

replication.Mod(clusterSim)

Modification of replication analysis for cluster validation

Formally, replicating clusters proceeds as follows (see Breckenridge [2000], 262-263; Milligan [1996], 368-369; Gordon [1999], 184; Walesiak [2008]):

1. The data are randomly divided into two samples: sample A (arbitrarily primary) and sample B (replication). Data must exist on the same set of variables in both samples.

2. Sample A is clustered (via `kmeans`, `pam` or any hierarchical agglomerative method: `single`, `complete`, `average`, `mcquitty`, `median`, `centroid`, `Ward`) into u clusters $A = \{A_1, \dots, A_u\}$. Decisions regarding variable normalization, distance measure, and selection of the number of clusters are to be completed. Once clusters have been identified, the centroids of u clusters are computed (for metric data) or u representative objects (often called centrotypes or medoids) are selected (for metric or nonmetric data).

3. Sample B is clustered, using the same clustering procedure, into u clusters $B = \{B_1, \dots, B_u\}$.

4. Determine the distances between sample B objects to the centroids (or medoids) of sample A . Assign objects from sample B to their nearest centroid (or medoid). Each element in sample B is assigned to the nearest centroid (or medoid) determined from the sample A (this provides a partition of sample B into no more than u clusters). This produces a clustering of sample B based on characteristics of sample A : $B^* = \{B_1^*, \dots, B_u^*\}$.

5. Repeat steps 1-4 S times (S – the number of simulations).

6. Compute a measure of agreement (mean corrected Rand index – see Hubert and Arabie [1985]) between two clusterings B and B^* for S simulations. The level of agreement between the two partitions reflects the stability of the clustering in the data.

References

- Breckenridge, J.N. (2000), *Validating cluster analysis: consistent replication and symmetry*, "Multivariate Behavioral Research", 35 (2), 261-285.
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- Hubert, L., Arabie, P. (1985), *Comparing partitions*, "Journal of Classification", no. 1, 193-218.
- Milligan, G.W. (1996), *Clustering validation: results and implications for applied analyses*, In P. Arabie, L.J. Hubert, G. de Soete (Eds.), *Clustering and classification*, World Scientific, Singapore, 341-375.
- Walesiak, M. (2008), *Ocena stabilnosci wyników klasyfikacji z wykorzystaniem analizy replikacji*, In: J. Pociecha (Ed.), *Modelowanie i prognozowanie zjawisk społeczno-gospodarczych*, Wydawnictwo UE, Krakow, 67-72.