```
>> 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  = 1000
*******************************************************************
   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|1.0e+00|2.6e+01|2.6e+07| 4.607070e+04  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.996|0.957|4.1e-03|1.2e+00|1.2e+06| 5.131201e+04  6.805706e+01| 0:0:00| chol  1↙
1
 2|1.000|0.949|1.4e-06|7.1e-02|1.1e+05| 4.445777e+04 -1.212359e+02| 0:0:01| chol  1↙
1
 3|0.358|0.945|9.9e-07|7.1e-03|4.2e+04| 3.653977e+04 -1.579445e+02| 0:0:01| chol  1↙
1
 4|1.000|0.772|1.0e-07|2.4e-03|1.5e+04| 1.353779e+04 -1.551067e+02| 0:0:01| chol  1↙
1
 5|0.886|0.986|5.8e-08|3.4e-04|2.2e+03| 2.026233e+03 -1.359643e+02| 0:0:01| chol  1↙
1
 6|1.000|0.997|2.2e-08|9.3e-05|6.1e+02| 4.707590e+02 -1.298105e+02| 0:0:01| chol  1↙
1
 7|0.860|0.940|6.8e-09|1.4e-05|1.7e+02| 4.213025e+01 -1.288902e+02| 0:0:01| chol  1↙
1
 8|0.789|1.000|2.0e-09|9.3e-07|1.0e+02|-2.343522e+01 -1.280502e+02| 0:0:01| chol  1↙
1
 9|1.000|1.000|8.9e-11|9.3e-08|5.8e+01|-6.994090e+01 -1.278171e+02| 0:0:01| chol  1↙
1
10|1.000|1.000|4.8e-13|9.3e-09|1.7e+01|-1.103312e+02 -1.275431e+02| 0:0:01| chol  1↙
1
11|1.000|1.000|9.5e-13|9.3e-10|8.5e+00|-1.188859e+02 -1.273922e+02| 0:0:01| chol  1↙
1
12|1.000|1.000|1.3e-12|9.3e-11|3.4e+00|-1.238918e+02 -1.273251e+02| 0:0:01| chol  1↙
1
13|1.000|1.000|1.2e-12|1.0e-11|2.0e+00|-1.253080e+02 -1.272846e+02| 0:0:01| chol  1↙
1
14|1.000|1.000|7.4e-14|1.9e-12|5.9e-01|-1.266739e+02 -1.272669e+02| 0:0:01| chol  1↙
1
15|1.000|1.000|2.0e-12|1.1e-12|2.2e-01|-1.270435e+02 -1.272591e+02| 0:0:01| chol  1↙
1
16|0.940|0.966|1.7e-11|1.0e-12|2.6e-02|-1.272304e+02 -1.272563e+02| 0:0:01| chol  2↙
2
17|0.869|0.903|6.7e-12|1.6e-12|1.4e-02|-1.272411e+02 -1.272556e+02| 0:0:01| chol  2↙
2
18|1.000|1.000|2.6e-12|1.3e-12|6.7e-03|-1.272487e+02 -1.272554e+02| 0:0:01| chol  2↙
1
19|0.981|0.867|3.4e-11|1.2e-12|7.8e-04|-1.272545e+02 -1.272552e+02| 0:0:01| chol  1↙
2
```

```
20|0.745|0.842|8.1e-12|1.7e-12|2.7e-04|-1.272550e+02 -1.272552e+02| 0:0:01| chol  2↙
2
21|0.817|0.922|2.8e-12|1.8e-12|6.4e-05|-1.272552e+02 -1.272552e+02| 0:0:01| chol  3↙
3
22|0.987|0.955|6.0e-11|1.1e-12|6.1e-06|-1.272552e+02 -1.272552e+02| 0:0:01|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 22
 primal objective value = -1.27255210e+02
 dual   objective value = -1.27255216e+02
 gap := trace(XZ)       = 6.10e-06
 relative gap           = 2.39e-08
 actual relative gap    = 2.39e-08
 rel. primal infeas     = 6.04e-11
 rel. dual   infeas     = 1.08e-12
 norm(X), norm(y), norm(Z) = 3.7e+01, 1.8e+02, 2.1e+01
 norm(A), norm(b), norm(C) = 9.1e+02, 3.2e+02, 2.5e+02
 Total CPU time (secs)  = 0.86
 CPU time per iteration = 0.04
 termination code       =  0
 DIMACS errors: 1.4e-10  0.0e+00  1.5e-12  0.0e+00  2.4e-08  2.4e-08
-------------------------------------------------------------------

ans =

  127.2552


 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*******************************************************************
