index.G1(clusterSim)

Caliński-Harabasz pseudo F-Statistic

$$G1(u) = \frac{\text{trace}(\mathbf{B}_u)/(u-1)}{\text{trace}(\mathbf{W}_u)/(n-u)},$$

where: $\boldsymbol{X} = \{x_{ij}\}$, $i = 1, \ldots, n$; $j = 1, \ldots, m$ – data matrix,
n – number of objects,
m – number of variables,
u – number of clusters ($u = 2, \ldots, n-1$),
$\boldsymbol{W}_u = \sum_r \sum_{i \in C_r} (\boldsymbol{x}_{ri} - \bar{\boldsymbol{x}}_r)(\boldsymbol{x}_{ri} - \bar{\boldsymbol{x}}_r)^T$ – within-group dispersion matrix for data clustered into u clusters,
$\boldsymbol{B}_u = \sum_r n_r (\bar{\boldsymbol{x}}_r - \bar{\boldsymbol{x}})(\bar{\boldsymbol{x}}_r - \bar{\boldsymbol{x}})^T$ – between-group dispersion matrix for data clustered into u clusters,
$r = 1, \ldots, u$ – cluster number,
$\bar{\boldsymbol{x}}_r$ – centroid or medoid of cluster r,
$\bar{\boldsymbol{x}}$ – centroid or medoid of data matrix,
C_r – the indices of objects in cluster r,
n_r – number of objects in cluster r.

The value of u, which maximizes $G1(u)$, is regarded as specifying the number of clusters.

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