

# Package ‘pacbpred’

July 2, 2014

**Type** Package

**Title** PAC-Bayesian Estimation and Prediction in Sparse Additive Models.

**Version** 0.92.2

**Date** 2013-02-05

**Author** Benjamin Guedj

**Maintainer** Benjamin Guedj <benjamin.guedj@upmc.fr>

**Description** This package is intended to perform estimation and prediction in high-dimensional additive models, using a sparse PAC-Bayesian point of view and a MCMC algorithm. The method is fully described in Guedj and Alquier (2013), 'PAC-Bayesian Estimation and Prediction in Sparse Additive Models', Electronic Journal of Statistics, 7, 264--291.

**License** GPL (>= 2)

**URL** <http://www.lsta.upmc.fr/doct/guedj/index.html>

**Repository** CRAN

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**NeedsCompilation** no

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pacbpred-package

*PAC-Bayesian Estimation and Prediction in Sparse Additive Models*

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## Description

This package is intended to perform estimation and prediction in high-dimensional additive models, using a PAC-Bayesian point of view and a MCMC algorithm.

## Details

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## Author(s)

Benjamin Guedj

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## References

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Guedj and Alquier (2013), 'PAC-Bayesian Estimation and Prediction in Sparse Additive Models'. *Electronic Journal of Statistics*, 7, 264–291. DOI:10.1214/13-EJS771. Available on <http://projecteuclid.org/DPubS?service=UI&version=1.0&verb=Display&handle=euclid.ejs/1359041592>.

## See Also

pacbpred

## Examples

```
ndata <- 100
ntrain <- 80
ntest <- ndata - ntrain
p <- 10
Y <- numeric(ndata)
X <- matrix(nr = ndata, nc = p, data = 2*runif(n = ndata*p) - 1)
for(i in 1:ndata)
{
  Y[i] <- X[i,1]^3+sin(pi*X[i,2])
}
```

```

Xtrain <- X[1:ntrain,]
Xtest <- X[(ntrain+1):ndata,]
Ytrain <- Y[1:ntrain]
Ytest <- Y[(ntrain+1):ndata]

niter <- 100
cst <- Inf
alpha <- .1
sigma2 <- .1
delta <- ntrain/2

res <- pacbpred(niter = niter, Xtrain = Xtrain, Xtest = Xtest, Y =
Ytrain, cst = cst,
sigma2 = sigma2, delta = delta, alpha = alpha)

print(cbind(res$predict,Ytest))

```

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pacbpred

*pacbpred*

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### Description

This package is intended to perform estimation and prediction in high-dimensional additive models, using a PAC-Bayesian point of view and a MCMC algorithm. The method is fully described in Guedj and Alquier (2013), 'PAC-Bayesian Estimation and Prediction in Sparse Additive Models', see <http://projecteuclid.org/DPubS?service=UI&version=1.0&verb=Display&handle=euclid.ejs/1359041592>.

### Usage

```

pacbpred(niter, burnin = floor(niter * 2/3), Xtrain, Xtest, Y, K = 8,
cst,
sigma2, alpha = 0.1, delta)

```

### Arguments

niter	Mandatory. The number of MCMC iterations.
burnin	Optional. How many iterations should be discarded in the beginning of the chain?
Xtrain	Mandatory. The design matrix of the training sample.
Xtest	Optional. The design matrix of the test sample.
Y	Mandatory. The vector of responses corresponding to Xtrain. Y is assumed to have the same number of rows as Xtrain.
K	Optional. The maximal order of the development on the trigonometric basis.

cst	Optional. A numerical constant bounding from above the sup norm of true regression function.
sigma2	Optional. The variance of the proposal density along the algorithm.
alpha	Optional. The penalization term over the complexity of a model.
delta	Optional. The inverse temperature parameter.

### Details

See Guedj and Alquier (2013), 'PAC-Bayesian Estimation and Prediction in Sparse Additive Models' on <http://projecteuclid.org/DPubS?service=UI&version=1.0&verb=Display&handle=euclid.ejs/1359041592>.

### Value

A list composed of the following items.

predict	If <code>Xtest</code> is provided, the predicted values of the corresponding responses.
estimates	The vector of estimates over the trigonometric basis.
ratio.mcmc	A vector of the MCMC ratio for each iteration.
accept	A logical vector whose length is the number of iterations. For each iteration, has the proposed move been accepted ?
models.mcmc	The current models all along the MCMC chain.

### Note

This is still an early stage development. Use at your own risk !

### Author(s)

Benjamin Guedj

### References

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### See Also

`pacbpred-package`

**Examples**

```
ndata <- 100
ntrain <- 80
ntest <- ndata - ntrain
p <- 10
Y <- numeric(ndata)
X <- matrix(nr = ndata, nc = p, data = 2*runif(n = ndata*p) - 1)
for(i in 1:ndata)
  {
    Y[i] <- X[i,1]^3+sin(pi*X[i,2])
  }

Xtrain <- X[1:ntrain,]
Xtest <- X[(ntrain+1):ndata,]
Ytrain <- Y[1:ntrain]
Ytest <- Y[(ntrain+1):ndata]

niter <- 100
cst <- Inf
alpha <- .1
sigma2 <- .1
delta <- ntrain/2

res <- pacbpred(niter = niter, Xtrain = Xtrain, Xtest = Xtest, Y =
Ytrain, cst = cst,
sigma2 = sigma2, delta = delta, alpha = alpha)

print(cbind(res$predict,Ytest))
```

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