   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|1.0e+00|2.7e+01|1.1e+08| 2.139525e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.986|0.943|1.4e-02|1.6e+00|6.7e+06| 2.161129e+05  2.183454e+03| 0:0:00| chol  1↙
1
 2|1.000|0.940|3.4e-07|1.3e-01|6.5e+05| 1.889301e+05  1.332430e+02| 0:0:00| chol  1↙
1
 3|0.286|1.000|2.7e-07|1.6e-02|2.3e+05| 1.734008e+05 -3.058419e+02| 0:0:00| chol  1↙
2
 4|1.000|1.000|1.4e-07|7.9e-03|9.0e+04| 6.954317e+04 -1.871420e+02| 0:0:00| chol  1↙
1
 5|0.883|0.912|3.1e-08|4.3e-03|1.3e+04| 1.079018e+04 -9.263262e+01| 0:0:00| chol  1↙
1
 6|0.901|1.000|9.1e-09|1.2e-03|6.9e+03| 6.337375e+03 -7.745690e+01| 0:0:00| chol  2↙
2
 7|1.000|1.000|3.8e-09|3.6e-04|3.2e+03| 3.044173e+03 -5.935003e+01| 0:0:00| chol  1↙
1
```

```
 8|0.906|1.000|2.0e-09|1.1e-04|7.4e+02| 6.755650e+02 -5.284002e+01| 0:0:00| chol  1↙
1
 9|1.000|0.911|5.3e-10|1.9e-05|4.0e+02| 3.535958e+02 -4.779338e+01| 0:0:00| chol  1↙
1
10|0.850|1.000|7.4e-11|1.1e-06|2.6e+02| 2.091653e+02 -4.706715e+01| 0:0:00| chol  1↙
1
11|1.000|0.996|2.9e-12|1.1e-07|1.4e+02| 9.315299e+01 -4.366019e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|1.1e-12|1.1e-08|6.9e+01| 2.557223e+01 -4.333620e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|9.4e-13|1.1e-09|3.1e+01|-1.086126e+01 -4.196911e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.3e-13|1.1e-10|9.4e+00|-3.241497e+01 -4.180788e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|1.9e-12|1.2e-11|3.9e+00|-3.772270e+01 -4.164078e+01| 0:0:00| chol  1↙
1
16|0.913|1.000|8.8e-12|2.1e-12|5.7e-01|-4.101628e+01 -4.158462e+01| 0:0:00| chol  1↙
1
17|0.739|1.000|3.2e-12|1.6e-12|2.4e-01|-4.130300e+01 -4.153940e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|4.7e-12|1.0e-12|4.3e-02|-4.149090e+01 -4.153373e+01| 0:0:00| chol  2↙
3
19|0.943|0.888|1.5e-10|1.1e-12|2.1e-02|-4.151086e+01 -4.153216e+01| 0:0:00| chol  3↙
3
20|1.000|1.000|1.0e-09|1.5e-12|1.3e-02|-4.151857e+01 -4.153133e+01| 0:0:00| chol  3↙
3
21|1.000|1.000|2.7e-11|2.3e-12|4.2e-03|-4.152630e+01 -4.153052e+01| 0:0:00| chol  3↙
3
22|1.000|1.000|4.1e-10|3.4e-12|1.7e-03|-4.152859e+01 -4.153028e+01| 0:0:00| chol  3↙
3
23|0.996|1.000|4.2e-10|5.1e-12|2.3e-04|-4.152991e+01 -4.153013e+01| 0:0:00| chol  5↙
5
24|1.000|1.000|1.7e-09|7.6e-12|5.0e-05|-4.153007e+01 -4.153012e+01| 0:0:00| chol  6↙
6
25|1.000|1.000|3.9e-09|1.1e-11|4.7e-06|-4.153011e+01 -4.153011e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -4.15301068e+01
 dual   objective value = -4.15301108e+01
 gap := trace(XZ)       = 4.69e-06
 relative gap           = 5.58e-08
 actual relative gap    = 4.81e-08
 rel. primal infeas     = 3.94e-09
 rel. dual   infeas     = 1.14e-11
 norm(X), norm(y), norm(Z) = 8.9e+01, 3.0e+02, 1.8e+02
 norm(A), norm(b), norm(C) = 3.4e+03, 1.7e+03, 2.5e+02
 Total CPU time (secs)  = 0.32
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 8.3e-09  0.0e+00  1.6e-11  0.0e+00  4.8e-08  5.6e-08
-----------------------------------------------------------------

ans =
```

