Package ‘MLCOPULA’

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Type  Package
Title  Classification Models with Copula Functions
Description  Provides several classifiers based on probabilistic models. These classifiers allow to model the dependence structure of continuous features through bivariate copula functions and graphical models, see Salinas-Gutiérrez et al. (2014) <doi:10.1007/s00180-013-0457-y>.
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copulaClassifier

Train a classification model using copula functions.

Description

It trains a classification model based on copulas, the joint density of copulas is built with tree or chain graphic model, as shown in Salinas-Gutiérrez et al., 2014.

Usage

copulaClassifier(
  X,
  y,
  distribution = "kernel",
  copula = "frank",
  weights = "likelihood",
  graph_model = "tree",
  k = 7,
  m = 7,
  method_grid = "ml"
)

Arguments

X          Data frame with \( n \) samples and \( d > 1 \) predictor variables.
y          a vector of size \( n \), with the classes to predict.
distribution Marginal distribution to be used: "normal" or "kernel", by default kernel.
copula Character or vector with the name of the copula to be used: "frank", "gaussian", "clayton", "joe", "gumbel", "amh","grid", by default "frank". For parametric copulas, "frank", "gaussian", "clayton", "joe", "gumbel", "amh", one or more copulas can be selected. For nonparametric copula, only "grid" can be selected. See the examples for more details.
weights Character with the weight construction method: "likelihood" or "mutual_information", by default "likelihood".
graph_model Character with the graphical model structure: "tree" or "chain", by default "tree".
k          Only for grid copula. Positive integer indicating the number of subintervals for the \( U_2 \) variable.
m          Only for grid copula. Positive integer indicating the number of subintervals for the \( U_1 \) variable.
method_grid Only for grid copula. Fitting method, least squares "ls" or maximum likelihood "ml", by default "ml".

Value

Returns a list with the trained model.
**copulaPredict**

Get predictions from a classification model.

**Description**

Use the models trained with copula functions to generate new predictions.

**Usage**

```r
copulaPredict(X, model)
```

**Arguments**

- **X**
  - Data frame with predictor variables.
- **model**
  - Classification model.

**Value**

A list with the prediction of the class "class" and the probabilities of each class "prob".

**Examples**

```r
X <- iris[,1:4]
y <- iris$Species
model <- copulaClassifier(X = X, y = y, copula = "frank",
                          distribution = "kernel", graph_model = "tree")
y_pred <- copulaPredict(X = X, model = model)
table(y, y_pred$class)
```

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**References**

table(y,y_pred$class)

#Example 2
X <- iris[,1:4]
y <- iris$Species
model <- copulaClassifier(X = X, y = y, copula = c("frank","clayton"),
                          distribution = "kernel", graph_model = "chain")
y_pred <- copulaPredict(X = X, model = model)
table(y,y_pred$class)
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