



`mapper.filters.kNN_distance(data, k, metricpar={}, callback=None)`

The distance to the k-th nearest neighbor as an (inverse) measure of density.

Note how the number of nearest neighbors is understood:

k=1, the first neighbor, makes no sense for a filter function since the first nearest neighbor of a data point is always the point itself, and hence this filter function is constantly zero.

The parameter k=2 measures the distance from x_i to the nearest data point other than x_i itself.

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$\delta_1(x) =$

$\delta_2(x) =$

$\delta_3(x) =$

$\delta_4(x) =$

If x is in a denser region than y, then $\delta_x(x) < \delta_x(y)$

Image of a circle under linear transformation $T(x) = Ax$ where A is a symmetric matrix

<https://en.wikipedia.org/wiki/File:Singular-Value-Decomposition.svg>

$$M = U \cdot \Sigma \cdot V^*$$

The SVD decomposes M into three simple transformations:

- a rotation V ,
- a scaling Σ along the coordinate axes and
- a second rotation U .