

R documentation

of 'dist.genet.Rd'

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dist.genet

Genetic distances from gene frequencies

Description

This program computes any one of five measures of genetic distance from a set of gene frequencies in different populations with several loci.

Usage

```
dist.genet(genet, method = 1, diag = FALSE, upper = FALSE)
```

Arguments

genet	a list of class genet
method	an integer between 1 and 5. See details
diag	a logical value indicating whether the diagonal of the distance matrix should be printed by <code>print.dist</code>
upper	a logical value indicating whether the upper triangle of the distance matrix should be printed by <code>print.dist</code>

Details

Let **A** a table containing allelic frequencies with t populations (rows) and m alleles (columns).

Let ν the number of loci. The locus j gets $m(j)$ alleles. $m = \sum_{j=1}^{\nu} m(j)$

For the row i and the modality k of the variable j , notice the value a_{ij}^k ($1 \leq i \leq t, 1 \leq j \leq \nu, 1 \leq k \leq m(j)$) the value of the initial table.

$$a_{ij}^+ = \sum_{k=1}^{m(j)} a_{ij}^k \text{ and } p_{ij}^k = \frac{a_{ij}^k}{a_{ij}^+}$$

Let **P** the table of general term p_{ij}^k

$$p_{ij}^+ = \sum_{k=1}^{m(j)} p_{ij}^k = 1, p_{i+}^+ = \sum_{j=1}^{\nu} p_{ij}^+ = \nu, p_{++}^+ = \sum_{j=1}^{\nu} p_{i+}^+ = t\nu$$

The option `method` computes the distance matrices between populations using the frequencies p_{ij}^k .

1. Nei's distance:

$$D_1(a, b) = -\ln\left(\frac{\sum_{k=1}^{\nu} \sum_{j=1}^{m(k)} p_{aj}^k p_{bj}^k}{\sqrt{\sum_{k=1}^{\nu} \sum_{j=1}^{m(k)} (p_{aj}^k)^2} \sqrt{\sum_{k=1}^{\nu} \sum_{j=1}^{m(k)} (p_{bj}^k)^2}}\right)$$

2. Angular distance or Edwards' distance:

$$D_2(a, b) = \sqrt{1 - \frac{1}{\nu} \sum_{k=1}^{\nu} \sum_{j=1}^{m(k)} p_{aj}^k p_{bj}^k}$$

3. Coancestrality coefficient or Reynolds' distance:

$$D_3(a, b) = \sqrt{\frac{\sum_{k=1}^{\nu} \sum_{j=1}^{m(k)} (p_{aj}^k - p_{bj}^k)^2}{2 \sum_{k=1}^{\nu} (1 - \sum_{j=1}^{m(k)} p_{aj}^k p_{bj}^k)}}$$

4. Classical Euclidean distance or Rogers' distance:

$$D_4(a, b) = \frac{1}{\nu} \sum_{k=1}^{\nu} \sqrt{\frac{1}{2} \sum_{j=1}^{m(k)} (p_{aj}^k - p_{bj}^k)^2}$$

5. Absolute genetics distance or Provesti's distance:

$$D_5(a, b) = \frac{1}{2\nu} \sum_{k=1}^{\nu} \sum_{j=1}^{m(k)} |p_{aj}^k - p_{bj}^k|$$

Value

returns a distance matrix of class `dist` between the rows of the data frame

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References

To complete informations about distances:

Distance 1:

Nei, M. (1972) Genetic distances between populations. *American Naturalist*, **106**, 283–292.

Nei M. (1978) Estimation of average heterozygosity and genetic distance from a small number of individuals. *Genetics*, **23**, 341–369.

Avise, J. C. (1994) Molecular markers, natural history and evolution. Chapman & Hall, London.

Distance 2:

Edwards, A.W.F. (1971) Distance between populations on the basis of gene frequencies. *Biometrics*, **27**, 873–881.

Cavalli-Sforza L.L. and Edwards A.W.F. (1967) Phylogenetic analysis: models and estimation procedures. *Evolution*, **32**, 550–570.

Hartl, D.L. and Clark, A.G. (1989) Principles of population genetics. Sinauer Associates, Sunderland, Massachusetts (p. 303).

Distance 3:

Reynolds, J. B., B. S. Weir, and C. C. Cockerham. (1983) Estimation of the coancestry coefficient: basis for a short-term genetic distance. *Genetics*, **105**, 767–779.

Distance 4:

Rogers, J.S. (1972) Measures of genetic similarity and genetic distances. *Studies in Genetics*, Univ.

Texas Publ., **7213**, 145–153.

Avise, J. C. (1994) Molecular markers, natural history and evolution. Chapman & Hall, London.

Distance 5:

Prevosti A. (1974) La distancia genética entre poblaciones. *Miscellanea Alcobé*, **68**, 109–118.

Prevosti A., Ocaña J. and Alonso G. (1975) Distances between populations of *Drosophila subobscura*, based on chromosome arrangements frequencies. *Theoretical and Applied Genetics*, **45**, 231–241.

To find some useful explanations:

Sanchez-Mazas A. (2003) Cours de Génétique Moléculaire des Populations. Cours VIII Distances génétiques - Représentation des populations.

http://anthro.unige.ch/GMDP/Alicia/GMDP_dist.htm

Examples

```
data(casitas)
casi.genet <- char2genet(casitas,
  as.factor(rep(c("dome", "cast", "musc", "casi"), c(24,11,9,30))))
ldist <- lapply(1:5, function(method) dist.genet(casi.genet,method))
ldist
unlist(lapply(ldist, is.euclid))
kdist(ldist)
```

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