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.

Imports prodlim, pec, Rcpp (>= 0.11.2), parallel, methods

LinkingTo Rcpp

Suggests survival, testthat

License GPL-3

RoxygenNote 5.0.1

NeedsCompilation yes

Repository CRAN

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R topics documented:

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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 >= 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 probabilites.

Author(s)

Marvin N. Wright

References

Lowsky, D.J. et al. (2013). A K-nearest neighbors survival probability prediction method. Stat Med, 32(12), 2062-2069.

See Also

predict

Examples

```
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, ])
```

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get_best_k   *Get optimal number of neighbors*

Description

Get optimal number of neighbors for bnnSurvival by cross validation

Usage

```
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

```
## 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,bnnSurvivalEnsemble-method

Predict survival probabilities with bagged k-nearest neighbors survival prediction.

Description

Predict survival probabilities with bagged k-nearest neighbors survival prediction.

Usage

```
## 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*

Description

Get Predictions

Usage

```
predictions(object, ...)
```

Arguments

object	Object to extract predictions from
...	further arguments passed to or from other methods.

```
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 bnnSur-
vivalEnsemble. 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'
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'
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*

Description

Get Timepoints

Usage

```
timepoints(object, ...)
```

Arguments

object	Object to extract timepoints from
...	further arguments passed to or from other methods.

---

timepoints,bnnSurvivalResult-method
Get timepoints

Description

Get timepoints

Usage

```
## S4 method for signature 'bnnSurvivalResult'
timepoints(object)
```

Arguments

object	bnnSurvivalResult object to extract timepoints from

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