```
>> demo_Polynomial_Dictionary_Learning
Starting to train the dictionary
solving the quadratic problem with YALMIP...

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*******************************************************************
   SDPT3: Infeasible path-following algorithms
*******************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
 0|0.000|0.000|8.2e+02|1.7e+01|1.9e+07| 5.828015e+04  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.578|0.577|3.5e+02|7.4e+00|1.1e+07| 6.455409e+04 -1.147401e+03| 0:0:00| chol  1↙
1
 2|0.924|0.888|2.6e+01|8.5e-01|1.7e+06| 8.457992e+04 -9.123212e+02| 0:0:00| chol  1↙
1
 3|1.000|0.942|5.0e-05|5.8e-02|1.7e+05| 7.240167e+04 -1.901473e+02| 0:0:00| chol  1↙
1
 4|0.214|0.841|4.0e-05|1.3e-02|8.9e+04| 6.727453e+04 -2.066905e+02| 0:0:00| chol  2↙
2
 5|0.514|0.481|1.9e-05|7.7e-03|5.8e+04| 4.591391e+04 -2.073755e+02| 0:0:00| chol  2↙
2
 6|0.928|0.904|1.4e-06|1.7e-03|2.3e+04| 2.069326e+04 -2.216140e+02| 0:0:00| chol  2↙
2
 7|0.446|0.356|9.2e-07|1.3e-03|2.0e+04| 1.725160e+04 -1.680139e+02| 0:0:00| chol  2↙
2
 8|0.361|0.556|6.5e-07|7.4e-04|1.7e+04| 1.516803e+04 -1.689980e+02| 0:0:00| chol  2↙
2
 9|0.482|1.000|3.4e-07|1.4e-04|1.3e+04| 1.218646e+04 -2.212413e+02| 0:0:00| chol  3↙
3
10|1.000|1.000|2.6e-07|6.9e-05|5.0e+03| 4.513710e+03 -1.937893e+02| 0:0:00| chol  3↙
3
11|1.000|1.000|1.8e-06|3.5e-05|2.4e+03| 2.167443e+03 -1.540773e+02| 0:0:00| chol  3↙
3
12|1.000|1.000|9.6e-07|1.7e-05|9.2e+02| 7.579480e+02 -1.357010e+02| 0:0:00| chol  3↙
3
13|1.000|1.000|4.5e-07|8.7e-06|2.0e+02| 7.486325e+01 -1.269746e+02| 0:0:00| chol  3↙
3
14|0.856|0.938|7.7e-08|3.1e-06|4.5e+01|-7.966836e+01 -1.247028e+02| 0:0:00| chol  2↙
2
15|0.616|1.000|3.0e-08|7.9e-07|3.3e+01|-9.140338e+01 -1.240920e+02| 0:0:00| chol  3↙
3
16|1.000|0.960|7.9e-09|2.6e-07|1.8e+01|-1.054066e+02 -1.234713e+02| 0:0:00| chol  2↙
2
17|1.000|1.000|1.9e-09|7.1e-08|7.5e+00|-1.159538e+02 -1.234060e+02| 0:0:00| chol  2↙
2
18|1.000|1.000|2.0e-09|7.4e-09|3.2e+00|-1.200219e+02 -1.232493e+02| 0:0:00| chol  2↙
2
19|0.967|1.000|7.8e-10|1.1e-09|5.3e-01|-1.226703e+02 -1.232042e+02| 0:0:00| chol  3↙
3
```

```
20|0.998|0.942|9.3e-10|2.9e-10|1.3e-01|-1.230637e+02 -1.231943e+02| 0:0:00| chol  2↙
2
21|0.916|1.000|5.2e-10|1.9e-10|6.9e-02|-1.231229e+02 -1.231919e+02| 0:0:00| chol  3↙
3
22|1.000|1.000|3.9e-10|1.1e-10|3.1e-02|-1.231601e+02 -1.231910e+02| 0:0:00| chol  2↙
3
23|0.975|0.967|8.5e-10|8.1e-11|3.3e-03|-1.231871e+02 -1.231904e+02| 0:0:00| chol  2↙
4
24|0.990|0.926|1.0e-09|1.2e-10|1.8e-04|-1.231902e+02 -1.231904e+02| 0:0:00| chol  6↙
6
25|0.996|0.986|8.2e-10|1.8e-10|1.1e-05|-1.231903e+02 -1.231903e+02| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -1.23190331e+02
 dual   objective value = -1.23190342e+02
 gap := trace(XZ)       = 1.11e-05
 relative gap           = 4.48e-08
 actual relative gap    = 4.30e-08
 rel. primal infeas     = 8.19e-10
 rel. dual   infeas     = 1.76e-10
 norm(X), norm(y), norm(Z) = 1.5e+02, 1.8e+02, 2.2e+01
 norm(A), norm(b), norm(C) = 7.3e+02, 1.9e+02, 2.5e+02
 Total CPU time (secs)  = 0.24
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.7e-09  0.0e+00  2.5e-10  0.0e+00  4.3e-08  4.5e-08
-----------------------------------------------------------------

ans =

  123.1903


 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*****************************************************************
   SDPT3: Infeasible path-following algorithms
