
Lab09 - optimization exercises, Pawel Drapiewski 25.04.2018 r.

Difference convex programming - exercise 10 from Optimization_Problems.pdf

```
eps = 10e-5; % this algorithm will iterate over cvx to gain good
result
x_k = 10; % init values (arbitrally choosen)

iter_index = 1;
found_x = [];

while (1)
    a = [0; 2]; % this is fixed point
    cvx_begin
        variables b(2) % we search this point. it should be the closest
        point thath lay on the  $y = x^2 + 1$ 
        minimize norm(a - b)
        subject to
            %b(2) - b(1) * b(1) - 1 <= 0 % this should be changed to non
            quadratic problem using linear aproximation (on sheet)
            b(2) - x_k * x_k - 1 - 2 * x_k * (b(1) - x_k) == 0 %
            aproximated  $y - x^2 - 1 == 0$ 

    cvx_end

    if (abs(x_k - b(1)) < eps)
        break;
    end
    %save the results
    x_k = b(1);

    fprintf('#####\n');
    fprintf('### Best result in %d iteration: %d ###\n',
iter_index, x_k)
    fprintf('#####\n');
    found_x = [found_x, x_k];

    iter_index = iter_index + 1;
end

found_x

% Good result is found in 11 iteration. Of course this may vary
depends on init value of x_k.
% As we can see, very close result is already obtained in 5th
iteration, so
% we can say that this algorithm works very efficiently.
```

Calling SDPT3 4.0: 3 variables, 1 equality constraints

```

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT      1      0.000 1      0
it pstep dstep pinfeas dinfeas gap      prim-obj      dual-obj
cputime
-----
0/0.000/0.000/9.9e-01/1.0e+01/1.8e+02/ 8.402821e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.948/3.8e-08/5.7e-01/1.7e+01/ 1.083118e+01 6.311493e+00/
0:0:00/ chol 1 1
2/1.000/1.000/2.6e-08/5.0e-03/1.8e+00/ 6.177119e+00 4.472507e+00/
0:0:00/ chol 1 1
3/0.981/0.992/8.7e-09/5.4e-04/2.6e-02/ 5.060735e+00 5.039775e+00/
0:0:00/ chol 1 1
4/0.989/0.989/7.1e-10/5.5e-05/2.9e-04/ 5.043888e+00 5.044155e+00/
0:0:00/ chol 1 1
5/0.989/0.989/4.7e-11/6.1e-07/3.2e-06/ 5.043701e+00 5.043704e+00/
0:0:00/ chol 1 1
6/0.989/0.989/8.2e-13/6.7e-09/3.5e-08/ 5.043699e+00 5.043699e+00/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----
number of iterations = 6
primal objective value = 5.04369933e+00
dual objective value = 5.04369937e+00
gap := trace(XZ) = 3.53e-08
relative gap = 3.18e-09
actual relative gap = -2.91e-09
rel. primal infeas (scaled problem) = 8.16e-13
rel. dual " " " = 6.70e-09
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 7.1e+00, 5.0e-02, 1.4e+00
norm(A), norm(b), norm(C) = 2.1e+01, 1.0e+02, 2.0e+00
Total CPU time (secs) = 0.07
CPU time per iteration = 0.01
termination code = 0
DIMACS: 8.2e-13 0.0e+00 6.7e-09 0.0e+00 -2.9e-09 3.2e-09
-----

-----
Status: Solved
Optimal value (cvx_optval): +5.0437

#####
#### Best result in 1 iteration: 5.037406e+00 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints

