

# Package ‘qrsvm’

May 10, 2017

**Type** Package

**Title** SVM Quantile Regression with the Pinball Loss

**Version** 0.2.1

**Author** Thilo Hofmeister

**Maintainer** Thilo Hofmeister <thilo.hofmeister@uni-hohenheim.de>

**Description** Quantile Regression (QR) using Support Vector Machines under the Pinball-Loss. Estimation is based on “Nonparametric Quantile Regression” by I. Takeuchi, Q.V.Le, T. Sears, A.J.Smola (2004). Implementation relies on 'quadprog' package, package 'kernlab' Kernelfunctions and package 'Matrix' nearPD to find next Positive definite Kernelmatrix. Package estimates quantiles individually but an Implementation of non crossing constraints coming soon. Function multqrsvm() now supports parallel backend for faster fitting.

**License** GPL-2

**Encoding** UTF-8

**LazyData** true

**Imports** kernlab, quadprog, Matrix, doParallel, foreach, methods

**RoxygenNote** 6.0.1

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2017-05-10 02:20:06 UTC

## R topics documented:

kernelMat . . . . .	2
multqrsvm . . . . .	2
predict.multqrsvm . . . . .	3
predict.qrsvm . . . . .	4
qrsvm . . . . .	4

<b>Index</b>	<b>6</b>
--------------	----------

---

kernelMat	<i>Modified KernelMatrix function to produce less errors</i>
-----------	--

---

**Description**

Modified KernelMatrix function to produce less errors

**Usage**

```
kernelMat(kernel, x, y = NULL)
```

**Arguments**

kernel	The kernel use from kernlab
x	The data
y	Currently not used

---

multqrsvm	<i>Fits multiple Quantile Regression SVM</i>
-----------	--

---

**Description**

Fits multiple Quantile Regression SVM

**Usage**

```
multqrsvm(x, y, kernel = "rbfdot", cost = 1, tau = c(0.05, 0.25, 0.5,
  0.75, 0.95), sigma = 5, degree = 2, scale = 1, offset = 1,
  order = 1, doPar = FALSE, clustnum = 2)
```

**Arguments**

x	An n X m matrix containing the predictors (n= number of observations, m = number of predictors) .
y	The Response onto which the qrsvm shall be fitted
kernel	a string giving the type of kernels from package kernlab to use f.e. "rbfdot" for Radial Basis Function Kernel. All Kernels except "stringdot" supported.
cost	The Cost parameter see f.e. package "e1071" and "kernlab"
tau	The Quantile that shall be estimated. A Vector of values (0<=tau<=1)
sigma	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
degree	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
scale	A possible tuning parameter for specific Kernelfunctions, see package kernlab.

offset	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
order	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
doPar	Should a parallel backend be used. Logical.
clustnum	The number of parallel tasks to use given doPar==TRUE. Default = 2.

### Details

There is no preimplemented scaling of the input variables which should be considered beforehand. Also optimization is based on "quadprog:solve.QP" function which can be considerably slow compared to other SVM implementations.

### Value

An object of class "qrsvm"

### References

"Nonparametric Quantile Regression" by I.Takeuchi, Q.V. Le, T. Sears, A.J. Smola (2004)

### Examples

```
n<-200

x<-as.matrix(seq(-2,2,length.out = n))
y<-rnorm(n)*(0.3+abs(sin(x)))

plot(x,y)

models<-list()
quant<-c(0.01,0.25,0.5,0.75,0.99)
models<-multqrsvm(x,y,tau = quant, doPar=FALSE, sigma = 1)
for(i in 1:length(models)){
  lines(x, models[[i]]$fitted, col="red")
}
```

---

predict.multqrsvm      *Predict an Object of class "multqrsvm"*

---

### Description

Predict an Object of class "multqrsvm"

### Usage

```
predict.multqrsvm(model, newdata)
```

**Arguments**

model	An object of class "multqrsvm"
newdata	The predictors of the predictable data in an n X m Matrix

**Value**

A list of predicted values

---

predict.qrsvm	<i>Predict an Object of class "qrsvm"</i>
---------------	---

---

**Description**

Predict an Object of class "qrsvm"

**Usage**

```
predict.qrsvm(model, newdata)
```

**Arguments**

model	An object of class "qrsvm"
newdata	The predictors of the predictable data in an n X m Matrix

**Value**

A numeric vector of predicted values

---

qrsvm	<i>Fits a quantile regression SVM based on the Pinball Loss</i>
-------	---

---

**Description**

Fits a quantile regression SVM based on the Pinball Loss

**Usage**

```
qrsvm(x, y, kernel = "rbfdot", cost = 1, tau = 0.95, sigma = 5,
      degree = 2, scale = 1, offset = 1, order = 1)
```

**Arguments**

x	An n X m matrix containing the predictors (n= number of observations, m = number of predictors) .
y	The Response onto which the qrsvm shall be fitted
kernel	a string giving the type of kernels from package kernlab to use f.e. "rbfdot" for Radial Basis Function Kernel. All Kernels except "stringdot" supported.
cost	The Cost parameter see f.e. package "e1071" and "kernlab"
tau	The Quantile that shall be estimated. $0 \leq \tau \leq 1$
sigma	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
degree	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
scale	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
offset	A possible tuning parameter for specific Kernelfunctions, see package kernlab.
order	A possible tuning parameter for specific Kernelfunctions, see package kernlab.

**Details**

There is no preimplemented scaling of the input variables which should be considered beforehand. Also optimization is based on "quadprog:solve.QP" function which can be considerably slow compared to other SVM implementations.

**Value**

An object of class "qrsvm"

**References**

"Nonparametric Quantile Regression" by I.Takeuchi, Q.V. Le, T. Sears, A.J. Smola (2004)

**Examples**

```
n<-200

x<-as.matrix(seq(-1.5,1.5,length.out = n))
y<-rnorm(n)*(0.3+abs(sin(x)))

plot(x,y)

mod005<-qrsvm(x,y, tau=0.05)
mod095<-qrsvm(x,y, tau=0.95)
lines(x, mod005$fitted, col="red")
lines(x, mod095$fitted, col="red")
```

# Index

`kernelMat`, 2

`multqsvm`, 2

`predict.multqsvm`, 3

`predict.qsvm`, 4

`qsvm`, 4