*****************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-----------------------------------------------------------------
 0|0.000|0.000|1.8e+02|1.9e+01|7.6e+07| 2.502154e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.878|0.839|2.2e+01|3.1e+00|1.4e+07| 2.180033e+05  5.503596e+02| 0:0:00| chol  1↙
1
 2|1.000|0.969|2.4e-07|1.2e-01|7.6e+05| 2.041062e+05 -3.936915e+02| 0:0:00| chol  2↙
2
 3|1.000|0.947|3.1e-07|2.0e-02|1.3e+05| 7.910690e+04 -1.062879e+02| 0:0:00| chol  1↙
1
 4|0.573|1.000|1.4e-07|7.4e-03|6.1e+04| 4.863459e+04 -1.299426e+02| 0:0:00| chol  2↙
2
```

```
 5|1.000|0.957|1.9e-09|3.8e-03|1.1e+04| 8.572770e+03 -9.406525e+01| 0:0:00| chol  2↙
2
 6|0.623|0.983|5.8e-09|1.2e-03|7.0e+03| 6.224726e+03 -8.453818e+01| 0:0:00| chol  2↙
2
 7|0.590|0.481|2.9e-08|8.6e-04|5.6e+03| 4.759132e+03 -6.103127e+01| 0:0:00| chol  2↙
2
 8|1.000|0.866|3.9e-08|3.5e-04|3.4e+03| 2.938155e+03 -6.784323e+01| 0:0:00| chol  2↙
2
 9|0.769|1.000|1.7e-08|1.4e-04|2.1e+03| 1.920345e+03 -5.909339e+01| 0:0:00| chol  3↙
2
10|1.000|1.000|4.4e-09|6.9e-05|1.3e+03| 1.171474e+03 -5.888816e+01| 0:0:00| chol  3↙
3
11|1.000|1.000|1.0e-08|3.5e-05|5.1e+02| 4.426398e+02 -4.909109e+01| 0:0:00| chol  3↙
3
12|1.000|1.000|9.7e-09|1.7e-05|1.1e+02| 6.317596e+01 -4.297868e+01| 0:0:00| chol  2↙
2
13|0.759|0.821|2.3e-09|7.3e-06|6.1e+01| 1.964553e+01 -4.073390e+01| 0:0:00| chol  2↙
2
14|1.000|1.000|3.4e-10|1.6e-06|3.9e+01|-1.216027e+00 -4.017498e+01| 0:0:00| chol  2↙
2
15|1.000|1.000|3.5e-10|4.7e-07|1.4e+01|-2.578853e+01 -3.946265e+01| 0:0:00| chol  2↙
2
16|1.000|1.000|8.2e-11|4.7e-08|5.7e+00|-3.353629e+01 -3.928427e+01| 0:0:00| chol  2↙
2
17|1.000|0.983|2.1e-11|5.4e-09|1.9e+00|-3.720684e+01 -3.914094e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|1.1e-11|4.7e-10|5.7e-01|-3.852048e+01 -3.908842e+01| 0:0:00| chol  2↙
2
19|0.801|1.000|3.5e-12|4.9e-11|3.1e-01|-3.877406e+01 -3.907946e+01| 0:0:00| chol  2↙
2
20|1.000|1.000|1.0e-11|5.7e-12|6.5e-02|-3.900918e+01 -3.907383e+01| 0:0:00| chol  2↙
2
21|0.551|0.901|9.9e-12|2.5e-12|3.9e-02|-3.903371e+01 -3.907267e+01| 0:0:00| chol  2↙
2
22|0.673|1.000|4.8e-11|2.0e-12|1.9e-02|-3.905307e+01 -3.907220e+01| 0:0:00| chol  3↙
3
23|0.921|0.990|7.2e-11|3.0e-12|3.7e-03|-3.906825e+01 -3.907193e+01| 0:0:00| chol  3↙
4
24|1.000|1.000|7.1e-11|4.5e-12|1.5e-03|-3.907044e+01 -3.907190e+01| 0:0:00| chol  3↙
3
25|0.965|0.906|1.0e-10|7.1e-12|6.5e-05|-3.907180e+01 -3.907187e+01| 0:0:00| chol  5↙
4
26|0.984|0.928|8.2e-11|1.1e-11|4.2e-06|-3.907186e+01 -3.907187e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 26
 primal objective value = -3.90718627e+01
 dual   objective value = -3.90718670e+01
 gap := trace(XZ)       = 4.19e-06
 relative gap           = 5.30e-08
 actual relative gap    = 5.36e-08
 rel. primal infeas     = 8.19e-11
 rel. dual   infeas     = 1.05e-11
 norm(X), norm(y), norm(Z) = 1.0e+02, 3.1e+02, 1.9e+02
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```
 norm(A), norm(b), norm(C) = 4.9e+03, 3.5e+03, 2.5e+02
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.9e-10  0.0e+00  1.5e-11  0.0e+00  5.4e-08  5.3e-08
------------------------------------------------------------------

ans =

   39.0719

Iteration   2   Total error is: 0.020813

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*******************************************************************
   SDPT3: Infeasible path-following algorithms