```

```

-----

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT 1 0.000 1 0
it pstep dstep pinfeas dinfeas gap prim-obj dual-obj
cputime
-----
0/0.000/0.000/9.6e-01/5.1e+00/4.7e+01/ 4.262345e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.938/7.0e-08/3.6e-01/5.6e+00/ 5.151434e+00 3.286821e+00/
0:0:00/ chol 1 1
2/1.000/1.000/1.2e-07/5.0e-03/4.5e-01/ 2.898602e+00 2.478484e+00/
0:0:00/ chol 1 1
3/0.986/0.989/1.9e-08/5.5e-04/5.6e-03/ 2.608847e+00 2.606093e+00/
0:0:00/ chol 1 1
4/0.989/0.989/3.0e-10/5.5e-05/6.1e-05/ 2.605199e+00 2.605427e+00/
0:0:00/ chol 1 1
5/0.989/0.989/1.2e-10/6.1e-07/6.8e-07/ 2.605160e+00 2.605162e+00/
0:0:00/ chol 1 1
6/0.992/0.994/1.6e-12/3.5e-09/7.6e-09/ 2.605159e+00 2.605159e+00/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----

number of iterations = 6
primal objective value = 2.60515906e+00
dual objective value = 2.60515908e+00
gap := trace(XZ) = 7.55e-09
relative gap = 1.22e-09
actual relative gap = -1.71e-09
rel. primal infeas (scaled problem) = 1.64e-12
rel. dual " " " = 3.48e-09
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 3.7e+00, 9.9e-02, 1.4e+00
norm(A), norm(b), norm(C) = 1.1e+01, 2.7e+01, 2.0e+00
Total CPU time (secs) = 0.09
CPU time per iteration = 0.02
termination code = 0
DIMACS: 1.6e-12 0.0e+00 3.5e-09 0.0e+00 -1.7e-09 1.2e-09
-----

Status: Solved
Optimal value (cvx_optval): +2.60516

#####
#### Best result in 2 iteration: 2.592420e+00 ####
#####

```

Calling SDPT3 4.0: 3 variables, 1 equality constraints

```
-----
num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT      1      0.000 1      0
it pstep dstep pinfeas dinfeas gap      prim-obj      dual-obj
cputime
-----
0/0.000/0.000/8.9e-01/2.6e+00/1.5e+01/ 2.405039e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.927/1.1e-07/2.4e-01/2.0e+00/ 2.554599e+00 1.813070e+00/
0:0:00/ chol 1 1
2/1.000/1.000/1.6e-07/5.0e-03/1.1e-01/ 1.536397e+00 1.442155e+00/
0:0:00/ chol 1 1
3/0.989/0.989/2.1e-08/5.5e-04/1.2e-03/ 1.462960e+00 1.463350e+00/
0:0:00/ chol 1 1
4/0.989/0.989/4.1e-09/5.5e-05/1.3e-05/ 1.462143e+00 1.462291e+00/
0:0:00/ chol 1 1
5/0.989/0.989/2.5e-10/6.1e-07/1.5e-07/ 1.462134e+00 1.462135e+00/
0:0:00/ chol 1 1
6/0.992/0.995/3.1e-12/3.4e-09/1.8e-09/ 1.462133e+00 1.462133e+00/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----
number of iterations = 6
primal objective value = 1.46213349e+00
dual objective value = 1.46213349e+00
gap := trace(XZ) = 1.78e-09
relative gap = 4.53e-10
actual relative gap = -2.07e-09
rel. primal infeas (scaled problem) = 3.15e-12
rel. dual " " " = 3.38e-09
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 2.1e+00, 1.9e-01, 1.4e+00
norm(A), norm(b), norm(C) = 6.3e+00, 8.7e+00, 2.0e+00
Total CPU time (secs) = 0.07
CPU time per iteration = 0.01
termination code = 0
DIMACS: 3.1e-12 0.0e+00 3.4e-09 0.0e+00 -2.1e-09 4.5e-10
-----

Status: Solved
Optimal value (cvx_optval): +1.46213

#####
#### Best result in 3 interation: 1.435675e+00 ####
#####
```

