# Package 'rrat'

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**Type** Package

**Title** Robust Regression with Asymmetric Heavy-Tail Noise Distributions

**Version** 1.0.0

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**Description** Implementation of Robust Regression tailored to deal with Asymmetric noise Distribution, which was originally proposed by Takeuchi & Bengio & Kanamori (2002) <doi:10.1162/08997660260293300>. In addition, this implementation is extended as introducing potential feature regularization by LASSO etc.

**Depends** R(>= 2.10), quantreg

**License** GPL (>= 2)

**RoxygenNote** 6.1.1

**NeedsCompilation** no

**Repository** CRAN

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## R topics documented:

| rrat | *Robust Regression with Asymmetric Heavy-Tail Noise Distributions* |
|---|---|

## Description

rrat implements Robust Regression approach tailored to deal with Asymmetric Tail noise distribution. The main idea is to learn most of the parameters of the model using conditional quantile estimators (which are biased but robust estimators of the regression) and then to learn a few remaining parameters to combine and correct these estimators, in order to minimize the average squared error in an unbiased way in the end.

## Usage

```
rrat(x, y, taus = 0.5, ...)
```

## Arguments

| | |
|---|---|
| x | a data frame of predictors in training data. Similar as design matrix style but without intercept. |
| y | a numeric vector of response. |
| taus | candidate quantiles of underlying robust regression. |
| ... | optional parameters to be passed to the low level function `rq`. |

## Details

Moreover than the original RRAT paper, our implementation is extended to be able to conduct feature regularization of LASSO by adding parameter `method` as `lasso`, as well as tuning the value of the additional penalty parameter `lambda` in the function.

Such feature regularization is employed in all the underlying base quantile models simultaneously. The architecture and combination of these underlying base quantile models should be designed according to the asymmetric tail pattern of the noise distribution.

## Value

An object of class `rrat`, which is a list with the following components:

| | |
|---|---|
| taus | candidate quantiles of underlying robust regression. |
| rrat_coefficients | |
| | a named vector of coefficients |
| rq_coefficients | |
| | a named matrix of coefficients from underlying quantile regressions bases |
| bias_correction | |
| | a number to correct the combinations of underlying quantile regressions bases |

## Author(s)

Yi He and Yuelin Zhao

## References

Takeuchi, Ichiro & Bengio, Y. & Kanamori, Takafumi. (2002). "Robust Regression with Asymmetric Heavy-Tail Noise Distributions". *Neural computation*. 14. 2469-96. 10.1162/08997660260293300.

## Examples

```
rrat_1 <- rrat(x=iris[,2:4], y=iris[,1], taus = 0.5)
```

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