SAMPLE CALLS

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% (1) TO MAXIMIZE THE LARGEST EIGENVALUE

% (this is specifically the numerical radius example)

% (compute the numerical radius of GR320, the Grcar matrix of size 320)

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>> pars.tol = 10^-12

>> pars.maxit = 20

>> pars.bounds.lb = 0

>> pars.bounds.ub = 2\*pi

>> pars.isprint = 0 % (set this 1 to print, default is 0 not print)

>> pars.gamma = -2\*norm(GR320);

>> M{1} = sparse(GR320);

>> [f,z] = leigopt\_max('numrad',1,1,M,pars)

%%%%

%% second parameter: # of parameters = 1

%% third parameter: largest eigenvalue to be maximized

%% fourth parameter: must be a cell array containing the matrices

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% (2) TO MINIMIZE THE SMALLEST SINGULAR VALUE

% (this is specifically the distance to instability example)

% (compute the distance to instability of tols1090S,

% the Tolosa matrix of size 10900)

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>> pars.tol = 10^-12

>> pars.bounds.lb = 150;

>> pars.bounds.ub = 160;

>> pars.z0 = 155;

>> C{1} = tols1090S;

>> C{2} = speye(1090);

>> C{3} = C{1}'\*C{1};

>> C{4} = C{2}'\*C{1};

>> C{5} = C{2}'\*C{2};

>> pars.sq = [0 0 1 1 1]';

>> [f,z] = lsvdminopt\_min\_general('distinstab\_general',1,1,C,pars)

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%% not only the coefficient matrices A1, A2 in the defn of the matrix-valued

%% function are paseed, but also A1'\*A1, A2'\*A1, A2'\*A2

%% these are passed inside the cell array C

%% To indicate, which cell entries are originals, which ones are products

%% we set pars.sq = [0 0 1 1 1]'

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% (3) TO MINIMIZE THE LARGEST EIGENVALUE

% (This concerns example 5 in the paper "A Subspace Method for Large-Scale

% Eigenvalue Optimization")

% In particular the largest eigenvalue

% of AF500 = diag(Ctilde250, CtildeC250) is minimized below

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%%% Form the matrix-valued function first

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>> n = 250

>> C250 = zeros(n);

>>for j = 1:n-1

C250(j+1,j) = j+0.1;

C250(j+2:n,j) = j\*ones(n-j-1,1);

end

>> C250 = C250 + C250';

>> IU250 = zeros(n);

>> IL250 = zeros(n);

>> IU250(1:n/2,1:n/2) = eye(n/2);

>> IL250(n/2+1:n,n/2+1:n) = eye(n/2);

>> AF500{1} = (1/(100\*n))\*[C250 zeros(n); zeros(n) -C250];

>> AF500{2} = [IU250 zeros(n); zeros(n) -IU250];

>> AF500{3} = [IL250 zeros(n); zeros(n) -IL250];

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% Now optimize

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>> pars.bounds.lb = [-10; -10];

>> pars.bounds.ub = [10; 10];

>> pars.gamma = -10^-6;

>> [fd,zd,itnum] = leigopt\_min('affinefunction',2,1,AF500,pars);

%%%%

%% second parameter: # of parameters = 2

%% third parameter: largest eigenvalue to be minimized

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