Calling SDPT3 4.0: 3 variables, 1 equality constraints

```
-----
num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT      1      0.000 1      0
it pstep dstep pinfeas dinfeas gap      prim-obj      dual-obj
cputime
-----
0/0.000/0.000/7.5e-01/1.5e+00/7.0e+00/ 1.740907e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.929/1.5e-07/1.5e-01/7.9e-01/ 1.510623e+00 1.189509e+00/
0:0:00/ chol 1 1
2/1.000/1.000/1.6e-07/5.0e-03/2.6e-02/ 1.024249e+00 1.008933e+00/
0:0:00/ chol 1 1
3/0.990/0.990/6.1e-09/5.5e-04/2.7e-04/ 1.006977e+00 1.007813e+00/
0:0:00/ chol 1 1
4/0.989/0.989/1.3e-08/6.0e-06/2.9e-06/ 1.006797e+00 1.006806e+00/
0:0:00/ chol 1 1
5/0.992/0.995/1.3e-10/3.3e-08/3.5e-08/ 1.006795e+00 1.006795e+00/
0:0:00/ chol 1 1
6/0.992/0.994/1.1e-12/2.2e-10/4.2e-10/ 1.006795e+00 1.006795e+00/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----
number of iterations = 6
primal objective value = 1.00679512e+00
dual objective value = 1.00679512e+00
gap := trace(XZ) = 4.25e-10
relative gap = 1.41e-10
actual relative gap = -7.00e-12
rel. primal infeas (scaled problem) = 1.14e-12
rel. dual " " " = 2.22e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.4e+00, 3.3e-01, 1.4e+00
norm(A), norm(b), norm(C) = 4.0e+00, 4.1e+00, 2.0e+00
Total CPU time (secs) = 0.07
CPU time per iteration = 0.01
termination code = 0
DIMACS: 1.1e-12 0.0e+00 2.2e-10 0.0e+00 -7.0e-12 1.4e-10
-----

-----
Status: Solved
Optimal value (cvx_optval): +1.0068

#####
#### Best result in 4 interation: 9.507842e-01 ####
```

```
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints
-----

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT 1 0.000 1 0
it pstep dstep pinfeas dinfeas gap prim-obj dual-obj
cputime
-----
0/0.000/0.000/6.6e-01/1.1e+00/5.5e+00/ 1.732051e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.969/1.7e-07/8.2e-02/4.2e-01/ 1.188237e+00 9.663883e-01/
0:0:00/ chol 1 1
2/0.999/1.000/1.1e-07/5.0e-03/5.2e-03/ 8.892244e-01 8.929662e-01/
0:0:00/ chol 1 1
3/0.989/0.989/7.5e-08/5.5e-04/5.5e-05/ 8.862365e-01 8.871532e-01/
0:0:00/ chol 1 1
4/0.989/0.989/2.3e-08/6.0e-06/6.3e-07/ 8.862043e-01 8.862144e-01/
0:0:00/ chol 1 1
5/0.992/0.993/2.0e-10/4.2e-08/7.6e-09/ 8.862039e-01 8.862040e-01/
0:0:00/ chol 1 1
6/0.992/0.993/1.6e-12/3.1e-10/9.2e-11/ 8.862039e-01 8.862039e-01/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----

number of iterations = 6
primal objective value = 8.86203927e-01
dual objective value = 8.86203927e-01
gap := trace(XZ) = 9.22e-11
relative gap = 3.32e-11
actual relative gap = -1.63e-10
rel. primal infeas (scaled problem) = 1.62e-12
rel. dual " " " = 3.09e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.3e+00, 4.7e-01, 1.4e+00
norm(A), norm(b), norm(C) = 3.1e+00, 2.9e+00, 2.0e+00
Total CPU time (secs) = 0.06
CPU time per iteration = 0.01
termination code = 0
DIMACS: 1.6e-12 0.0e+00 3.1e-10 0.0e+00 -1.6e-10 3.3e-11
-----

Status: Solved
Optimal value (cvx_optval): +0.886204

#####
```

```
#### Best result in 5 iteration: 7.843583e-01 ####
#####
```

