

Davies-Bouldin Criterion

The Davies-Bouldin criterion is based on a ratio of within-cluster and between-cluster distances. The Davies-Bouldin index is defined as

$$DB = \frac{1}{k} \sum_{i=1}^k \max_{j \neq i} \{D_{i,j}\},$$

where $D_{i,j}$ is the within-to-between cluster distance ratio for the i th and j th clusters. In mathematical terms,

$$D_{i,j} = \frac{(\bar{d}_i + \bar{d}_j)}{d_{i,j}}.$$

\bar{d}_i is the average distance between each point in the i th cluster and the centroid of the i th cluster. \bar{d}_j is the average distance between each point in the j th cluster and the centroid of the j th cluster. $d_{i,j}$ is the Euclidean distance between the centroids of the i th and j th clusters.

The maximum value of $D_{i,j}$ represents the worst-case within-to-between cluster ratio for cluster i . The optimal clustering solution has the smallest Davies-Bouldin index value.