Always first add the auxiliary routines to your Matlab path. More precisely, under the directory containing the main routines, type the following.

```
>> addpath eigopt
>> addpath auxiliary
```

UNSTRUCTURED STABILITY RADII

COMPUTATION OF r(R;B,C) = r(J;B,C)
(WHEN Q IS AVAILABLE RATHER THAN Q^{-1})

```
%  This data set is available under the directory data/randomdense800x800
%  It consists of J,R,Q,B,C all of which are dense, random
%   J,R,Q are 800x800,   B is 800x2, and  C is 2x800

>> load randomdense1.mat;
>> [f,z,info] = DHradiiJR_nonHermit(J,Q,R,B,C,1,25,10,intval);
```

% *f* contains 1/r(R;B,C) = 1/r(J;B,C)
% *z* contains the maximizer of sigma_max(CQ(iwI – (J-R)Q $)^{-1}$B) over w

COMPUTATION OF r(Q;B,C)

```
>> load randomdense1.mat;
>> [f,z,info] = DHradiiQ_nonHermit(J,Q,R,B,C,1,25,10,intval);
```

% *f* contains 1/r(Q;B,C)
% *z* contains the maximizer of sigma_max(C(iwI – (J-R) Q $)^{-1}$ (J-R)B) over w

COMPUTATION OF r(R;B,C) = r(J;B,C)
(WHEN Q^{-1} IS AVAILABLE RATHER THAN Q)

% This is the brake-squealing problem (for details see the motivating
% example in Section 1 in [1]; also see Section 3.3.3 in [1], this concerns
% exactly the example considered over there.)
% The data set is available under the directory data/BrakeSqueal

```
>> load BrakeSqueal9338x9338.mat;
>> omega = 2.5;
>> J = [-omega*DG   -KE-omega^2*Kg;  (KE+omega^2*Kg)'  zeros(size(DG))];
>> Zn = zeros(4669,4669);
>> R = [DM + (1/omega)*DR   Zn;  Zn  Zn];
>> Qinv = [M Zn; Zn  KE+omega^2*Kg];
>>  [f,z,info] = DHradiiJR_nonHermit_Qinv(J,Qinv,R,B,B',2,15,15,intval,0,1,'lu_brake');
```

STRUCTURED STABILITY RADII
(SUBJECT TO HERMITIAN PERTURBATIONS OF R)

SMALL-SCALE COMPUTATION OF r^{Herm}(R;B)

```
%  The data is available under the directory data/structured,small
%  This is also the small-scale example in Section 5.1 of [1].
%   J,R,Q are 20x20,   B is 20x2, rank (R) = 5

>> load random20by20.mat;
>> [f, z, parsout] = DHradiiJR_Hermit_ss(J,Q,R,B,intval);
```

% *f* contains r^{Herm}(R;B)
% *z* is such that i*z is the first point on the imaginary axis that is attained under
% smallest Hermitation perturbation of R of the form R + $B\ \Delta\ B^{*}$.

LARGE-SCALE COMPUTATION OF r^{Herm}(R;B)
(WHEN Q IS AVAILABLE RATHER THAN Q^{-1})

```
%  The data set is available under the directory data/structured,large
%   J,R,Q are 2000x2000,   B is 2000x2

>> load random2000x2000_1.mat;
>> [f,z,info] = DHradiiJR_Hermit(J,Q,R,B,1,5,5,intval);
```

% *f* and *z* are the same as the for the small-scale problems.

LARGE-SCALE COMPUTATION OF r^{Herm}(R;B)
(WHEN Q^{-1} IS AVAILABLE RATHER THAN Q)

```
% Once again the brake-squealing problem

>> load BrakeSqueal9338x9338.mat;
>> omega = 2.5;
>> J = [-omega*DG   -KE-omega^2*Kg;  (KE+omega^2*Kg)'  zeros(size(DG))];
>> Zn = zeros(4669,4669);
>> R = [DM + (1/omega)*DR   Zn;  Zn  Zn];
>> Qinv = [M Zn; Zn  KE+omega^2*Kg];
>>[f,z,info] = DHradiiJR_Hermit_Qinv(J,Qinv,R,B,2,15,15,intval,0,1,'lu_brake');
```

References:

[1] N. Aliyev, V. Mehrmann and E. Mengi. Computation of Stability Radii for Large-Scale Dissipative Hamiltonian Systems. arXiv preprint arXiv:1808.03574v2 [math.NA]