Package ‘admmDensestSubmatrix’

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Type Package

Title Alternating Direction Method of Multipliers to Solve Dense Dubmatrix Problem

Version 0.1.0

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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:

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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

\[
\min |X|_* + \gamma |Y|_1 + 1_{\Omega_W}(W) + 1_{\Omega_Q}(Q) + 1_{\Omega_Z}(Z)
\]
\[
s.t. \quad X - Y = 0, \quad X = W, \quad X = Z,
\]

where \( \Omega_W(W), \Omega_Q(Q), \Omega_Z(Z) \) are the sets: \( \Omega_W = \text{Win}R^{M \times N}|e^T We = mn \)
\( \Omega_Q = \text{Qin}R^{M \times N}|\text{ProjectionofQnotN} = 0 \)
\( \Omega_Z = \text{Zin}R^{M \times N}|Z_{i,j} <= 1\text{forall}(i,j)\text{in}M \times N \)
\( \Omega_Q = \text{Qin}R^{M \times N}|\text{ProjectionofQnotN} = 0 \)
\( \Omega_Z = \text{Zin}R^{M \times N}|Z_{i,j} <= 1\text{forall}(i,j)\text{in}M \times N \)

1\(_S\) is the indicator function of the set \( S \) in \( R^{N \times M} \) 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 thresholding operator.

**Description**

Applies the shrinkage operator for singular value thresholding.

**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 $a_{i,j} = 1$ with probability $q$ and 0 otherwise. For each remaining $i,j$ we set $a_{i,j} = 1$ with probability $p < q$ and take $a_{i,j} = 0$ otherwise.

Value

Matrix $G$ sampled from the planted dense $(mn)$-submatrix model, dense submatrix $X_0$, matrix $Y_0$ used to count the number of disagreements between $G$ and $X_0$.

Examples

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