Package ‘ROI.plugin.clarabel’

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Version 0.3

Title 'clarabel' Plug-in for the 'R' Optimization Infrastructure

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Description Enhances the 'R' Optimization Infrastructure ('ROI') package
with the 'clarabel' solver for solving convex cone problems.
More information about 'clarabel' can be found at
<https://oxfordcontrol.github.io/ClarabelDocs/stable/>.

Imports stats, methods, slam, ROI (>= 1.0-0), clarabel (>= 0.5.1)

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URL https://gitlab.com/roigrp/solver/roi.plugin.clarabel

RoxygenNote 7.1.2

NeedsCompilation no

Repository CRAN

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R topics documented:

`Example-1` *SOCP 1*

Description

$$\begin{aligned} maximize\ \ & x + y \\ subject\ to\ \ & x^2 + y^2 \leq 1 \\ & x \geq 0, y \geq 0 \end{aligned}$$

Examples

```
Sys.setenv("ROI_LOAD_PLUGINS" = FALSE)
library(ROI)
library(ROI.plugin.clarabel)

obj <- L_objective(c(1, 1))
## NOTE: chol(diag(2)) == diag(2)
con <- C_constraint(L = rbind(0, -diag(2)), cones = K_soc(3), rhs = c(1, 0, 0))
op <- OP(obj, con, maximum = TRUE)
x <- ROI_solve(op, solver = "clarabel")
x
## Optimal solution found.
## The objective value is: 1.414214e+00
solution(x)
## [1] 0.7071068 0.7071068
```

`Example-2` *SOCP 2*

Description

The following example is also known as `Problem 10` from the Hock-Schittkowski-Collection `Hock and Schittkowski (1981)`.

$$\begin{aligned} minimize\ \ & x - y \\ subject\ to\ \ & -3x^2 + 2xy + 1 \geq 0 \end{aligned}$$

References

W. Hock, K. Schittkowski (1981): Test Examples for Nonlinear Programming Codes, Lecture Notes in Economics and Mathematical Systems, Vol. 187, Springer

Examples

```
Sys.setenv("ROI_LOAD_PLUGINS" = FALSE)
library(ROI)
library(ROI.plugin.clarabel)

obj <- L_objective(c(1, -1))
L <- chol(rbind(c(3, -1), c(-1, 1)))
con <- C_constraint(L = rbind(0, -L), cones = K_soc(3), rhs = c(1, 0, 0))
op <- OP(objective = obj, constraints = con,
         bounds = V_bound(li = 1:2, lb = rep(-Inf, 2)))
x <- ROI_solve(op, solver="clarabel")
x
## Optimal solution found.
## The objective value is: -1.000000e+00
solution(x)
## [1] -4.622464e-16  1.000000e+00
```

`Example-3` *SOCP 3*

Description

The following example is originally from the `CVXOPT` (https://cvxopt.org/userguide/coneprog.html) homepage.

$$minimize \quad -2x_1 + x_2 + 5x_3$$

subject to

$$\left\| \begin{array}{c} -13x_1 + 3x_2 + 5x_3 - 3 \\ -12x_1 + 12x_2 - 6x_3 - 2 \end{array} \right\|_2 \leq -12x_1 - 6x_2 + 5x_3 - 12$$

$$\left\| \begin{array}{c} -3x_1 + 6x_2 + 2x_3 \\ x_1 + 9x_2 + 2x_3 + 3 \\ -x_1 - 19x_2 + 3x_3 - 42 \end{array} \right\|_2 \leq -3x_1 + 6x_2 - 10x_3 + 27$$

References

Andersen, Martin S and Dahl, Joachim and Vandenberghe, Lieven (2016) CVXOPT: A Python package for convex optimization, version 1.1.8, https://cvxopt.org/

Examples

```
Sys.setenv("ROI_LOAD_PLUGINS" = FALSE)
library(ROI)
library(ROI.plugin.clarabel)

lo <- L_objective(c(-2, 1, 5))
```

```
lc1 <- rbind(c(12, 6, -5), c(13, -3, -5), c(12, -12, 6))
lc2 <- rbind(c(3, -6, 10), c(3, -6, -2), c(-1, -9, -2), c(1, 19, -3))
lc <- C_constraint(L = rbind(lc1, lc2),
                   cones = K_soc(c(3, 4)),
                   rhs = c(c(-12, -3, -2), c(27, 0, 3, -42)))
vb <- V_bound(li = 1:3, lb = rep(-Inf, 3))
op <- OP(objective = lo, constraints = lc, bounds = vb)
x <- ROI_solve(op, solver="clarabel")
x
## Optimal solution found.
## The objective value is: -3.834637e+01
solution(x)
## [1] -5.014767 -5.766924 -8.521796
```

vech *Half-Vectorization*

Description

Extension of the utility function vech performing a half-vectorization on the given matrices.

Usage

```
vech(..., lower = TRUE, scale = FALSE)
```

Arguments

`...`	one or more matrices to be half-vectorized.
`lower`	use lower or upper half-vectorization
`scale`	whether the lower/upper triangular elements are scaled

Value

a matrix

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