

# Package ‘bfcluster’

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**Title** Buttler-Fickel Distance and R2 for Mixed-Scale Cluster Analysis

**Version** 1.0.0

**Description** Implements the distance measure for mixed-scale variables proposed by Buttler and Fickel (1995), based on normalized mean pairwise distances (Gini mean difference), and an R2 statistic to assess clustering quality.

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**Encoding** UTF-8

**RoxygenNote** 7.3.3

**Depends** R (>= 4.0.0)

**NeedsCompilation** no

**Author** Moritz Schäfer [aut, cre]

**Maintainer** Moritz Schäfer <moritz1.schaefer@uni-a.de>

**Repository** CRAN

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bf\_R2 *R<sup>2</sup> for Cluster Solutions after Buttler & Fickel (1995)*

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## Description

Computes the proportion of explained distance variation ( $R^2$ ) for a given clustering solution using a distance matrix derived from the Buttler-Fickel distance. The statistic reflects how well the clustering partitions the total pairwise distance structure.

**Usage**

```
bf_R2(D, cluster)
```

**Arguments**

**D** A distance object of class `dist`, usually computed via `buttlер_fickel_dist()`.

**cluster** An integer or factor vector of cluster assignments, typically obtained from `cutree()` or another clustering method.

**Details**

The  $R^2$  is defined as:

$$R^2 = 1 - \frac{D_{\text{within}}}{D_{\text{total}}}$$

where  $D_{\text{total}}$  is the sum of all pairwise distances and  $D_{\text{within}}$  is the sum of distances within clusters.

**Value**

A numeric value between 0 and 1 indicating the proportion of explained distance variation. Higher values represent better cluster fit.

**Examples**

```
df <- data.frame(
  sex    = factor(c("m", "f", "m", "f")),
  height = c(180, 165, 170, 159),
  age    = c(25, 32, 29, 28)
)

types <- c("nominal", "metric", "metric")

D <- buttlер_fickel_dist(df, types)
hc <- hclust(D)
cl <- cutree(hc, k = 2)

bf_R2(D, cl)
```

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buttlер\_fickel\_dist *Buttler-Fickel Distance Matrix*

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**Description**

Computes a distance matrix following Buttler & Fickel (1995) for mixed-scale variables. Each variable-specific distance matrix is normalized by its mean pairwise distance (Gini mean difference), ensuring equal contribution of all variables to the overall distance.

**Usage**

```
buttlér_fickel_dist(df, types)
```

**Arguments**

df	A data.frame where rows are cases and columns are variables.
types	A character vector of the same length as ncol(df), indicating the scale level of each variable. Allowed values are "metric", "ordinal", or "nominal".

**Value**

An object of class dist.

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