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   41.5301

Iteration   2   Total error is: 0.021469

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*******************************************************************
   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|1.0e+00|2.7e+01|1.1e+08| 2.195580e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.989|0.939|1.1e-02|1.7e+00|7.3e+06| 2.217309e+05  2.666173e+03| 0:0:00| chol  1↙
1
 2|1.000|0.940|2.3e-07|1.3e-01|6.9e+05| 1.954291e+05  1.789683e+02| 0:0:00| chol  1↙
1
 3|0.333|1.000|1.7e-07|1.6e-02|2.4e+05| 1.775561e+05 -3.201845e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|9.5e-08|7.9e-03|9.6e+04| 7.421577e+04 -1.873050e+02| 0:0:00| chol  1↙
1
 5|0.886|0.909|2.0e-08|4.3e-03|1.4e+04| 1.098755e+04 -8.838732e+01| 0:0:00| chol  1↙
1
 6|0.911|1.000|4.6e-09|1.2e-03|7.0e+03| 6.464999e+03 -7.349706e+01| 0:0:00| chol  1↙
2
 7|1.000|1.000|1.6e-09|3.6e-04|3.3e+03| 3.176600e+03 -5.681800e+01| 0:0:00| chol  1↙
1
 8|0.900|1.000|8.3e-10|1.1e-04|6.6e+02| 6.024514e+02 -5.095105e+01| 0:0:00| chol  1↙
1
 9|1.000|0.958|2.2e-10|1.5e-05|3.8e+02| 3.336571e+02 -4.616252e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|3.1e-11|1.1e-06|2.5e+02| 2.014350e+02 -4.461532e+01| 0:0:00| chol  1↙
1
11|1.000|0.826|1.2e-11|2.7e-07|1.4e+02| 9.530044e+01 -4.267653e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|4.5e-12|1.1e-08|6.0e+01| 1.940399e+01 -4.059141e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|5.5e-12|1.1e-09|2.9e+01|-1.114934e+01 -3.967549e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|7.0e-14|1.1e-10|7.7e+00|-3.149192e+01 -3.923106e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|2.3e-14|1.2e-11|2.0e+00|-3.709265e+01 -3.911628e+01| 0:0:00| chol  1↙
1
16|0.882|0.977|1.6e-11|2.3e-12|3.1e-01|-3.878326e+01 -3.908829e+01| 0:0:00| chol  2↙
2
17|0.685|0.987|3.4e-12|1.6e-12|1.3e-01|-3.894306e+01 -3.907326e+01| 0:0:00| chol  2↙
2
18|0.973|1.000|3.9e-12|1.0e-12|5.6e-02|-3.901508e+01 -3.907091e+01| 0:0:00| chol  2↙
2
19|0.891|0.890|2.9e-11|1.1e-12|1.3e-02|-3.905533e+01 -3.906848e+01| 0:0:00| chol  3↙
```

```
4
20|0.611|0.833|1.4e-09|1.7e-12|9.8e-03|-3.905871e+01 -3.906854e+01| 0:0:00| chol  3↙
3
21|1.000|1.000|1.2e-09|2.3e-12|5.4e-03|-3.906291e+01 -3.906832e+01| 0:0:00| chol  3↙
3
22|1.000|1.000|9.7e-11|3.4e-12|2.3e-03|-3.906585e+01 -3.906810e+01| 0:0:00| chol  3↙
3
23|0.781|0.937|5.2e-10|5.3e-12|9.0e-04|-3.906717e+01 -3.906807e+01| 0:0:00| chol  4↙
4
24|1.000|1.000|9.0e-10|7.6e-12|3.1e-04|-3.906774e+01 -3.906805e+01| 0:0:00| chol  5↙
5
25|1.000|1.000|8.1e-10|1.1e-11|6.2e-05|-3.906798e+01 -3.906804e+01| 0:0:00| chol  8↙
8
26|0.863|0.997|1.8e-09|1.7e-11|1.4e-05|-3.906803e+01 -3.906804e+01| 0:0:00| chol 17↙
30
27|1.000|1.000|1.7e-09|2.6e-11|1.9e-06|-3.906804e+01 -3.906804e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 27
 primal objective value = -3.90680412e+01
 dual   objective value = -3.90680428e+01
 gap := trace(XZ)       = 1.86e-06
 relative gap           = 2.35e-08
 actual relative gap    = 2.11e-08
 rel. primal infeas     = 1.73e-09
 rel. dual   infeas     = 2.56e-11
 norm(X), norm(y), norm(Z) = 9.6e+01, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.0e+03, 2.6e+03, 2.5e+02
 Total CPU time (secs)  = 0.33
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 3.6e-09  0.0e+00  3.6e-11  0.0e+00  2.1e-08  2.4e-08
-------------------------------------------------------------------

ans =

   39.0680

Iteration   3   Total error is: 0.020818

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*******************************************************************
   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|1.0e+00|2.7e+01|1.1e+08| 2.240490e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.990|0.940|1.0e-02|1.7e+00|7.3e+06| 2.261396e+05  2.639316e+03| 0:0:00| chol  1↙
1
```