*******************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
 0|0.000|0.000|1.7e+02|1.9e+01|7.3e+07| 2.409049e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.873|0.833|2.2e+01|3.2e+00|1.5e+07| 2.129368e+05  7.917808e+02| 0:0:00| chol  1↙
1
 2|1.000|0.968|2.3e-07|1.3e-01|7.8e+05| 2.000191e+05 -3.999371e+02| 0:0:00| chol  2↙
2
 3|1.000|0.942|2.9e-07|2.1e-02|1.3e+05| 8.163451e+04 -1.065430e+02| 0:0:00| chol  1↙
1
 4|0.569|1.000|1.3e-07|7.4e-03|6.3e+04| 5.044167e+04 -1.337667e+02| 0:0:00| chol  2↙
2
 5|1.000|0.942|2.8e-09|3.9e-03|1.1e+04| 8.183924e+03 -9.758980e+01| 0:0:00| chol  2↙
2
 6|0.612|0.974|4.0e-09|1.2e-03|6.9e+03| 6.073281e+03 -8.720228e+01| 0:0:00| chol  2↙
2
 7|0.514|0.418|2.9e-08|8.2e-04|5.7e+03| 4.862878e+03 -6.409954e+01| 0:0:00| chol  2↙
2
 8|0.918|0.774|3.5e-08|3.1e-04|3.8e+03| 3.238311e+03 -7.510924e+01| 0:0:00| chol  2↙
2
 9|0.999|1.000|8.0e-09|8.3e-05|2.2e+03| 1.962085e+03 -6.410523e+01| 0:0:00| chol  3↙
2
10|0.680|1.000|5.5e-09|4.1e-05|1.6e+03| 1.501494e+03 -6.391697e+01| 0:0:00| chol  3↙
3
11|1.000|1.000|1.1e-08|2.1e-05|9.6e+02| 8.714120e+02 -5.814619e+01| 0:0:00| chol  3↙
3
12|1.000|1.000|2.4e-08|1.0e-05|3.2e+02| 2.647021e+02 -4.763022e+01| 0:0:00| chol  3↙
3
13|0.904|0.915|7.9e-09|5.6e-06|7.1e+01| 2.785633e+01 -4.267595e+01| 0:0:00| chol  2↙
2
14|0.827|0.945|1.5e-09|1.8e-06|4.9e+01| 8.416166e+00 -4.019966e+01| 0:0:00| chol  2↙
2
15|1.000|1.000|2.0e-10|4.7e-07|2.9e+01|-1.142766e+01 -3.994857e+01| 0:0:00| chol  2↙
```

```
2
16|1.000|1.000|2.8e-10|1.4e-07|1.0e+01|-2.886308e+01 -3.910674e+01| 0:0:00| chol  2↙
2
17|1.000|0.818|3.2e-11|3.7e-08|3.8e+00|-3.508206e+01 -3.892534e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|4.1e-11|1.4e-09|1.5e+00|-3.715999e+01 -3.870317e+01| 0:0:00| chol  2↙
2
19|0.967|0.969|6.7e-12|1.9e-10|4.4e-01|-3.821719e+01 -3.865416e+01| 0:0:00| chol  2↙
2
20|0.958|0.966|1.2e-11|2.1e-11|1.8e-01|-3.845759e+01 -3.863760e+01| 0:0:00| chol  2↙
2
21|0.924|0.987|1.8e-11|3.7e-12|4.8e-02|-3.858182e+01 -3.862960e+01| 0:0:00| chol  2↙
2
22|0.968|0.899|2.0e-11|3.5e-12|6.7e-03|-3.862167e+01 -3.862835e+01| 0:0:00| chol  3↙
3
23|0.931|0.928|3.1e-11|4.2e-12|1.3e-03|-3.862679e+01 -3.862813e+01| 0:0:00| chol  3↙
3
24|0.965|0.944|6.4e-11|6.2e-12|7.3e-05|-3.862802e+01 -3.862809e+01| 0:0:00| chol  5↙
4
25|0.991|0.996|2.5e-11|9.0e-12|3.1e-06|-3.862808e+01 -3.862809e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -3.86280827e+01
 dual   objective value = -3.86280857e+01
 gap := trace(XZ)       = 3.06e-06
 relative gap           = 3.91e-08
 actual relative gap    = 3.89e-08
 rel. primal infeas     = 2.55e-11
 rel. dual   infeas     = 8.95e-12
 norm(X), norm(y), norm(Z) = 1.1e+02, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.9e+03, 3.5e+03, 2.5e+02
 Total CPU time (secs)  = 0.23
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 6.2e-11  0.0e+00  1.3e-11  0.0e+00  3.9e-08  3.9e-08
-------------------------------------------------------------------

ans =

   38.6281

Iteration   3   Total error is: 0.02069

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*******************************************************************
   SDPT3: Infeasible path-following algorithms
*******************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
```

```
 0|0.000|0.000|1.7e+02|1.9e+01|7.1e+07| 2.336117e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.847|0.822|2.7e+01|3.4e+00|1.6e+07| 2.157312e+05  2.374138e+02| 0:0:00| chol  1↙