Calling SDPT3 4.0: 3 variables, 1 equality constraints

```
-----

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT      1      0.000 1      0
it pstep dstep pinfeas dinfeas gap      prim-obj      dual-obj
cputime
-----
0/0.000/0.000/6.2e-01/9.3e-01/5.0e+00/ 1.732051e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.979/1.7e-07/6.9e-02/3.0e-01/ 1.091919e+00 9.372265e-01/
0:0:00/ chol 1 1
2/0.996/1.000/1.0e-07/5.0e-03/3.3e-03/ 8.704741e-01 8.758649e-01/
0:0:00/ chol 1 1
3/0.989/0.989/1.6e-07/5.5e-04/3.6e-05/ 8.682616e-01 8.691784e-01/
0:0:00/ chol 1 1
4/0.989/0.989/2.9e-08/6.0e-06/4.3e-07/ 8.682375e-01 8.682475e-01/
0:0:00/ chol 1 1
5/0.992/0.994/2.6e-10/3.8e-08/5.2e-09/ 8.682372e-01 8.682372e-01/
0:0:00/ chol 1 1
6/0.992/0.993/2.1e-12/2.7e-10/6.3e-11/ 8.682372e-01 8.682372e-01/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----

number of iterations = 6
primal objective value = 8.68237173e-01
dual objective value = 8.68237173e-01
gap := trace(XZ) = 6.28e-11
relative gap = 2.29e-11
actual relative gap = -1.45e-10
rel. primal infeas (scaled problem) = 2.08e-12
rel. dual " " " = 2.66e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.2e+00, 5.4e-01, 1.4e+00
norm(A), norm(b), norm(C) = 2.9e+00, 2.6e+00, 2.0e+00
Total CPU time (secs) = 0.06
CPU time per iteration = 0.01
termination code = 0
DIMACS: 2.1e-12 0.0e+00 2.7e-10 0.0e+00 -1.4e-10 2.3e-11
-----

Status: Solved
Optimal value (cvx_optval): +0.868237
```

```
#####
#### Best result in 6 iteration: 7.321332e-01 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints
-----

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT      1      0.000 1      0
it pstep dstep pinfeas dinfeas gap      prim-obj      dual-obj
cputime
-----
0/0.000/0.000/6.1e-01/8.9e-01/4.8e+00/ 1.732051e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.981/1.8e-07/6.6e-02/2.7e-01/ 1.064215e+00 9.346968e-01/
0:0:00/ chol 1 1
2/0.996/1.000/1.1e-07/5.0e-03/2.8e-03/ 8.682433e-01 8.741085e-01/
0:0:00/ chol 1 1
3/0.989/0.989/2.0e-07/5.5e-04/3.0e-05/ 8.662853e-01 8.672054e-01/
0:0:00/ chol 1 1
4/0.989/0.989/3.1e-08/6.0e-06/3.7e-07/ 8.662639e-01 8.662740e-01/
0:0:00/ chol 1 1
5/0.992/0.994/2.8e-10/3.6e-08/4.4e-09/ 8.662636e-01 8.662637e-01/
0:0:00/ chol 1 1
6/0.992/0.993/2.3e-12/2.4e-10/5.3e-11/ 8.662636e-01 8.662636e-01/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----

number of iterations = 6
primal objective value = 8.66263609e-01
dual objective value = 8.66263609e-01
gap := trace(XZ) = 5.35e-11
relative gap = 1.96e-11
actual relative gap = -1.33e-10
rel. primal infeas (scaled problem) = 2.28e-12
rel. dual " " " = 2.43e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.2e+00, 5.6e-01, 1.4e+00
norm(A), norm(b), norm(C) = 2.8e+00, 2.5e+00, 2.0e+00
Total CPU time (secs) = 0.09
CPU time per iteration = 0.01
termination code = 0
DIMACS: 2.3e-12 0.0e+00 2.4e-10 0.0e+00 -1.3e-10 2.0e-11
-----

Status: Solved
Optimal value (cvx_optval): +0.866264
```



```
#####
#### Best result in 7 iteration: 7.153583e-01 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints
-----

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT 1 0.000 1 0
it pstep dstep pinfeas dinfeas gap prim-obj dual-obj
cputime
-----
0/0.000/0.000/6.0e-01/8.7e-01/4.8e+00/ 1.732051e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.981/1.8e-07/6.6e-02/2.6e-01/ 1.055639e+00 9.346174e-01/
0:0:00/ chol 1 1
2/0.996/1.000/1.1e-07/5.0e-03/2.7e-03/ 8.679475e-01 8.739619e-01/
0:0:00/ chol 1 1
3/0.989/0.989/2.1e-07/5.5e-04/2.9e-05/ 8.660723e-01 8.669938e-01/
0:0:00/ chol 1 1
4/0.989/0.989/3.1e-08/6.0e-06/3.5e-07/ 8.660518e-01 8.660619e-01/
0:0:00/ chol 1 1
5/0.992/0.994/2.8e-10/3.5e-08/4.2e-09/ 8.660515e-01 8.660516e-01/
0:0:00/ chol 1 1
6/0.992/0.993/2.3e-12/2.4e-10/5.1e-11/ 8.660515e-01 8.660515e-01/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----

number of iterations = 6
primal objective value = 8.66051509e-01
dual objective value = 8.66051509e-01
gap := trace(XZ) = 5.06e-11
relative gap = 1.85e-11
actual relative gap = -1.29e-10
rel. primal infeas (scaled problem) = 2.33e-12
rel. dual " " " = 2.35e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.2e+00, 5.7e-01, 1.4e+00
norm(A), norm(b), norm(C) = 2.7e+00, 2.5e+00, 2.0e+00
Total CPU time (secs) = 0.08
CPU time per iteration = 0.01
termination code = 0
DIMACS: 2.3e-12 0.0e+00 2.4e-10 0.0e+00 -1.3e-10 1.9e-11
-----

-----
Status: Solved
```