```
 2|1.000|0.937|2.3e-07|1.4e-01|7.2e+05| 1.990591e+05  1.852576e+02| 0:0:00| chol  1↙
1
 3|0.317|1.000|1.7e-07|1.6e-02|2.4e+05| 1.826730e+05 -3.358489e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|8.5e-08|7.9e-03|9.7e+04| 7.493540e+04 -1.951760e+02| 0:0:00| chol  1↙
1
 5|0.886|0.908|2.0e-08|4.3e-03|1.4e+04| 1.117055e+04 -9.558887e+01| 0:0:00| chol  1↙
1
 6|0.926|1.000|5.0e-09|1.2e-03|7.1e+03| 6.560434e+03 -7.945173e+01| 0:0:00| chol  1↙
2
 7|1.000|1.000|2.0e-09|3.6e-04|3.4e+03| 3.231999e+03 -6.218760e+01| 0:0:00| chol  1↙
1
 8|0.891|1.000|1.2e-09|1.1e-04|7.1e+02| 6.490213e+02 -5.492886e+01| 0:0:00| chol  1↙
1
 9|1.000|0.891|2.3e-10|2.1e-05|4.6e+02| 4.068119e+02 -4.824544e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|3.5e-10|1.1e-06|2.9e+02| 2.476005e+02 -4.645667e+01| 0:0:00| chol  1↙
2
11|1.000|0.909|9.0e-13|1.9e-07|1.6e+02| 1.126305e+02 -4.286399e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|2.3e-12|1.1e-08|7.1e+01| 3.062185e+01 -4.041895e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|2.6e-12|1.1e-09|3.0e+01|-8.915637e+00 -3.903502e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|3.3e-14|1.1e-10|9.8e+00|-2.864039e+01 -3.840165e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|1.3e-13|1.2e-11|2.3e+00|-3.591043e+01 -3.817842e+01| 0:0:00| chol  1↙
2
16|1.000|1.000|1.5e-12|2.1e-12|7.2e-01|-3.741114e+01 -3.813485e+01| 0:0:00| chol  2↙
2
17|0.987|1.000|2.0e-12|1.1e-12|1.5e-01|-3.796967e+01 -3.811881e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|1.3e-11|1.0e-12|6.2e-02|-3.805011e+01 -3.811213e+01| 0:0:00| chol  2↙
2
19|0.824|0.946|7.0e-12|1.6e-12|2.0e-02|-3.809097e+01 -3.811068e+01| 0:0:00| chol  2↙
2
20|0.606|1.000|1.1e-10|1.4e-12|1.3e-02|-3.809739e+01 -3.811051e+01| 0:0:00| chol  2↙
2
21|0.812|1.000|8.1e-12|2.1e-12|5.9e-03|-3.810433e+01 -3.811022e+01| 0:0:00| chol  3↙
3
22|0.495|1.000|2.6e-10|1.6e-12|3.7e-03|-3.810654e+01 -3.811020e+01| 0:0:00| chol  3↙
3
23|1.000|1.000|6.7e-10|2.4e-12|1.7e-03|-3.810849e+01 -3.811016e+01| 0:0:00| chol  3↙
3
24|1.000|1.000|1.4e-10|3.6e-12|7.9e-04|-3.810934e+01 -3.811013e+01| 0:0:00| chol  4↙
4
25|1.000|1.000|7.8e-10|5.5e-12|3.3e-04|-3.810979e+01 -3.811012e+01| 0:0:00| chol  4↙
5
26|1.000|1.000|1.9e-10|8.2e-12|1.2e-04|-3.810999e+01 -3.811011e+01| 0:0:00| chol  5↙
5
27|1.000|1.000|6.1e-10|1.2e-11|2.3e-05|-3.811009e+01 -3.811011e+01| 0:0:00| chol  7↙
8
28|0.996|0.993|6.5e-11|1.9e-11|1.3e-06|-3.811011e+01 -3.811011e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
```