1
 2|1.000|0.960|2.6e-07|1.6e-01|9.4e+05| 2.036773e+05 -4.057580e+02| 0:0:00| chol  1↙
2
 3|1.000|0.935|2.3e-07|2.4e-02|1.6e+05| 9.863953e+04 -1.110243e+02| 0:0:00| chol  1↙
1
 4|0.550|1.000|1.0e-07|7.4e-03|7.6e+04| 6.160300e+04 -1.443911e+02| 0:0:00| chol  2↙
2
 5|1.000|0.865|2.9e-09|4.2e-03|1.3e+04| 1.010963e+04 -1.197761e+02| 0:0:00| chol  2↙
2
 6|0.691|1.000|3.0e-09|1.8e-03|8.9e+03| 7.627428e+03 -9.282108e+01| 0:0:00| chol  2↙
2
 7|1.000|0.946|8.0e-09|9.7e-04|5.4e+03| 4.594032e+03 -7.073930e+01| 0:0:00| chol  2↙
2
 8|1.000|0.958|4.3e-08|4.8e-04|2.2e+03| 1.829663e+03 -6.153998e+01| 0:0:00| chol  2↙
2
 9|0.936|1.000|2.1e-08|2.3e-04|1.2e+03| 1.008407e+03 -5.187058e+01| 0:0:00| chol  2↙
2
10|1.000|1.000|8.9e-10|1.2e-04|6.6e+02| 5.565679e+02 -5.120085e+01| 0:0:00| chol  2↙
2
11|1.000|1.000|1.7e-09|5.8e-05|2.6e+02| 1.922674e+02 -4.670931e+01| 0:0:00| chol  2↙
2
12|1.000|0.969|2.0e-09|1.8e-05|7.9e+01| 3.420486e+01 -4.257022e+01| 0:0:00| chol  2↙
2
13|1.000|1.000|4.9e-10|5.2e-06|5.0e+01| 9.144902e+00 -4.066546e+01| 0:0:00| chol  2↙
2
14|1.000|1.000|3.1e-10|1.6e-06|2.7e+01|-1.258349e+01 -3.974798e+01| 0:0:00| chol  2↙
2
15|1.000|1.000|1.7e-10|4.7e-07|9.5e+00|-2.964560e+01 -3.914031e+01| 0:0:00| chol  2↙
2
16|1.000|0.927|3.2e-11|7.7e-08|3.4e+00|-3.539186e+01 -3.877506e+01| 0:0:00| chol  2↙
2
17|1.000|1.000|4.4e-11|4.7e-09|1.1e+00|-3.748603e+01 -3.856569e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|5.1e-12|4.7e-10|4.3e-01|-3.810919e+01 -3.853527e+01| 0:0:00| chol  2↙
2
19|0.936|1.000|1.1e-11|4.8e-11|1.2e-01|-3.838856e+01 -3.851264e+01| 0:0:00| chol  2↙
2
20|0.796|0.838|5.4e-12|1.3e-11|4.1e-02|-3.846850e+01 -3.850969e+01| 0:0:00| chol  2↙
2
21|0.751|0.964|1.1e-11|2.0e-12|1.4e-02|-3.849436e+01 -3.850868e+01| 0:0:00| chol  2↙
2
22|0.917|0.990|7.1e-11|1.7e-12|2.4e-03|-3.850608e+01 -3.850850e+01| 0:0:00| chol  3↙
3
23|1.000|1.000|1.6e-10|2.5e-12|6.8e-04|-3.850779e+01 -3.850847e+01| 0:0:00| chol  4↙
4
24|1.000|1.000|1.8e-10|3.7e-12|1.9e-04|-3.850827e+01 -3.850846e+01| 0:0:00| chol  4↙
4
25|1.000|1.000|8.5e-11|5.5e-12|1.6e-05|-3.850844e+01 -3.850846e+01| 0:0:00| chol
  warning: symqmr failed: 0.3
  switch to LU factor. lu 30 ^ 5
26|1.000|1.000|4.5e-10|8.3e-12|5.6e-07|-3.850846e+01 -3.850846e+01| 0:0:00|
```

```
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 26
 primal objective value = -3.85084592e+01
 dual   objective value = -3.85084599e+01
 gap := trace(XZ)       = 5.64e-07
 relative gap           = 7.23e-09
 actual relative gap    = 9.14e-09
 rel. primal infeas     = 4.46e-10
 rel. dual   infeas     = 8.28e-12
 norm(X), norm(y), norm(Z) = 1.1e+02, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.9e+03, 3.4e+03, 2.5e+02
 Total CPU time (secs)  = 0.23
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.1e-09  0.0e+00  1.2e-11  0.0e+00  9.1e-09  7.2e-09
-----------------------------------------------------------------

ans =

   38.5085

Iteration   4   Total error is: 0.020647

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*****************************************************************
   SDPT3: Infeasible path-following algorithms
*****************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-----------------------------------------------------------------
 0|0.000|0.000|1.8e+02|1.9e+01|7.0e+07| 2.299310e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.818|0.795|3.3e+01|3.9e+00|1.8e+07| 2.207529e+05 -4.375806e+02| 0:0:00| chol  1↙
