

```
SDRepresentation(PopShares, BodyN, a = -0.5, b = 1, nMonte = 10000)
```

Arguments

PopShares	A numeric vector containing the group-level population proportions.
BodyN	A positive integer denoting the size of the political body in question.
a, b	Parameters controlling the affine transformation for how the representation measure is summarized. That is, a and b control how the expected L1 deviation of the population shares from the body shares is re-weighted. The expected L1 deviation is the average value of the absolute deviation of the population from body shares under a random sampling model. This expected L1 deviation is multiplied by a; b is as an additive re-scaling term: a*E[L1]+b. By default, a=-0.5 and b=1 so that the expected Rose Index of Proportionality is used in the calculation.
nMonte	A positive integer denoting number of Monte Carlo iterations used to approximate the variance of representation under a random sampling model.

Value

A scalar summary of the amount of representation not explained by a random sampling model. More precisely, this function returns the the residual standard deviation when using the expected degree of representation to predict observed representation under a random sampling model.

References

- John Gerring, Connor T. Jerzak, Erzen Oncel. (2024), The Composition of Descriptive Representation, *American Political Science Review*, 118(2): 784-801. doi:10.1017/S0003055423000680

See Also

- `ExpectedRepresentation` for calculating expected representation scores under random sampling.
- `ObservedRepresentation` for calculating representation scores from observed data.

Examples

```
SDRep <- SDRepresentation(PopShares = c(1/4, 2/4, 1/4),
                                     BodyN = 50)

print( SDRep )
```

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