Optimal value (cvx_optval): +0.866052

Best result in 8 interation: 7.098469e-01 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1

SDPT3: Infeasible path-following algorithms

version predcorr gam expon scale_data
NT 1 0.000 1 0
it pstep dstep pinfeas dinfeas gap prim-obj dual-obj
cputime

0	/0.000	/0.000	/6.0e-01	/8.7e-01	/4.7e+00	1.732051e+00	0.000000e+00
0:0:00	chol	1	1				
1	/1.000	/0.981	/1.8e-07	/6.5e-02	/2.6e-01	1.052858e+00	9.346711e-01
0:0:00	chol	1	1				
2	/0.996	/1.000	/1.1e-07	/5.0e-03	/2.6e-03	8.678968e-01	8.739599e-01
0:0:00	chol	1	1				
3	/0.989	/0.989	/2.1e-07	/5.5e-04	/2.8e-05	8.660488e-01	8.669708e-01
0:0:00	chol	1	1				
4	/0.989	/0.989	/3.2e-08	/6.0e-06	/3.4e-07	8.660286e-01	8.660386e-01
0:0:00	chol	1	1				
5	/0.992	/0.994	/2.9e-10	/3.5e-08	/4.1e-09	8.660283e-01	8.660283e-01
0:0:00	chol	1	1				
6	/0.992	/0.993	/2.4e-12	/2.3e-10	/5.0e-11	8.660283e-01	8.660283e-01
0:0:00							
stop: max(relative gap, infeasibilities) < 1.49e-08							

number of iterations	=	6					
primal objective value	=	8.66028290e-01					
dual objective value	=	8.66028290e-01					
gap := trace(XZ)	=	4.97e-11					
relative gap	=	1.82e-11					
actual relative gap	=	-1.28e-10					
rel. primal infeas (scaled problem)	=	2.35e-12					
rel. dual " " "	=	2.33e-10					
rel. primal infeas (unscaled problem)	=	0.00e+00					
rel. dual " " "	=	0.00e+00					
norm(X), norm(Y), norm(Z)	=	1.2e+00, 5.8e-01, 1.4e+00					
norm(A), norm(b), norm(C)	=	2.7e+00, 2.5e+00, 2.0e+00					
Total CPU time (secs)	=	0.08					
CPU time per iteration	=	0.01					
termination code	=	0					
DIMACS: 2.4e-12 0.0e+00 2.3e-10 0.0e+00 -1.3e-10 1.8e-11							

