Package ‘bnnSurvival’

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Type Package
Title Bagged k-Nearest Neighbors Survival Prediction
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Description Implements a bootstrap aggregated (bagged) version of the k-nearest neighbors survival probability prediction method (Lowsky et al. 2013). In addition to the bootstrapping of training samples, the features can be subsampled in each baselearner to break the correlation between them. The Rcpp package is used to speed up the computation.
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BnnSurvival

Bagged k-nearest neighbors survival prediction

Description

Bootstrap aggregated (bagged) version of the k-nearest neighbors survival probability prediction method (Lowsky et al. 2013). In addition to the bootstrapping of training samples, the features can be subsampled in each base learner.

Usage

bnnSurvival(formula, data, k = max(1, nrow(data)/10),
        num_base_learners = 50, num_features_per_base_learner = NULL,
        metric = "mahalanobis", weighting_function = function(x) { x * 0 + 1
        }, replace = TRUE, sample_fraction = NULL)

Arguments

formula Object of class formula or character describing the model to fit.
data Training data of class data.frame.
k Number nearest neighbors to use. If a vector is given, the optimal k of these values is found using 5-fold cross validation.
num_base_learners Number of base learners to use for bootstrapping.
num_features_per_base_learner Number of features randomly selected in each base learner. Default: all.
metric Metric d(x,y) used to measure the distance between observations. Currently only "mahalanobis".
weighting_function Weighting function w(d(x,y)) used to weight the observations based on their distance.
replace Sample with or without replacement.
sample_fraction Fraction of observations to sample in [0,1]. Default is 1 for replace=TRUE, and 0.6321 for replace=FALSE.
Details

For a description of the k-nearest neighbors survival probability prediction method see (Lowsky et al. 2013). Please note, that parallel processing, as currently implemented, does not work on Microsoft Windows platforms.

The weighting function needs to be defined for all distances \( \geq 0 \). The default function is constant 1, a possible alternative is \( w(x) = 1/(1+x) \).

To use the non-bagged version as in Lowsky et al. 2013, use `num_base_learners=1`, `replace=FALSE` and `sample_fraction=1`.

Value

`bnnSurvivalEnsemble` object. Use `predict()` with a new data set to predict survival probabilities.

Author(s)

Marvin N. Wright

References


See Also

`predict`

Examples

```r
require(bnnSurvival)

## Use only 1 core
options(mc.cores = 1)

## Load a dataset and split in training and test data
require(survival)

n <- nrow(veteran)
idx <- sample(n, 2/3*n)
train_data <- veteran[idx, ]
test_data <- veteran[-idx, ]

## Create model with training data and predict for test data
model <- bnnSurvival(Surv(time, status) ~ trt + karno + diagtime + age + prior, train_data, k = 20, num_base_learners = 10, num_features_per_base_learner = 3)
result <- predict(model, test_data)

## Plot survival curve for the first observations
plot(timepoints(result), predictions(result)[1, ])
```
get_best_k  

*Get optimal number of neighbors*

**Description**

Get optimal number of neighbors for bnnSurvival by cross validation

**Usage**

```r
get_best_k(formula, data, k, ...)
```

**Arguments**

- `formula`: Formula
- `data`: Data
- `k`: Number of neighbors
- `...`: Further arguments passed to bnnSurvival

**Value**

Optimal k

---

predict.bnnSurvivalBaseLearner-method

*Compute prediction for all samples.*

**Description**

Compute prediction for all samples.

**Usage**

```r
## S4 method for signature 'bnnSurvivalBaseLearner'
predict(object, train_data, test_data, timepoints, metric, weighting_function, k)
```

**Arguments**

- `object`: bnnSurvivalBaseLearner object
- `train_data`: Training data (with response)
- `test_data`: Test data (without response)
- `timepoints`: Timepoint to predict at
- `metric`: Metric used
- `weighting_function`: Weighting function used
- `k`: Number of nearest neighbors
**Predict survival probabilities with bagged k-nearest neighbors survival prediction.**

### Usage

```r
## S4 method for signature 'bnnSurvivalEnsemble'
predict(object, test_data)
```

### Arguments

- `object` Object of class `bnnSurvivalEnsemble`, created with `bnnSurvival()`.
- `test_data` Data set containing data to predict survival.

### Predictions

Get Predictions

```r
predictions(object, …)
```

### Arguments

- `object` Object to extract predictions from
- `…` further arguments passed to or from other methods.
predictSurvProb.bnnSurvivalEnsemble

predictions, bnnSurvivalResult-method
Get Predictions

Description
Get Predictions

Usage
## S4 method for signature 'bnnSurvivalResult'
predictions(object)

Arguments
object bnnSurvivalResult object to extract predictions from

predictSurvProb.bnnSurvivalEnsemble
Function to extract survival probability predictions from bnnSurvivalEnsemble. Use with pec package.

Description
Function to extract survival probability predictions from bnnSurvivalEnsemble. Use with pec package.

Usage
## S3 method for class 'bnnSurvivalEnsemble'
predictSurvProb(object, newdata, times, ...)

Arguments
object bnnSurvivalEnsemble object.
newdata Data used for prediction.
times Not used.
... Not used.

Value
survival probability predictions
print,bnnSurvivalEnsemble-method

Generic print method for bnnSurvivalEnsemble

Description

Generic print method for bnnSurvivalEnsemble

Usage

## S4 method for signature 'bnnSurvivalEnsemble'
personalize

print(x)

Arguments

x bnnSurvivalEnsemble object to print

print,bnnSurvivalResult-method

Generic print method for bnnSurvivalResult

Description

Generic print method for bnnSurvivalResult

Usage

## S4 method for signature 'bnnSurvivalResult'
personalize

print(x)

Arguments

x bnnSurvivalResult object to print
show.bnnSurvivalEnsemble-method

Generic show method for bnnSurvivalEnsemble

Description

Generic show method for bnnSurvivalEnsemble

Usage

## S4 method for signature 'bnnSurvivalEnsemble'
show(object)

Arguments

object bnnSurvivalEnsemble object to show

show.bnnSurvivalResult-method

Generic show method for bnnSurvivalResult

Description

Generic show method for bnnSurvivalResult

Usage

## S4 method for signature 'bnnSurvivalResult'
show(object)

Arguments

object bnnSurvivalResult object to show
### timepoints

**Get Timepoints**

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**timepoints,bnnSurvivalResult-method**

**Get timepoints**

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