

# Package: dyndimred (via r-universe)

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**Type** Package

**Title** Dimensionality Reduction Methods in a Common Format

**Version** 1.0.4

**Description** Provides a common interface for applying dimensionality reduction methods, such as Principal Component Analysis ('PCA'), Independent Component Analysis ('ICA'), diffusion maps, Locally-Linear Embedding ('LLE'), t-distributed Stochastic Neighbor Embedding ('t-SNE'), and Uniform Manifold Approximation and Projection ('UMAP'). Has built-in support for sparse matrices.

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**Imports** dynutils (>= 1.0.5), irlba, lmds, stats, tibble

**Suggests** testthat, diffusionMap, fastICA, igraph, lle, MASS, Matrix, RANN, Rtsne, smacof, uwot

**RoxygenNote** 7.1.1

**Roxygen** list(markdown = TRUE)

**URL** <https://github.com/dynverse/dyndimred>

**BugReports** <https://github.com/dynverse/dyndimred/issues>

**Config/pak/sysreqs** git libicu-dev

**Repository** <https://dynverse.r-universe.dev>

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|        |                                                |
|--------|------------------------------------------------|
| dimred | <i>Perform simple dimensionality reduction</i> |
|--------|------------------------------------------------|

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## Description

Perform simple dimensionality reduction

## Usage

```
dimred(x, method, ndim, ...)

dimred_dm_destiny(
  x,
  ndim = 2,
  distance_method = c("euclidean", "spearman", "cosine")
)

dimred_dm_diffusionmap(
  x,
  ndim = 2,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)

dimred_ica(x, ndim = 3)

dimred_knn_fr(
  x,
  ndim = 2,
  lmds_components = 10,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski"),
  n_neighbors = 10
)

dimred_landmark_mds(
  x,
  ndim = 2,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
```

```

    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)

dimred_lle(x, ndim = 3)

dimred_mds(
  x,
  ndim = 2,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)

dimred_mds_isomds(
  x,
  ndim = 2,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)

dimred_mds_sammon(
  x,
  ndim = 2,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)

dimred_mds_smacof(
  x,
  ndim = 2,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)

dimred_pca(x, ndim = 2)

list_dimred_methods()

```

## Arguments

|                              |                                                                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>               | Log transformed expression data, with rows as cells and columns as features                                                               |
| <code>method</code>          | The name of the dimensionality reduction method to use                                                                                    |
| <code>ndim</code>            | The number of dimensions                                                                                                                  |
| <code>...</code>             | Any arguments to be passed to the dimensionality reduction method                                                                         |
| <code>distance_method</code> | The name of the distance metric, see <a href="#">dynutils::calculate_distance</a>                                                         |
| <code>lmds_components</code> | The number of lmds components to use. If NULL, LMDS will not be performed first. If this is a matrix, it is assumed it is a dimred for x. |

`n_neighbors`      The size of local neighborhood (in terms of number of neighboring sample points).

### Examples

```
library(Matrix)
x <- abs(Matrix::rsparsematrix(100, 100, .5))
dimred(x, "pca", ndim = 3)
dimred(x, "ica", ndim = 3)

if (interactive()) {
  dimred_dm_destiny(x)
  dimred_dm_diffusionmap(x)
  dimred_ica(x)
  dimred_landmark_mds(x)
  dimred_lle(x)
  dimred_mds(x)
  dimred_mds_isomds(x)
  dimred_mds_sammon(x)
  dimred_mds_smacof(x)
  dimred_pca(x)
  dimred_tsne(x)
  dimred_umap(x)
}
```

---

|             |             |
|-------------|-------------|
| dimred_tsne | <i>tSNE</i> |
|-------------|-------------|

---

### Description

tSNE

### Usage

```
dimred_tsne(
  x,
  ndim = 2,
  perplexity = 30,
  theta = 0.5,
  initial_dims = 50,
  distance_method = c("pearson", "spearman", "cosine", "euclidean", "chisquared",
    "hamming", "kullback", "manhattan", "maximum", "canberra", "minkowski")
)
```

### Arguments

`x`                      Log transformed expression data, with rows as cells and columns as features

