

Package ‘PseudoVoigtMixt’

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Type Package

Title Multivariate Pseudo-Voigt Mixture Models

Version 0.1.0

Description Fits multivariate pseudo-Voigt mixture models for model-based clustering and outlier detection. The model combines multivariate Gaussian and Cauchy distributions within each cluster to accommodate heavy-tailed observations and decompose the data into a high-density region and a low-density remainder, with outliers more likely to arise from the latter.

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Imports MASS, tclust

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MPVmixture

Fit Multivariate Pseudo-Voigt Mixture Models Estimates MPVM models over a range of numbers of components and selects the best-fitting model according to the Bayesian information criterion (BIC).

Description

Fit Multivariate Pseudo-Voigt Mixture Models Estimates MPVM models over a range of numbers of components and selects the best-fitting model according to the Bayesian information criterion (BIC).

Usage

```
MPVmixture(
  x,
  G_range,
  max_iter = 100,
  init_method = c("modified_tkmeans", "manual"),
  tol = 1e-08,
  alpha_trim = 0.3,
  nstart = 1000,
  verbose = FALSE,
  seed = NULL,
  shared_scale = TRUE,
  Z_init = NULL,
  V_init = NULL
)
```

Arguments

x	Numeric matrix or data frame containing the observations. Rows correspond to observations and columns to variables.
G_range	Positive integer or vector of positive integers specifying the number of mixture components to fit.
max_iter	Maximum number of EM iterations. Default is 100.
init_method	Initialization method. Either "modified_tkmeans" or "manual".
tol	Positive convergence tolerance for the log-likelihood.
alpha_trim	Trimming proportion used by the modified trimmed k-means initialization.
nstart	Number of random starts used by the modified trimmed k-means initialization.
verbose	Logical; if 'TRUE', iteration information is printed.
seed	Optional random seed for reproducibility.
shared_scale	Logical; if 'TRUE', the Gaussian and Cauchy sub-components share the same scale matrix within each cluster.

<code>Z_init</code>	Optional initial cluster-membership matrix used when <code>'init_method = "manual"</code> .
<code>V_init</code>	Optional initial Gaussian/Cauchy sub-component-membership matrix used when <code>'init_method = "manual"</code> .

Value

A list containing:

all Results for each value in `'G_range'`.

best The model corresponding to the minimum BIC, including clustering and outlier-detection results.

bic Numeric vector of BIC values corresponding to `'G_range'`.

```
#' @examples sim <- rmpvm( n = 100, pi = c(0.5, 0.5), alpha = c(0.8, 0.8), mu = list( c(0, 0), c(4, 4) ), Sigma = list( diag(2), diag(2) ), Gamma = list( diag(2), diag(2) ), seed = 123 )
```

```
fit <- MPVmixture( x = sim$data, G_range = 2, max_iter = 20, nstart = 20, seed = 123 )
```

```
fit$best$G
```

rmpvm

Generate Data from a Multivariate Pseudo-Voigt Mixture Model

Description

Generate Data from a Multivariate Pseudo-Voigt Mixture Model

Usage

```
rmpvm(n, pi, alpha, mu, Sigma, Gamma, seed = NULL)
```

Arguments

<code>n</code>	Number of observations to generate.
<code>pi</code>	Numeric vector of mixing proportions.
<code>alpha</code>	Numeric vector of Gaussian subcomponent proportions.
<code>mu</code>	List of component location vectors.
<code>Sigma</code>	List of Gaussian covariance matrices.
<code>Gamma</code>	List of Cauchy scale matrices.
<code>seed</code>	Optional random seed for reproducibility.

Value

A list containing the generated data matrix, latent cluster labels, latent Gaussian/Cauchy indicators, and corresponding factor labels.

```
#' @examples sim <- rmpvm( n = 100, pi = c(0.5, 0.5), alpha = c(0.8, 0.8), mu = list( c(0, 0), c(4, 4) ), Sigma = list( diag(2), diag(2) ), Gamma = list( diag(2), diag(2) ), seed = 123 )
```

```
head(sim$data)
```

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