Status: Solved

Optimal value (cvx_optval): +0.866028

Best result in 9 interation: 7.080190e-01 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1

SDPT3: Infeasible path-following algorithms

version	predcorr	gam	expon	scale_data			
NT	1	0.000	1	0			
it	pstep	dstep	pinfeas	dinfeas	gap	prim-obj	dual-obj
cputime							

0	0.000	0.000	6.0e-01	8.7e-01	4.7e+00	1.732051e+00	0.000000e+00
0:0:00	chol	1	1				
1	1.000	0.981	1.8e-07	6.5e-02	2.5e-01	1.051940e+00	9.346977e-01
0:0:00	chol	1	1				
2	0.996	1.000	1.1e-07	5.0e-03	2.6e-03	8.678850e-01	8.739643e-01
0:0:00	chol	1	1				
3	0.989	0.989	2.1e-07	5.5e-04	2.8e-05	8.660462e-01	8.669683e-01
0:0:00	chol	1	1				
4	0.989	0.989	3.2e-08	6.0e-06	3.4e-07	8.660260e-01	8.660361e-01
0:0:00	chol	1	1				
5	0.992	0.994	2.9e-10	3.5e-08	4.1e-09	8.660257e-01	8.660258e-01
0:0:00	chol	1	1				
6	0.992	0.993	2.4e-12	2.3e-10	4.9e-11	8.660257e-01	8.660257e-01
0:0:00							
stop: max(relative gap, infeasibilities) < 1.49e-08							

number of iterations	=	6					
primal objective value	=	8.66025724e-01					
dual objective value	=	8.66025724e-01					
gap := trace(XZ)	=	4.94e-11					
relative gap	=	1.81e-11					
actual relative gap	=	-1.28e-10					
rel. primal infeas (scaled problem)	=	2.37e-12					
rel. dual " " "	=	2.32e-10					
rel. primal infeas (unscaled problem)	=	0.00e+00					
rel. dual " " "	=	0.00e+00					
norm(X), norm(Y), norm(Z)	=	1.2e+00, 5.8e-01, 1.4e+00					
norm(A), norm(b), norm(C)	=	2.7e+00, 2.5e+00, 2.0e+00					
Total CPU time (secs)	=	0.06					
CPU time per iteration	=	0.01					
termination code	=	0					
DIMACS: 2.4e-12 0.0e+00 2.3e-10 0.0e+00 -1.3e-10 1.8e-11							

```

-----
Status: Solved
Optimal value (cvx_optval): +0.866026

#####
#### Best result in 10 iteration: 7.074107e-01 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints
-----

num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT 1 0.000 1 0
it pstep dstep pinfeas dinfeas gap prim-obj dual-obj
cputime
-----
0/0.000/0.000/6.0e-01/8.7e-01/4.7e+00/ 1.732051e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.981/1.8e-07/6.5e-02/2.5e-01/ 1.051635e+00 9.347076e-01/
0:0:00/ chol 1 1
2/0.996/1.000/1.1e-07/5.0e-03/2.6e-03/ 8.678817e-01 8.739663e-01/
0:0:00/ chol 1 1
3/0.989/0.989/2.1e-07/5.5e-04/2.8e-05/ 8.660459e-01 8.669680e-01/
0:0:00/ chol 1 1
4/0.989/0.989/3.2e-08/6.0e-06/3.4e-07/ 8.660257e-01 8.660358e-01/
0:0:00/ chol 1 1
5/0.992/0.994/2.9e-10/3.5e-08/4.1e-09/ 8.660254e-01 8.660255e-01/
0:0:00/ chol 1 1
6/0.992/0.993/2.4e-12/2.3e-10/4.9e-11/ 8.660254e-01 8.660254e-01/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----

number of iterations = 6
primal objective value = 8.66025439e-01
dual objective value = 8.66025440e-01
gap := trace(XZ) = 4.93e-11
relative gap = 1.80e-11
actual relative gap = -1.28e-10
rel. primal infeas (scaled problem) = 2.37e-12
rel. dual " " " = 2.32e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.2e+00, 5.8e-01, 1.4e+00
norm(A), norm(b), norm(C) = 2.7e+00, 2.5e+00, 2.0e+00
Total CPU time (secs) = 0.07
CPU time per iteration = 0.01
termination code = 0
DIMACS: 2.4e-12 0.0e+00 2.3e-10 0.0e+00 -1.3e-10 1.8e-11
-----