`ndim`                  The number of dimensions

|                 |                                                                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| perplexity      | numeric; Perplexity parameter (should not be bigger than $3 * \text{perplexity} < \text{nrow}(X) - 1$ , see details for interpretation) |
| theta           | numeric; Speed/accuracy trade-off (increase for less accuracy), set to 0.0 for exact TSNE (default: 0.5)                                |
| initial_dims    | integer; the number of dimensions that should be retained in the initial PCA step (default: 50)                                         |
| distance_method | The name of the distance metric, see <a href="#">dynutils::calculate_distance</a>                                                       |

**See Also**

[Rtsne::Rtsne\(\)](#)

**Examples**

```
library(Matrix)
dataset <- abs(Matrix::rsparsematrix(100, 100, .5))
dimred_tsne(dataset, ndim = 3)
```

---

dimred\_umap

*UMAP*


---

**Description**

UMAP

**Usage**

```
dimred_umap(
  x,
  ndim = 2,
  distance_method = c("euclidean", "cosine", "manhattan"),
  pca_components = 50,
  n_neighbors = 15L,
  init = "spectral",
  n_threads = 1
)
```

**Arguments**

|                 |                                                                                        |
|-----------------|----------------------------------------------------------------------------------------|
| x               | Log transformed expression data, with rows as cells and columns as features            |
| ndim            | The number of dimensions                                                               |
| distance_method | The name of the distance metric, see <a href="#">dynutils::calculate_distance</a>      |
| pca_components  | The number of pca components to use for UMAP. If NULL, PCA will not be performed first |

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>n_neighbors</code> | The size of local neighborhood (in terms of number of neighboring sample points).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <code>init</code>        | <p>Type of initialization for the coordinates. Options are:</p> <ul style="list-style-type: none"> <li>• "spectral" Spectral embedding using the normalized Laplacian of the fuzzy 1-skeleton, with Gaussian noise added.</li> <li>• "normlaplacian". Spectral embedding using the normalized Laplacian of the fuzzy 1-skeleton, without noise.</li> <li>• "random". Coordinates assigned using a uniform random distribution between -10 and 10.</li> <li>• "lvrandom". Coordinates assigned using a Gaussian distribution with standard deviation 1e-4, as used in LargeVis (Tang et al., 2016) and t-SNE.</li> <li>• "laplacian". Spectral embedding using the Laplacian Eigenmap (Belkin and Niyogi, 2002).</li> <li>• "pca". The first two principal components from PCA of <math>X</math> if <math>X</math> is a data frame, and from a 2-dimensional classical MDS if <math>X</math> is of class "dist".</li> <li>• "spca". Like "pca", but each dimension is then scaled so the standard deviation is 1e-4, to give a distribution similar to that used in t-SNE. This is an alias for <code>init = "pca"</code>, <code>init_sdev = 1e-4</code>.</li> <li>• "agspectral" An "approximate global" modification of "spectral" which all edges in the graph to a value of 1, and then sets a random number of edges (<code>negative_sample_rate</code> edges per vertex) to 0.1, to approximate the effect of non-local affinities.</li> <li>• A matrix of initial coordinates.</li> </ul> <p>For spectral initializations, ("spectral", "normlaplacian", "laplacian"), if more than one connected component is identified, each connected component is initialized separately and the results are merged. If <code>verbose = TRUE</code> the number of connected components are logged to the console. The existence of multiple connected components implies that a global view of the data cannot be attained with this initialization. Either a PCA-based initialization or increasing the value of <code>n_neighbors</code> may be more appropriate.</p> |
| <code>n_threads</code>   | Number of threads to use (except during stochastic gradient descent). Default is half the number of concurrent threads supported by the system. For nearest neighbor search, only applies if <code>nn_method = "annoy"</code> . If <code>n_threads &gt; 1</code> , then the Annoy index will be temporarily written to disk in the location determined by <a href="#">tempfile</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### See Also

[uwot::umap\(\)](#)

### Examples

```
library(Matrix)
dataset <- abs(Matrix::rsparsematrix(100, 100, .5))
dimred_umap(dataset, ndim = 2, pca_components = NULL)
```

---

dyndimred*Common dimensionality reduction methods*

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**Description**

Provides a common interface for applying common dimensionality reduction methods, Such as PCA, ICA, diffusion maps, LLE, t-SNE, and umap.

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