```
-----------------------------------------------------------------
 number of iterations   = 28
 primal objective value = -3.81101098e+01
 dual   objective value = -3.81101111e+01
 gap := trace(XZ)       = 1.27e-06
 relative gap           = 1.65e-08
 actual relative gap    = 1.61e-08
 rel. primal infeas     = 6.52e-11
 rel. dual   infeas     = 1.85e-11
 norm(X), norm(y), norm(Z) = 9.7e+01, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.0e+03, 2.5e+03, 2.5e+02
 Total CPU time (secs)  = 0.33
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.3e-10  0.0e+00  2.6e-11  0.0e+00  1.6e-08  1.6e-08
-----------------------------------------------------------------

ans =

   38.1101

Iteration   4   Total error is: 0.020558

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*****************************************************************
   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|1.0e+00|2.7e+01|1.2e+08| 2.280864e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.993|0.941|6.7e-03|1.7e+00|7.3e+06| 2.299843e+05  2.485023e+03| 0:0:00| chol  1↙
1
 2|1.000|0.931|2.5e-07|1.4e-01|7.6e+05| 2.020517e+05  1.893052e+02| 0:0:00| chol  1↙
1
 3|0.314|1.000|1.9e-07|1.6e-02|2.5e+05| 1.872647e+05 -3.557829e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|5.9e-08|7.9e-03|9.2e+04| 7.073782e+04 -2.052369e+02| 0:0:00| chol  1↙
1
 5|0.888|0.901|2.1e-08|4.4e-03|1.3e+04| 1.073104e+04 -1.090780e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|6.1e-09|1.2e-03|6.9e+03| 6.283128e+03 -8.851768e+01| 0:0:00| chol  1↙
2
 7|1.000|1.000|3.3e-09|3.6e-04|3.0e+03| 2.814967e+03 -7.074969e+01| 0:0:00| chol  1↙
1
 8|0.855|1.000|1.7e-09|1.1e-04|8.5e+02| 7.835826e+02 -6.004762e+01| 0:0:00| chol  1↙
1
 9|1.000|0.984|2.4e-10|3.3e-05|5.8e+02| 5.328155e+02 -5.004794e+01| 0:0:00| chol  1↙
1
10|0.703|1.000|8.4e-11|3.2e-06|3.7e+02| 3.206475e+02 -5.153209e+01| 0:0:00| chol  1↙
```

```
1
11|1.000|0.972|2.3e-11|4.0e-07|2.1e+02| 1.621198e+02 -4.290187e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|9.3e-12|3.2e-08|9.2e+01| 4.989769e+01 -4.224663e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|7.0e-12|3.2e-09|4.8e+01| 9.149967e+00 -3.914430e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.5e-13|3.2e-10|1.3e+01|-2.584946e+01 -3.836449e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|1.5e-12|3.3e-11|5.5e+00|-3.250410e+01 -3.800701e+01| 0:0:00| chol  1↙
1
16|0.943|0.972|3.2e-13|5.1e-12|9.0e-01|-3.695570e+01 -3.785384e+01| 0:0:00| chol  1↙
2
17|1.000|0.958|3.3e-12|1.5e-12|3.0e-01|-3.754351e+01 -3.784300e+01| 0:0:00| chol  2↙
2
18|1.000|0.976|2.7e-12|1.1e-12|9.0e-02|-3.774165e+01 -3.783201e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|7.6e-11|1.0e-12|3.4e-02|-3.779541e+01 -3.782983e+01| 0:0:00| chol  2↙
2
20|1.000|1.000|5.9e-11|1.5e-12|9.6e-03|-3.781946e+01 -3.782907e+01| 0:0:00| chol  3↙
3
21|1.000|0.778|4.3e-11|2.6e-12|7.5e-04|-3.782809e+01 -3.782884e+01| 0:0:00| chol  2↙
2
22|0.761|0.857|1.0e-11|3.7e-12|2.3e-04|-3.782857e+01 -3.782880e+01| 0:0:00| chol  4↙
4
23|0.900|0.884|1.1e-10|2.5e-12|5.7e-05|-3.782874e+01 -3.782880e+01| 0:0:00| chol 12↙
13
24|0.942|0.966|2.6e-09|3.1e-12|8.3e-06|-3.782879e+01 -3.782880e+01| 0:0:00| chol
  linsysolve: Schur complement matrix not positive definite
  switch to LU factor. lu 30 ^18
25|0.999|0.897|1.0e-09|4.9e-12|2.7e-07|-3.782880e+01 -3.782880e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -3.78287955e+01
 dual   objective value = -3.78287957e+01
 gap := trace(XZ)       = 2.68e-07
 relative gap           = 3.50e-09
 actual relative gap    = 2.80e-09
 rel. primal infeas     = 1.02e-09
 rel. dual   infeas     = 4.88e-12
 norm(X), norm(y), norm(Z) = 9.7e+01, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 4.1e+03, 2.4e+03, 2.5e+02
 Total CPU time (secs)  = 0.35
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 2.0e-09  0.0e+00  6.9e-12  0.0e+00  2.8e-09  3.5e-09
-----------------------------------------------------------------