1
 2|1.000|0.953|3.0e-07|2.1e-01|1.2e+06| 2.087279e+05 -4.570658e+02| 0:0:00| chol  1↙
2
 3|1.000|0.929|2.7e-07|2.8e-02|2.1e+05| 1.179247e+05 -1.166210e+02| 0:0:00| chol  1↙
1
 4|0.545|0.977|1.2e-07|7.8e-03|9.3e+04| 7.472887e+04 -1.584684e+02| 0:0:00| chol  2↙
2
 5|0.925|0.652|1.1e-08|5.1e-03|3.0e+04| 2.327902e+04 -1.650222e+02| 0:0:00| chol  2↙
2
 6|1.000|1.000|1.6e-08|1.8e-03|1.9e+04| 1.608389e+04 -1.105862e+02| 0:0:00| chol  2↙
2
 7|0.793|0.916|9.7e-09|1.0e-03|9.0e+03| 7.766366e+03 -8.755350e+01| 0:0:00| chol  2↙
2
 8|1.000|0.647|4.0e-08|6.5e-04|5.0e+03| 4.053307e+03 -7.845032e+01| 0:0:00| chol  2↙
2
 9|1.000|1.000|4.6e-08|2.3e-04|2.5e+03| 2.176013e+03 -6.745233e+01| 0:0:00| chol  2↙
2
```

```
10|1.000|1.000|9.7e-09|1.2e-04|1.3e+03| 1.107569e+03 -5.650169e+01| 0:0:00| chol  3↙
2
11|1.000|1.000|2.8e-09|5.8e-05|4.2e+02| 3.413127e+02 -5.293081e+01| 0:0:00| chol  3↙
3
12|1.000|1.000|4.7e-09|2.9e-05|1.5e+02| 1.001535e+02 -4.514039e+01| 0:0:00| chol  2↙
2
13|0.738|1.000|1.2e-09|8.6e-06|8.3e+01| 3.993773e+01 -4.215200e+01| 0:0:00| chol  2↙
2
14|1.000|1.000|7.6e-10|2.6e-06|4.8e+01| 7.798048e+00 -4.045245e+01| 0:0:00| chol  2↙
2
15|1.000|1.000|5.2e-10|7.8e-07|1.8e+01|-2.121132e+01 -3.966241e+01| 0:0:00| chol  2↙
2
16|1.000|1.000|1.2e-10|7.8e-08|7.8e+00|-3.113458e+01 -3.896578e+01| 0:0:00| chol  2↙
2
17|1.000|0.988|2.6e-11|8.7e-09|2.5e+00|-3.616605e+01 -3.866423e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|2.0e-11|7.8e-10|9.6e-01|-3.754831e+01 -3.850390e+01| 0:0:00| chol  2↙
2
19|0.683|0.898|8.5e-12|1.5e-10|4.6e-01|-3.800623e+01 -3.847016e+01| 0:0:00| chol  2↙
2
20|1.000|0.999|9.4e-12|9.6e-12|9.9e-02|-3.835621e+01 -3.845518e+01| 0:0:00| chol  2↙
2
21|0.513|0.902|5.8e-12|3.5e-12|5.9e-02|-3.839348e+01 -3.845260e+01| 0:0:00| chol  2↙
2
22|0.860|1.000|2.5e-11|1.2e-12|2.2e-02|-3.842994e+01 -3.845155e+01| 0:0:00| chol  3↙
3
23|0.919|1.000|5.7e-11|1.7e-12|4.6e-03|-3.844639e+01 -3.845097e+01| 0:0:00| chol  3↙
3
24|1.000|1.000|6.2e-11|2.6e-12|2.1e-03|-3.844881e+01 -3.845093e+01| 0:0:00| chol  3↙
3
25|0.946|0.973|1.2e-10|4.0e-12|2.8e-04|-3.845062e+01 -3.845089e+01| 0:0:00| chol  5↙
5
26|1.000|1.000|4.0e-10|5.8e-12|8.1e-05|-3.845081e+01 -3.845089e+01| 0:0:00| chol  6↙
6
27|1.000|1.000|2.2e-10|8.7e-12|1.3e-05|-3.845088e+01 -3.845089e+01| 0:0:00| chol 26↙
30
28|1.000|0.993|2.9e-09|1.3e-11|6.5e-07|-3.845089e+01 -3.845089e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 28
 primal objective value = -3.84508891e+01
 dual   objective value = -3.84508901e+01
 gap := trace(XZ)       = 6.51e-07
 relative gap           = 8.36e-09
 actual relative gap    = 1.33e-08
 rel. primal infeas     = 2.87e-09
 rel. dual   infeas     = 1.32e-11
 norm(X), norm(y), norm(Z) = 1.1e+02, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.9e+03, 3.2e+03, 2.5e+02
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 6.4e-09  0.0e+00  1.9e-11  0.0e+00  1.3e-08  8.4e-09
------------------------------------------------------------------
```

```
ans =

   38.4509

Iteration   5   Total error is: 0.020624

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*******************************************************************
   SDPT3: Infeasible path-following algorithms
*******************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
 0|0.000|0.000|1.9e+02|1.9e+01|6.9e+07| 2.272063e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.799|0.779|3.7e+01|4.2e+00|2.0e+07| 2.225810e+05 -9.010076e+02| 0:0:00| chol  1↙