```

Status: Solved

Optimal value (cvx_optval): +0.866025

Best result in 11 iteration: 7.072081e-01 ####
#####

Calling SDPT3 4.0: 3 variables, 1 equality constraints

```
num. of constraints = 1
dim. of socp var = 3, num. of socp blk = 1
*****
SDPT3: Infeasible path-following algorithms
*****
version predcorr gam expon scale_data
NT      1      0.000 1      0
it pstep dstep pinfeas dinfeas gap      prim-obj      dual-obj
cputime
-----
0/0.000/0.000/6.0e-01/8.7e-01/4.7e+00/ 1.732051e+00 0.000000e+00/
0:0:00/ chol 1 1
1/1.000/0.981/1.8e-07/6.5e-02/2.5e-01/ 1.051534e+00 9.347109e-01/
0:0:00/ chol 1 1
2/0.996/1.000/1.1e-07/5.0e-03/2.6e-03/ 8.678807e-01 8.739671e-01/
0:0:00/ chol 1 1
3/0.989/0.989/2.1e-07/5.5e-04/2.8e-05/ 8.660458e-01 8.669680e-01/
0:0:00/ chol 1 1
4/0.989/0.989/3.2e-08/6.0e-06/3.4e-07/ 8.660257e-01 8.660358e-01/
0:0:00/ chol 1 1
5/0.992/0.994/2.9e-10/3.5e-08/4.1e-09/ 8.660254e-01 8.660255e-01/
0:0:00/ chol 1 1
6/0.992/0.993/2.4e-12/2.3e-10/4.9e-11/ 8.660254e-01 8.660254e-01/
0:0:00/
stop: max(relative gap, infeasibilities) < 1.49e-08
-----
number of iterations = 6
primal objective value = 8.66025408e-01
dual objective value = 8.66025408e-01
gap := trace(XZ) = 4.92e-11
relative gap = 1.80e-11
actual relative gap = -1.27e-10
rel. primal infeas (scaled problem) = 2.37e-12
rel. dual " " " = 2.31e-10
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual " " " = 0.00e+00
norm(X), norm(Y), norm(Z) = 1.2e+00, 5.8e-01, 1.4e+00
norm(A), norm(b), norm(C) = 2.7e+00, 2.5e+00, 2.0e+00
Total CPU time (secs) = 0.06
CPU time per iteration = 0.01
termination code = 0
DIMACS: 2.4e-12 0.0e+00 2.3e-10 0.0e+00 -1.3e-10 1.8e-11
```


Status: Solved
Optimal value (cvx_optval): +0.866025

found_x =

Columns 1 through 7

<i>5.0374</i>	<i>2.5924</i>	<i>1.4357</i>	<i>0.9508</i>	<i>0.7844</i>	<i>0.7321</i>	<i>0.7154</i>
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Columns 8 through 11

<i>0.7098</i>	<i>0.7080</i>	<i>0.7074</i>	<i>0.7072</i>
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