ans =

   37.8288

Iteration   5   Total error is: 0.020477
```

```
 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*******************************************************************
   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|1.0e+00|2.7e+01|1.2e+08| 2.298458e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.996|0.941|3.9e-03|1.7e+00|7.3e+06| 2.316225e+05  2.378126e+03| 0:0:00| chol  1↙
1
 2|1.000|0.928|2.7e-07|1.5e-01|7.8e+05| 2.034214e+05  1.859262e+02| 0:0:00| chol  1↙
1
 3|0.334|1.000|2.0e-07|1.6e-02|2.5e+05| 1.881937e+05 -3.628911e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|4.9e-08|7.9e-03|8.1e+04| 6.259367e+04 -2.091518e+02| 0:0:00| chol  1↙
1
 5|0.892|0.888|2.5e-08|4.4e-03|1.2e+04| 9.775027e+03 -1.181446e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|8.4e-09|1.2e-03|6.8e+03| 6.237059e+03 -9.113037e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|4.3e-09|3.6e-04|1.8e+03| 1.669267e+03 -7.477347e+01| 0:0:00| chol  1↙
1
 8|1.000|0.856|1.5e-09|1.4e-04|8.8e+02| 8.097169e+02 -5.975274e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|2.3e-10|3.2e-05|5.7e+02| 5.148824e+02 -5.288708e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|9.1e-12|3.2e-06|2.6e+02| 2.174386e+02 -4.512214e+01| 0:0:00| chol  1↙
1
11|1.000|1.000|5.7e-11|3.2e-07|1.2e+02| 8.076443e+01 -4.254836e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|3.3e-12|3.2e-08|5.4e+01| 1.470099e+01 -3.933959e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|1.3e-13|3.2e-09|1.5e+01|-2.353384e+01 -3.841319e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|8.5e-13|3.2e-10|6.5e+00|-3.147280e+01 -3.797320e+01| 0:0:00| chol  1↙
1
15|0.938|0.977|2.5e-13|4.0e-11|1.2e+00|-3.656885e+01 -3.779350e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|3.9e-11|4.2e-12|4.9e-01|-3.728655e+01 -3.777358e+01| 0:0:00| chol  2↙
2
17|0.964|0.948|6.1e-12|2.0e-12|1.0e-01|-3.765486e+01 -3.775899e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|1.8e-10|1.3e-12|5.5e-02|-3.770023e+01 -3.775500e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|4.4e-12|1.8e-12|1.1e-02|-3.774284e+01 -3.775348e+01| 0:0:00| chol  2↙
2
20|1.000|1.000|3.5e-12|1.0e-12|2.7e-03|-3.775061e+01 -3.775330e+01| 0:0:00| chol  3↙
3
21|0.989|0.915|2.4e-11|1.1e-12|4.7e-04|-3.775278e+01 -3.775325e+01| 0:0:00| chol  4↙
```

```
4
22|0.888|0.948|2.7e-10|1.6e-12|1.6e-04|-3.775308e+01 -3.775324e+01| 0:0:00| chol  5↙
6
23|1.000|1.000|3.1e-10|2.2e-12|3.1e-05|-3.775321e+01 -3.775324e+01| 0:0:00| chol 10↙
13
24|1.000|1.000|5.0e-10|3.4e-12|7.9e-06|-3.775323e+01 -3.775324e+01| 0:0:00| chol
  linsysolve: Schur complement matrix not positive definite
  switch to LU factor. lu 30  30
25|0.950|0.765|1.2e-09|5.9e-12|8.2e-07|-3.775324e+01 -3.775324e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -3.77532356e+01
 dual   objective value = -3.77532359e+01
 gap := trace(XZ)       = 8.21e-07
 relative gap           = 1.07e-08
 actual relative gap    = 3.85e-09
 rel. primal infeas     = 1.16e-09
 rel. dual   infeas     = 5.86e-12
 norm(X), norm(y), norm(Z) = 9.7e+01, 3.1e+02, 2.0e+02
 norm(A), norm(b), norm(C) = 4.1e+03, 2.3e+03, 2.5e+02
 Total CPU time (secs)  = 0.33
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 2.2e-09  0.0e+00  8.3e-12  0.0e+00  3.8e-09  1.1e-08
-------------------------------------------------------------------