1
 2|1.000|0.949|3.2e-07|2.4e-01|1.3e+06| 2.102870e+05 -4.890289e+02| 0:0:00| chol  1↙
2
 3|1.000|0.925|4.0e-07|3.1e-02|2.3e+05| 1.272016e+05 -1.192411e+02| 0:0:00| chol  1↙
1
 4|0.542|0.957|1.8e-07|8.4e-03|1.0e+05| 8.179444e+04 -1.664313e+02| 0:0:00| chol  2↙
2
 5|0.777|0.560|4.2e-08|5.7e-03|4.8e+04| 3.771906e+04 -1.855608e+02| 0:0:00| chol  2↙
2
 6|1.000|1.000|1.7e-08|1.8e-03|2.6e+04| 2.248058e+04 -1.431018e+02| 0:0:00| chol  2↙
2
 7|0.698|0.841|2.0e-08|1.1e-03|1.4e+04| 1.249704e+04 -9.992544e+01| 0:0:00| chol  3↙
3
 8|0.828|0.551|5.8e-08|7.3e-04|9.4e+03| 7.750215e+03 -9.224429e+01| 0:0:00| chol  2↙
2
 9|1.000|1.000|5.9e-08|2.3e-04|5.5e+03| 4.918125e+03 -1.087054e+02| 0:0:00| chol  2↙
3
10|1.000|1.000|1.8e-08|1.2e-04|2.5e+03| 2.188695e+03 -8.555255e+01| 0:0:00| chol  3↙
3
11|1.000|1.000|3.2e-08|5.8e-05|1.4e+03| 1.252825e+03 -6.398347e+01| 0:0:00| chol  3↙
3
12|0.970|1.000|2.9e-08|2.9e-05|3.0e+02| 2.406929e+02 -5.136023e+01| 0:0:00| chol  3↙
3
13|1.000|0.956|5.3e-09|1.5e-05|1.4e+02| 8.866850e+01 -4.450450e+01| 0:0:00| chol  2↙
2
14|0.779|1.000|1.4e-09|4.3e-06|8.3e+01| 3.990367e+01 -4.288155e+01| 0:0:00| chol  3↙
3
15|1.000|1.000|7.2e-10|1.3e-06|4.6e+01| 5.504778e+00 -4.036723e+01| 0:0:00| chol  2↙
2
16|1.000|1.000|3.3e-10|3.9e-07|1.9e+01|-2.035554e+01 -3.981271e+01| 0:0:00| chol  2↙
2
17|1.000|1.000|1.6e-10|3.9e-08|7.9e+00|-3.099987e+01 -3.894624e+01| 0:0:00| chol  2↙
2
18|1.000|0.918|2.1e-11|6.8e-09|3.1e+00|-3.557387e+01 -3.868885e+01| 0:0:00| chol  2↙
```

```
2
19|1.000|1.000|2.3e-11|3.9e-10|1.1e+00|-3.740097e+01 -3.847338e+01| 0:0:00| chol  2↙
2
20|0.574|0.923|1.0e-11|7.0e-11|6.1e-01|-3.782477e+01 -3.843073e+01| 0:0:00| chol  2↙
2
21|0.958|1.000|7.8e-12|6.0e-12|1.5e-01|-3.826301e+01 -3.841428e+01| 0:0:00| chol  2↙
2
22|1.000|0.832|1.2e-11|2.9e-12|3.6e-02|-3.837283e+01 -3.840862e+01| 0:0:00| chol  2↙
2
23|0.637|0.943|1.5e-11|2.5e-12|1.8e-02|-3.838871e+01 -3.840673e+01| 0:0:00| chol  3↙
3
24|0.801|0.974|3.3e-11|3.0e-12|6.1e-03|-3.840036e+01 -3.840641e+01| 0:0:00| chol  3↙
3
25|0.846|1.000|7.2e-11|4.4e-12|1.4e-03|-3.840490e+01 -3.840632e+01| 0:0:00| chol  4↙
4
26|1.000|1.000|5.2e-10|6.5e-12|7.3e-04|-3.840558e+01 -3.840631e+01| 0:0:00| chol  3↙
3
27|0.998|1.000|1.1e-11|9.8e-12|4.1e-05|-3.840626e+01 -3.840630e+01| 0:0:00| chol  5↙
5
28|0.994|1.000|1.2e-10|2.1e-12|2.9e-06|-3.840630e+01 -3.840630e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 28
 primal objective value = -3.84062977e+01
 dual   objective value = -3.84063006e+01
 gap := trace(XZ)       = 2.93e-06
 relative gap           = 3.76e-08
 actual relative gap    = 3.83e-08
 rel. primal infeas     = 1.18e-10
 rel. dual   infeas     = 2.13e-12
 norm(X), norm(y), norm(Z) = 1.1e+02, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.8e+03, 3.0e+03, 2.5e+02
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 2.6e-10  0.0e+00  3.0e-12  0.0e+00  3.8e-08  3.8e-08
-------------------------------------------------------------------

ans =

   38.4063

Iteration   6   Total error is: 0.02061

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*******************************************************************
   SDPT3: Infeasible path-following algorithms
*******************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
```

```
