

Package ‘lumbermark’

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Type Package

Title Resistant Clustering via Chopping Up Mutual Reachability Minimum Spanning Trees

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Description Implements a fast and resistant divisive clustering algorithm which identifies a specified number of clusters: 'lumbermark' iteratively chops off sizeable limbs that are joined by protruding segments of a dataset's mutual reachability minimum spanning tree; see Gagolewski (2026) <<https://lumbermark.gagolewski.com/>>. The use of a mutual reachability distance pulls peripheral points farther away from each other. When combined with the 'deadwood' package, it can act as an outlier detector. The 'Python' version of 'lumbermark' is available via 'PyPI'.

BugReports <https://github.com/gagolews/lumbermark/issues>

URL <https://lumbermark.gagolewski.com/>,
<https://clustering-benchmarks.gagolewski.com/>,
<https://github.com/gagolews/lumbermark>

License AGPL-3

Imports Rcpp, deadwood

Suggests datasets,

LinkingTo Rcpp

Encoding UTF-8

SystemRequirements OpenMP

RoxygenNote 7.3.3

NeedsCompilation yes

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|------------|---|
| lumbermark | <i>Lumbermark: Fast and Robust Clustering</i> |
|------------|---|

Description

Lumbermark is a fast and robust divisive clustering algorithm which identifies a specified number of clusters.

It iteratively chops off sizeable limbs that are joined by protruding segments of a dataset's mutual reachability minimum spanning tree.

The use of a mutual reachability distance ($M > 1$; Campello et al., 2013) pulls peripheral points farther away from each other. This way, Lumbermark gives an alternative to the HDBSCAN* algorithm that is able to detect a predefined number of clusters and indicate outliers (via **deadwood**; see Gagolewski, 2026).

Usage

```
lumbermark(d, ...)
```

```
## Default S3 method:
```

```
lumbermark(
  d,
  k,
  min_cluster_size = 10,
  min_cluster_factor = 0.25,
  skip_leaves = (M > 0L),
  M = 5L,
  distance = c("euclidean", "l2", "manhattan", "cityblock", "l1", "cosine"),
  verbose = FALSE,
  ...
)
```

```
## S3 method for class 'dist'
```

```
lumbermark(
  d,
  k,
  min_cluster_size = 10,
  min_cluster_factor = 0.25,
  skip_leaves = (M > 0L),
  M = 5L,
  verbose = FALSE,
  ...
)
```

```

)

## S3 method for class 'mst'
lumbermark(
  d,
  k,
  min_cluster_size = 10,
  min_cluster_factor = 0.25,
  skip_leaves = TRUE,
  verbose = FALSE,
  ...
)

```

Arguments

| | |
|---------------------------------|---|
| <code>d</code> | a numeric matrix (or an object coercible to one, e.g., a data frame with numeric-like columns) or an object of class <code>dist</code> (see dist), or an object of class <code>mst</code> (see mst) |
| <code>...</code> | further arguments passed to mst() |
| <code>k</code> | integer; the desired number of clusters to detect |
| <code>min_cluster_size</code> | integer; minimal cluster size |
| <code>min_cluster_factor</code> | numeric value in (0,1); output cluster sizes will not be smaller than <code>min_cluster_factor*n/k</code> |
| <code>skip_leaves</code> | logical; whether the MST leaves should be omitted from cluster size counting |
| <code>M</code> | integer; smoothing factor; $M \leq 1$ gives the selected distance; otherwise, the mutual reachability distance is used |
| <code>distance</code> | metric used to compute the linkage, one of: "euclidean" (synonym: "l2"), "manhattan" (a.k.a. "l1" and "cityblock"), "cosine" |
| <code>verbose</code> | logical; whether to print diagnostic messages and progress information |

Details

As with all distance-based methods (this includes k-means and DBSCAN as well), applying data preprocessing and feature engineering techniques (e.g., feature scaling, feature selection, dimensionality reduction) might lead to more meaningful results.

If `d` is a numeric matrix or an object of class `dist`, [mst\(\)](#) will be called to compute an MST, which generally takes at most $O(n^2)$ time. However, by default, a faster algorithm based on K-d trees is selected automatically for low-dimensional Euclidean spaces; see [mst_euclid](#) from the **quitefastmst** package.

Once a minimum spanning tree is determined, the Lumbermark algorithm runs in $O(kn)$ time. If you want to test different parameters or `ks`, it is best to compute the MST explicitly beforehand.

Value

`lumbermark()` returns an object of class `mstclust`, which defines a k -partition, i.e., a vector whose i -th element denotes the i -th input point's cluster label between 1 and k .

The `mst` attribute gives the computed minimum spanning tree which can be reused in further calls to the functions from **genieclust**, **lumbermark**, and **deadwood**.

The `cut_edges` attribute gives the $k - 1$ indexes of the MST edges whose omission leads to the requested k -partition (connected components of the resulting spanning forest).

Author(s)

Marek Gagolewski

References

M. Gagolewski, `lumbermark`, in preparation, 2026

R.J.G.B. Campello, D. Moulavi, J. Sander, Density-based clustering based on hierarchical density estimates, *Lecture Notes in Computer Science* 7819, 2013, 160-172, doi:10.1007/978364237456-2_14

M. Gagolewski, A. Cena, M. Bartoszuk, Ł. Brzozowski, Clustering with minimum spanning trees: How good can it be?, *Journal of Classification* 42, 2025, 90-112, doi:10.1007/s00357024094831

M. Gagolewski, `deadwood`, in preparation, 2026

M. Gagolewski, `quitefastmst`, in preparation, 2026

See Also

The official online manual of **lumbermark** at <https://lumbermark.gagolewski.com/mst/> for the minimum spanning tree routines

Examples

```
library("datasets")
data("iris")
X <- jitter(as.matrix(iris[3:4]))
y_pred <- lumbermark(X, k=3)
y_test <- as.integer(iris[,5])
plot(X, col=y_pred, pch=y_test, asp=1, las=1)

# detect 3 clusters and find outliers with Deadwood
library("deadwood")
y_pred2 <- lumbermark(X, k=3)
plot(X, col=y_pred2, asp=1, las=1)
is_outlier <- deadwood(y_pred2)
points(X[!is_outlier, ], col=y_pred2[!is_outlier], pch=16)
```

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