ans =

   37.7532

Iteration   6   Total error is: 0.020453

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*******************************************************************
   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|1.0e+00|2.7e+01|1.2e+08| 2.312901e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.997|0.942|3.1e-03|1.7e+00|7.3e+06| 2.330285e+05  2.363773e+03| 0:0:00| chol  1↙
1
 2|1.000|0.929|2.8e-07|1.5e-01|7.8e+05| 2.046317e+05  1.835410e+02| 0:0:00| chol  1↙
1
 3|0.348|1.000|2.0e-07|1.6e-02|2.5e+05| 1.884173e+05 -3.616881e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|4.9e-08|7.9e-03|7.5e+04| 5.752422e+04 -2.065356e+02| 0:0:00| chol  1↙
1
 5|0.881|0.878|2.7e-08|4.4e-03|1.2e+04| 9.872534e+03 -1.185228e+02| 0:0:00| chol  1↙
```

```
1
 6|1.000|1.000|8.5e-09|1.2e-03|6.8e+03| 6.226215e+03 -9.340028e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|5.3e-09|3.6e-04|1.7e+03| 1.570386e+03 -7.542606e+01| 0:0:00| chol  1↙
1
 8|1.000|0.844|1.4e-09|1.5e-04|9.4e+02| 8.633932e+02 -6.023621e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|1.5e-10|3.2e-05|6.0e+02| 5.458158e+02 -5.416478e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|6.2e-12|3.2e-06|2.7e+02| 2.262777e+02 -4.574911e+01| 0:0:00| chol  1↙
1
11|1.000|1.000|3.0e-11|3.2e-07|1.3e+02| 8.666347e+01 -4.259925e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|1.8e-12|3.2e-08|5.5e+01| 1.576486e+01 -3.945743e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|1.2e-13|3.2e-09|1.5e+01|-2.330703e+01 -3.837907e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.9e-13|3.2e-10|6.3e+00|-3.162613e+01 -3.793831e+01| 0:0:00| chol  1↙
1
15|0.941|0.990|3.7e-13|3.6e-11|1.2e+00|-3.652142e+01 -3.776016e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|2.3e-11|4.2e-12|5.1e-01|-3.723443e+01 -3.773976e+01| 0:0:00| chol  1↙
2
17|0.964|0.755|6.9e-13|2.8e-12|8.6e-02|-3.764055e+01 -3.772691e+01| 0:0:00| chol  2↙
2
18|0.714|0.841|4.6e-12|1.5e-12|4.8e-02|-3.767221e+01 -3.772061e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|6.2e-11|1.0e-12|1.4e-02|-3.770519e+01 -3.771929e+01| 0:0:00| chol  2↙
2
20|1.000|0.890|5.0e-12|1.6e-12|1.8e-03|-3.771706e+01 -3.771889e+01| 0:0:00| chol  2↙
2
21|0.769|0.927|1.1e-10|1.1e-12|5.3e-04|-3.771831e+01 -3.771884e+01| 0:0:00| chol  4↙
4
22|0.996|0.945|5.5e-11|1.6e-12|4.8e-05|-3.771878e+01 -3.771883e+01| 0:0:00| chol  8↙
7
23|0.980|0.989|1.9e-10|2.3e-12|2.8e-06|-3.771883e+01 -3.771883e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 23
 primal objective value = -3.77188270e+01
 dual   objective value = -3.77188301e+01
 gap := trace(XZ)       = 2.75e-06
 relative gap           = 3.60e-08
 actual relative gap    = 3.98e-08
 rel. primal infeas     = 1.93e-10
 rel. dual   infeas     = 2.27e-12
 norm(X), norm(y), norm(Z) = 9.7e+01, 3.1e+02, 2.0e+02
 norm(A), norm(b), norm(C) = 4.1e+03, 2.2e+03, 2.5e+02
 Total CPU time (secs)  = 0.28
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 3.7e-10  0.0e+00  3.2e-12  0.0e+00  4.0e-08  3.6e-08
-----------------------------------------------------------------
```