 0|0.000|0.000|1.8e+02|1.9e+01|6.8e+07| 2.251971e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.784|0.765|4.0e+01|4.5e+00|2.1e+07| 2.240039e+05 -1.210449e+03| 0:0:00| chol  1↙
1
 2|1.000|0.947|3.3e-07|2.7e-01|1.4e+06| 2.115572e+05 -5.145917e+02| 0:0:00| chol  2↙
2
 3|1.000|0.923|6.3e-07|3.4e-02|2.5e+05| 1.337272e+05 -1.212019e+02| 0:0:00| chol  1↙
1
 4|0.541|0.946|2.9e-07|8.8e-03|1.1e+05| 8.689221e+04 -1.725692e+02| 0:0:00| chol  2↙
2
 5|0.701|0.509|8.8e-08|6.2e-03|6.0e+04| 4.693502e+04 -1.990007e+02| 0:0:00| chol  2↙
2
 6|1.000|1.000|8.8e-09|1.8e-03|2.9e+04| 2.505167e+04 -1.625630e+02| 0:0:00| chol  2↙
2
 7|0.656|0.811|5.4e-08|1.1e-03|1.7e+04| 1.484095e+04 -1.045520e+02| 0:0:00| chol  2↙
3
 8|0.724|0.524|5.8e-08|7.6e-04|1.2e+04| 1.006011e+04 -9.781072e+01| 0:0:00| chol  2↙
2
 9|1.000|0.898|3.7e-08|2.8e-04|7.5e+03| 6.608988e+03 -1.279855e+02| 0:0:00| chol  2↙
2
10|0.783|1.000|1.2e-08|1.2e-04|4.1e+03| 3.734058e+03 -1.111716e+02| 0:0:00| chol  3↙
3
11|1.000|1.000|4.3e-08|5.8e-05|2.5e+03| 2.301278e+03 -7.611831e+01| 0:0:00| chol  3↙
3
12|1.000|1.000|1.5e-07|2.9e-05|7.8e+02| 6.874989e+02 -6.268270e+01| 0:0:00| chol  3↙
3
13|1.000|1.000|2.1e-08|1.4e-05|3.1e+02| 2.561294e+02 -5.070813e+01| 0:0:00| chol  3↙
3
14|0.823|0.876|5.8e-09|8.1e-06|9.7e+01| 5.165692e+01 -4.449378e+01| 0:0:00| chol  2↙
2
15|1.000|1.000|1.4e-09|2.2e-06|6.6e+01| 2.429812e+01 -4.096136e+01| 0:0:00| chol  2↙
2
16|0.914|1.000|2.6e-10|6.5e-07|2.8e+01|-1.333967e+01 -4.080898e+01| 0:0:00| chol  2↙
2
17|1.000|1.000|2.5e-10|1.9e-07|1.4e+01|-2.496305e+01 -3.916771e+01| 0:0:00| chol  2↙
2
18|0.979|1.000|3.7e-11|1.9e-08|4.0e+00|-3.475200e+01 -3.878530e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|2.4e-11|1.9e-09|1.7e+00|-3.681705e+01 -3.848310e+01| 0:0:00| chol  2↙
2
20|0.905|0.862|8.6e-12|4.4e-10|4.9e-01|-3.792746e+01 -3.841405e+01| 0:0:00| chol  2↙
2
21|0.671|1.000|6.7e-12|2.1e-11|2.6e-01|-3.812762e+01 -3.838491e+01| 0:0:00| chol  2↙
2
22|1.000|1.000|6.2e-12|3.3e-12|5.2e-02|-3.832536e+01 -3.837743e+01| 0:0:00| chol  2↙
2
23|0.860|0.917|3.2e-11|1.7e-12|1.5e-02|-3.836090e+01 -3.837548e+01| 0:0:00| chol  2↙
2
24|0.781|0.957|3.7e-11|1.9e-12|4.4e-03|-3.837072e+01 -3.837512e+01| 0:0:00| chol  3↙
3
25|0.946|0.969|3.1e-11|2.8e-12|3.5e-04|-3.837470e+01 -3.837505e+01| 0:0:00| chol  4↙
4
26|0.936|1.000|3.3e-10|4.2e-12|5.8e-05|-3.837499e+01 -3.837504e+01| 0:0:00| chol  7↙
13
```

```
27|1.000|1.000|2.3e-09|6.3e-12|1.6e-05|-3.837503e+01 -3.837504e+01| 0:0:00| chol 12↙
12
28|1.000|1.000|3.5e-09|9.4e-12|9.9e-07|-3.837504e+01 -3.837504e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 28
 primal objective value = -3.83750413e+01
 dual   objective value = -3.83750429e+01
 gap := trace(XZ)       = 9.87e-07
 relative gap           = 1.27e-08
 actual relative gap    = 2.00e-08
 rel. primal infeas     = 3.51e-09
 rel. dual   infeas     = 9.38e-12
 norm(X), norm(y), norm(Z) = 1.1e+02, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.8e+03, 3.0e+03, 2.5e+02
 Total CPU time (secs)  = 0.26
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 7.5e-09  0.0e+00  1.3e-11  0.0e+00  2.0e-08  1.3e-08
-----------------------------------------------------------------

ans =

   38.3750

Iteration   7   Total error is: 0.020601

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 861
*****************************************************************
   SDPT3: Infeasible path-following algorithms
