

Package ‘osqp’

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Title Quadratic Programming Solver using the 'OSQP' Library

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Description Provides bindings to the 'OSQP' solver. The 'OSQP' solver is a numerical optimization package for solving convex quadratic programs written in 'C' and based on the alternating direction method of multipliers. See <[arXiv:1711.08013](https://arxiv.org/abs/1711.08013)> for details.

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Imports Rcpp (>= 0.12.14), methods, Matrix, R6

LinkingTo Rcpp

RoxygenNote 7.2.1

Collate 'RcppExports.R' 'osqp-package.R' 'solve.R' 'osqp.R' 'params.R'

NeedsCompilation yes

Suggests testthat

Encoding UTF-8

URL <https://osqp.org>

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osqp

*OSQP Solver object***Description**

OSQP Solver object

Usage

```
osqp(P = NULL, q = NULL, A = NULL, l = NULL, u = NULL, pars = osqpSettings())
```

Arguments

P, A	sparse matrices of class dgCMatrix or coercible into such, with P positive semidefinite.
q, l, u	Numeric vectors, with possibly infinite elements in l and u
pars	list with optimization parameters, conveniently set with the function osqpSettings . For <code>osqpObject\$updateSettings(newPars)</code> only a subset of the settings can be updated once the problem has been initialized.

Details

Allows one to solve a parametric problem with for example warm starts between updates of the parameter, c.f. the examples. The object returned by `osqp` contains several methods which can be used to either update/get details of the problem, modify the optimization settings or attempt to solve the problem.

Value

An R6-object of class "osqp_model" with methods defined which can be further used to solve the problem with updated settings / parameters.

Usage

```
model = osqp(P=NULL, q=NULL, A=NULL, l=NULL, u=NULL, pars=osqpSettings())

model$Solve()
model$update(q = NULL, l = NULL, u = NULL, Px = NULL, Px_idx = NULL, Ax = NULL, Ax_idx = NULL)
model$getParams()
model$getDims()
model$updateSettings(newPars = list())

model$getData(element = c("P", "q", "A", "l", "u"))
model$warmStart(x=NULL, y=NULL)

print(model)
```

Method Arguments

element a string with the name of one of the matrices / vectors of the problem
newPars list with optimization parameters

See Also

[solve_osqp](#)

Examples

```
## example, adapted from OSQP documentation
library(Matrix)

P <- Matrix(c(11., 0.,
             0., 0.), 2, 2, sparse = TRUE)
q <- c(3., 4.)
A <- Matrix(c(-1., 0., -1., 2., 3.,
             0., -1., -3., 5., 4.)
           , 5, 2, sparse = TRUE)
u <- c(0., 0., -15., 100., 80)
l <- rep_len(-Inf, 5)

settings <- osqpSettings(verbose = FALSE)

model <- osqp(P, q, A, l, u, settings)

# Solve
res <- model$Solve()

# Define new vector
q_new <- c(10., 20.)

# Update model and solve again
model$update(q = q_new)
res <- model$Solve()
```

osqpSettings

Settings for OSQP

Description

For further details please consult the OSQP documentation: <https://osqp.org/>

Usage

```
osqpSettings(
  rho = 0.1,
  sigma = 1e-06,
```

```

max_iter = 4000L,
eps_abs = 0.001,
eps_rel = 0.001,
eps_prim_inf = 1e-04,
eps_dual_inf = 1e-04,
alpha = 1.6,
linsys_solver = c(QDLDL_SOLVER = 0L),
delta = 1e-06,
polish = FALSE,
polish_refine_iter = 3L,
verbose = TRUE,
scaled_termination = FALSE,
check_termination = 25L,
warm_start = TRUE,
scaling = 10L,
adaptive_rho = 1L,
adaptive_rho_interval = 0L,
adaptive_rho_tolerance = 5,
adaptive_rho_fraction = 0.4
)

```

Arguments

rho	ADMM step rho
sigma	ADMM step sigma
max_iter	maximum iterations
eps_abs	absolute convergence tolerance
eps_rel	relative convergence tolerance
eps_prim_inf	primal infeasibility tolerance
eps_dual_inf	dual infeasibility tolerance
alpha	relaxation parameter
linsys_solver	which linear systems solver to use, 0=QDLDL, 1=MKL Pardiso
delta	regularization parameter for polish
polish	boolean, polish ADMM solution
polish_refine_iter	iterative refinement steps in polish
verbose	boolean, write out progress
scaled_termination	boolean, use scaled termination criteria
check_termination	integer, check termination interval. If 0, termination checking is disabled
warm_start	boolean, warm start
scaling	heuristic data scaling iterations. If 0, scaling disabled
adaptive_rho	boolean, is rho step size adaptive?

`adaptive_rho_interval`
 Number of iterations between rho adaptations rho. If 0, it is automatic
`adaptive_rho_tolerance`
 Tolerance X for adapting rho. The new rho has to be X times larger or 1/X times smaller than the current one to trigger a new factorization
`adaptive_rho_fraction`
 Interval for adapting rho (fraction of the setup time)

`solve_osqp` *Sparse Quadratic Programming Solver*

Description

Solves

$$\arg \min_x 0.5x'Px + q'x$$

s.t.

$$l_i < (Ax)_i < u_i$$

for real matrices P (nxn, positive semidefinite) and A (mxn) with m number of constraints

Usage

```

solve_osqp(
  P = NULL,
  q = NULL,
  A = NULL,
  l = NULL,
  u = NULL,
  pars = osqpSettings()
)

```

Arguments

P, A sparse matrices of class `dgCMatrix` or coercible into such, with P positive semidefinite. Only the upper triangular part of P will be used.
q, l, u Numeric vectors, with possibly infinite elements in l and u
pars list with optimization parameters, conveniently set with the function `osqpSettings`

Value

A list with elements `x` (the primal solution), `y` (the dual solution), `prim_inf_cert`, `dual_inf_cert`, and `info`.

References

Stellato, B., Banjac, G., Goulart, P., Bemporad, A., Boyd and S. (2018). "OSQP: An Operator Splitting Solver for Quadratic Programs." *ArXiv e-prints*. 1711.08013.

See Also

osqp. The underlying OSQP documentation: <https://osqp.org/>

Examples

```
library(osqp)
## example, adapted from OSQP documentation
library(Matrix)

P <- Matrix(c(11., 0.,
             0., 0.), 2, 2, sparse = TRUE)
q <- c(3., 4.)
A <- Matrix(c(-1., 0., -1., 2., 3.,
             0., -1., -3., 5., 4.)
           , 5, 2, sparse = TRUE)
u <- c(0., 0., -15., 100., 80)
l <- rep_len(-Inf, 5)

settings <- osqpSettings(verbose = TRUE)

# Solve with OSQP
res <- solve_osqp(P, q, A, l, u, settings)
res$x
```

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