```
ans =

   37.7188

Iteration   7   Total error is: 0.020444

 num. of constraints = 85
 dim. of socp   var  = 86,   num. of socp blk  =  1
 dim. of linear var  = 1000
*******************************************************************
   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|1.0e+00|2.7e+01|1.2e+08| 2.331106e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.998|0.942|2.3e-03|1.6e+00|7.4e+06| 2.348065e+05  2.337411e+03| 0:0:00| chol  1↙
1
 2|1.000|0.929|2.9e-07|1.5e-01|7.8e+05| 2.061237e+05  1.793548e+02| 0:0:00| chol  1↙
1
 3|0.363|1.000|2.1e-07|1.6e-02|2.5e+05| 1.886182e+05 -3.592996e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|4.8e-08|7.9e-03|6.8e+04| 5.193281e+04 -2.030202e+02| 0:0:00| chol  1↙
1
 5|0.869|0.866|2.8e-08|4.5e-03|1.2e+04| 9.910208e+03 -1.183122e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|8.3e-09|1.2e-03|6.7e+03| 6.182023e+03 -9.510849e+01| 0:0:00| chol  1↙
1
 7|0.994|1.000|5.0e-09|3.6e-04|1.6e+03| 1.508047e+03 -7.560342e+01| 0:0:00| chol  1↙
1
 8|1.000|0.898|1.5e-09|1.3e-04|1.0e+03| 9.363551e+02 -5.991635e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|1.2e-10|3.2e-05|6.2e+02| 5.652893e+02 -5.596191e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|7.7e-12|3.2e-06|3.1e+02| 2.617178e+02 -4.587326e+01| 0:0:00| chol  1↙
1
11|0.960|1.000|4.8e-12|3.2e-07|1.4e+02| 9.653602e+01 -4.432558e+01| 0:0:00| chol  1↙
1
12|1.000|1.000|9.6e-12|3.2e-08|7.8e+01| 3.762998e+01 -3.990746e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|5.4e-13|3.2e-09|2.0e+01|-1.830811e+01 -3.857354e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.2e-12|3.2e-10|8.9e+00|-2.914675e+01 -3.800924e+01| 0:0:00| chol  1↙
1
15|0.940|0.986|3.7e-13|3.7e-11|1.8e+00|-3.598774e+01 -3.776147e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|7.3e-13|4.2e-12|7.6e-01|-3.697089e+01 -3.772952e+01| 0:0:00| chol  1↙
1
17|0.974|0.829|3.8e-11|2.0e-12|1.3e-01|-3.758426e+01 -3.771044e+01| 0:0:00| chol  2↙
2
18|0.590|0.781|1.2e-11|2.0e-12|7.7e-02|-3.762702e+01 -3.770356e+01| 0:0:00| chol  2↙
2
```

```
19|1.000|0.995|3.2e-11|2.3e-12|2.8e-02|-3.767320e+01 -3.770156e+01| 0:0:00| chol  2↙
2
20|0.967|0.795|2.2e-11|3.8e-12|3.1e-03|-3.769766e+01 -3.770073e+01| 0:0:00| chol  2↙
2
21|0.777|0.812|3.8e-11|5.1e-12|1.0e-03|-3.769961e+01 -3.770062e+01| 0:0:00| chol  2↙
2
22|0.783|0.926|2.6e-11|7.0e-12|3.1e-04|-3.770027e+01 -3.770059e+01| 0:0:00| chol  3↙
4
23|0.969|0.985|8.7e-11|5.3e-12|3.3e-05|-3.770055e+01 -3.770058e+01| 0:0:00| chol  7↙
8
24|1.000|1.000|2.8e-10|7.8e-12|1.9e-06|-3.770058e+01 -3.770058e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
------------------------------------------------------------------------
 number of iterations   = 24
 primal objective value = -3.77005787e+01
 dual   objective value = -3.77005805e+01
 gap := trace(XZ)       = 1.86e-06
 relative gap           = 2.44e-08
 actual relative gap    = 2.37e-08
 rel. primal infeas     = 2.77e-10
 rel. dual   infeas     = 7.81e-12
 norm(X), norm(y), norm(Z) = 9.8e+01, 3.1e+02, 2.0e+02
 norm(A), norm(b), norm(C) = 4.1e+03, 2.1e+03, 2.5e+02
 Total CPU time (secs)  = 0.29
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 5.3e-10  0.0e+00  1.1e-11  0.0e+00  2.4e-08  2.4e-08
------------------------------------------------------------------------

ans =

   37.7006

Iteration   8   Total error is: 0.02044
The total representation error of the testing signals is: 0.20561
```