*****************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-----------------------------------------------------------------
 0|0.000|0.000|1.9e+02|1.9e+01|6.8e+07| 2.250688e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.774|0.756|4.2e+01|4.7e+00|2.2e+07| 2.253941e+05 -1.461202e+03| 0:0:00| chol  1↙
1
 2|1.000|0.945|3.4e-07|2.8e-01|1.5e+06| 2.130163e+05 -5.394709e+02| 0:0:00| chol  2↙
2
 3|1.000|0.921|1.1e-06|3.5e-02|2.6e+05| 1.380958e+05 -1.235651e+02| 0:0:00| chol  1↙
1
 4|0.541|0.939|5.3e-07|9.0e-03|1.1e+05| 9.034701e+04 -1.775574e+02| 0:0:00| chol  2↙
2
 5|0.668|0.486|1.8e-07|6.4e-03|6.6e+04| 5.195734e+04 -2.079300e+02| 0:0:00| chol  2↙
2
 6|1.000|1.000|5.4e-09|1.8e-03|3.0e+04| 2.602408e+04 -1.745487e+02| 0:0:00| chol  2↙
2
 7|0.636|0.798|7.9e-08|1.1e-03|1.8e+04| 1.592182e+04 -1.065436e+02| 0:0:00| chol  3↙
3
 8|0.639|0.537|6.0e-08|7.6e-04|1.3e+04| 1.150527e+04 -1.013690e+02| 0:0:00| chol  2↙
```

```
2
 9|1.000|0.932|3.9e-08|2.7e-04|8.4e+03| 7.449316e+03 -1.362472e+02| 0:0:00| chol  2↙
2
10|0.858|1.000|1.7e-08|1.2e-04|4.3e+03| 3.892356e+03 -1.145041e+02| 0:0:00| chol  3↙
3
11|1.000|1.000|5.7e-08|5.8e-05|2.7e+03| 2.453274e+03 -8.096818e+01| 0:0:00| chol  3↙
3
12|1.000|1.000|1.9e-07|2.9e-05|8.2e+02| 7.298188e+02 -6.343528e+01| 0:0:00| chol  3↙
3
13|1.000|1.000|2.4e-07|1.4e-05|3.3e+02| 2.735096e+02 -5.205545e+01| 0:0:00| chol  3↙
3
14|0.829|0.867|4.2e-08|8.2e-06|1.0e+02| 5.707832e+01 -4.505926e+01| 0:0:00| chol  2↙
2
15|1.000|1.000|9.6e-10|2.2e-06|6.9e+01| 2.758576e+01 -4.131233e+01| 0:0:00| chol  2↙
2
16|1.000|1.000|5.4e-10|6.5e-07|2.6e+01|-1.432164e+01 -4.064893e+01| 0:0:00| chol  2↙
2
17|1.000|1.000|4.0e-10|1.9e-07|1.4e+01|-2.563883e+01 -3.919104e+01| 0:0:00| chol  2↙
2
18|0.932|1.000|4.8e-11|1.9e-08|4.1e+00|-3.464281e+01 -3.870494e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|1.5e-11|2.0e-09|1.6e+00|-3.687055e+01 -3.846341e+01| 0:0:00| chol  2↙
2
20|0.950|0.867|8.1e-12|4.3e-10|4.2e-01|-3.796091e+01 -3.838273e+01| 0:0:00| chol  2↙
2
21|0.645|1.000|6.8e-12|2.1e-11|2.2e-01|-3.813038e+01 -3.835435e+01| 0:0:00| chol  2↙
2
22|1.000|1.000|8.1e-12|3.3e-12|4.3e-02|-3.830555e+01 -3.834857e+01| 0:0:00| chol  2↙
2
23|0.925|0.898|1.3e-11|2.1e-12|8.0e-03|-3.833886e+01 -3.834684e+01| 0:0:00| chol  2↙
3
24|0.904|0.943|1.6e-11|2.6e-12|1.2e-03|-3.834537e+01 -3.834657e+01| 0:0:00| chol  3↙
3
25|0.922|0.925|8.3e-11|3.4e-12|1.0e-04|-3.834644e+01 -3.834654e+01| 0:0:00| chol  5↙
5
26|0.980|1.000|3.4e-10|4.8e-12|2.8e-05|-3.834651e+01 -3.834654e+01| 0:0:00| chol  9↙
12
27|1.000|1.000|4.7e-10|7.1e-12|3.7e-06|-3.834654e+01 -3.834654e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
------------------------------------------------------------------------
 number of iterations   = 27
 primal objective value = -3.83465381e+01
 dual   objective value = -3.83465415e+01
 gap := trace(XZ)       = 3.67e-06
 relative gap           = 4.72e-08
 actual relative gap    = 4.45e-08
 rel. primal infeas     = 4.66e-10
 rel. dual   infeas     = 7.13e-12
 norm(X), norm(y), norm(Z) = 1.1e+02, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.8e+03, 3.0e+03, 2.5e+02
 Total CPU time (secs)  = 0.24
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 9.9e-10  0.0e+00  1.0e-11  0.0e+00  4.4e-08  4.7e-08
```

```
------------------------------------------------------------------

ans =

   38.3465

Iteration   8   Total error is: 0.020593
The total representation error of the testing signals is: 0.2074
>>
```