index.S(clusterSim)

Rousseeuw Silhouette internal cluster quality index

$$S(u) = \sum_{i=1}^{n} S(i)/n$$

$$S(u) \in [-1, \quad 1],$$

where: $S(i) = \frac{b(i)-a(i)}{max\{a(i);b(i)\}}$,

$i, k = 1, \ldots, n$ – number of object,

P_r, P_s – r-th, s-th cluster,

u – number of clusters,

n_r, n_s – number of objects in cluster P_r, P_s,

$a(i) = \sum_{k \in \{P_r \setminus i\}} d_{ik}/(n_r - 1)$ – average dissimilarity of i-th object to all other objects of P_r cluster;

$b(i) = \min_{s \neq r}\{d_{iP_s}\}$,

$d_{iP_s} = \sum_{k \in P_s} d_{ik}/n_s$ – average dissimilarity of i-th object to all objects of P_s cluster.

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

References

Gatnar, E., Walesiak, M. (Eds.) (2004), *Metody statystycznej analizy wielowymiarowej w badaniach marketingowych [Multivariate statistical analysis methods in marketing research]*, Wydawnictwo AE, Wroclaw, 342-343, erratum.

Kaufman, L., Rousseeuw, P.J. (1990), *Finding groups in data: an introduction to cluster analysis*, Wiley, New York, 83-88.

Gordon, A.D. (1999), *Classification*, Chapman & Hall/CRC, London, 204-206.

Rousseeuw, P.J. (1987), *Silhouettes: a graphical aid to the interpretation and validation of cluster analysis*, "Journal of Computational and Applied Mathematics", 20, 53-65.