Package ‘admmDensestSubmatrix’

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Type Package

Title Alternating Direction Method of Multipliers to Solve Dense Dubmatrix Problem

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Description Solves the problem of identifying the densest submatrix in a given or sampled binary matrix, Bombina et al. (2019) <arXiv:1904.03272>.

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Depends R (>= 3.5.0)

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Suggests knitr, rmarkdown

VignetteBuilder knitr

Imports Rdpack, utils, stats

RdMacros Rdpack

NeedsCompilation no

Repository CRAN

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R topics documented:

densub *densub*

Description

Iteratively solves the convex optimization problem using ADMM.

Usage

```
densub(G, m, n, tau = 0.35, gamma = 6/(sqrt(m * n) * (q - p)),
  opt_tol = 1e-04, maxiter, quiet = TRUE)
```

Arguments

`G`	sampled binary matrix
`m`	number of rows in dense submatrix
`n`	number of columns in dense submatrix
`tau`	penalty parameter for equality constraint violation
`gamma`	l_1 regularization parameter
`opt_tol`	stopping tolerance in algorithm
`maxiter`	maximum number of iterations of the algorithm to run
`quiet`	toggles between displaying intermediate statistics

Details

$min|X|_* + gamma * |Y|_1 + 1_Omega_W(W) + 1_Omega_Q(Q) + 1_Omega_Z(Z)$

s.t $X - Y = 0$, $X = W$, $X = Z$,

where $Omega_W(W), Omega_Q(Q), Omega_Z(Z)$ are the sets: $Omega_W = WinR^MxN|e^TWe = mn$

$Omega_Q = QinR^MxN|ProjectionofQonnotN = 0$

$Omega_Z = ZinR^MxN|Z_ij <= 1forall(i,j)inMxN$

$Omega_Q = QinR^MxN|ProjectionofQonnotN = 0$

$Omega_Z = ZinR^MxN|Z_ij <= 1forall(i,j)inMxN$

1_S is the indicator function of the set S in R^MxN such that $1_S(X) = 0$ if X in S and +infinity otherwise

Value

Rank one matrix with mn nonzero entries, matrix Y that is used to count the number of disagreements between G and X

`mat_shrink` *Soft threshholding operator.*

Description

Applies the shrinkage operator for singular value tresholding.

Usage

```
mat_shrink(K, tau)
```

Arguments

`K`	matrix
`tau`	regularization parameter

Value

Matrix

Examples

```
mat_shrink(matrix(c(1,0,0,0,1,1,1,1,1), nrow=3, ncol=3, byrow=TRUE),0.35)
```

`plantedsubmatrix` *Sample matrix*

Description

Generates binary (M, N) - matrix sampled from dense (m, n) - submatrix.

Usage

```
plantedsubmatrix(M, N, m, n, p, q)
```

Arguments

`M`	number of rows in sampled matrix
`N`	number of rows in sampled matrix
`m`	number of rows in dense submatrix
`n`	natural number used to calculate number of rows in dense submatrix
`p`	density outside planted submatrix
`q`	density inside planted submatrix

Details

Let $U*$ and $V*$ be m and n index sets. For each i in U*, j in V* we let $a_ij = 1$ with probability q and 0 otherwise. For each remaining ij we set $a_ij = 1$ with probability $p < q$ and take $a_ij = 0$ otherwise.

Value

Matrix G sampled from the planted dense (mn)-submatrix model, dense sumbatrix $X0$, matrix $Y0$ used to count the number of disagreements between G and $X0$

Examples

```
plantedsubmatrix(10,10,1,2,0.25,0.75)
```

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