```
>> 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|3.2e+07| 5.698178e+04  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.989|0.959|1.1e-02|1.1e+00|1.4e+06| 6.232526e+04  1.350940e+02| 0:0:00| chol  1↙
1
 2|1.000|0.964|1.2e-06|5.1e-02|1.1e+05| 5.369676e+04 -1.186781e+02| 0:0:00| chol  1↙
1
 3|0.472|0.966|7.9e-07|5.1e-03|4.2e+04| 3.715299e+04 -1.472202e+02| 0:0:00| chol  1↙
1
 4|1.000|0.785|8.9e-08|1.9e-03|1.6e+04| 1.417266e+04 -1.484709e+02| 0:0:00| chol  1↙
1
 5|0.903|0.996|4.7e-08|5.2e-04|2.1e+03| 1.910785e+03 -1.274010e+02| 0:0:00| chol  1↙
1
 6|1.000|0.988|3.4e-08|1.6e-04|6.4e+02| 5.135130e+02 -1.217791e+02| 0:0:00| chol  1↙
1
 7|0.865|0.875|1.2e-08|3.3e-05|1.6e+02| 3.481760e+01 -1.203095e+02| 0:0:00| chol  1↙
1
 8|0.954|0.853|1.2e-09|6.2e-06|1.0e+02|-1.856128e+01 -1.193937e+02| 0:0:00| chol  1↙
1
 9|1.000|1.000|7.9e-11|1.5e-07|6.4e+01|-5.545915e+01 -1.191978e+02| 0:0:00| chol  1↙
1
10|1.000|1.000|1.9e-12|1.5e-08|3.5e+01|-8.436301e+01 -1.190271e+02| 0:0:00| chol  1↙
1
11|1.000|0.999|3.4e-12|1.6e-09|7.7e+00|-1.111758e+02 -1.188293e+02| 0:0:00| chol  1↙
1
12|1.000|1.000|1.3e-10|1.6e-10|3.4e+00|-1.154031e+02 -1.188126e+02| 0:0:00| chol  1↙
1
13|0.910|0.961|1.9e-11|2.2e-11|6.7e-01|-1.181242e+02 -1.187941e+02| 0:0:00| chol  2↙
2
14|0.842|1.000|2.6e-12|3.8e-12|3.2e-01|-1.184721e+02 -1.187901e+02| 0:0:00| chol  2↙
1
15|1.000|1.000|3.1e-12|1.2e-12|1.6e-01|-1.186287e+02 -1.187889e+02| 0:0:00| chol  2↙
2
16|0.923|1.000|1.0e-12|1.0e-12|3.1e-02|-1.187571e+02 -1.187878e+02| 0:0:00| chol  2↙
2
17|1.000|1.000|3.6e-12|1.0e-12|1.4e-02|-1.187736e+02 -1.187874e+02| 0:0:00| chol  2↙
2
18|0.876|0.874|5.6e-13|1.1e-12|3.0e-03|-1.187841e+02 -1.187871e+02| 0:0:00| chol  1↙
2
19|0.229|1.000|1.7e-12|1.0e-12|2.6e-03|-1.187844e+02 -1.187870e+02| 0:0:00| chol  2↙
2
```

```
20|0.877|1.000|3.0e-11|1.0e-12|1.2e-03|-1.187858e+02 -1.187870e+02| 0:0:00| chol  2↙
2
21|1.000|1.000|1.2e-11|1.5e-12|4.6e-04|-1.187865e+02 -1.187869e+02| 0:0:00| chol  2↙
2
22|1.000|1.000|1.3e-11|2.3e-12|8.6e-05|-1.187868e+02 -1.187869e+02| 0:0:00| chol  3↙
3
23|0.867|0.984|2.2e-11|2.6e-12|2.2e-05|-1.187869e+02 -1.187869e+02| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 23
 primal objective value = -1.18786904e+02
 dual   objective value = -1.18786925e+02
 gap := trace(XZ)       = 2.15e-05
 relative gap           = 9.02e-08
 actual relative gap    = 9.02e-08
 rel. primal infeas     = 2.19e-11
 rel. dual   infeas     = 2.59e-12
 norm(X), norm(y), norm(Z) = 4.6e+01, 1.9e+02, 2.3e+01
 norm(A), norm(b), norm(C) = 9.4e+02, 3.5e+02, 2.5e+02
 Total CPU time (secs)  = 0.46
 CPU time per iteration = 0.02
 termination code       =  0
 DIMACS errors: 5.2e-11  0.0e+00  3.7e-12  0.0e+00  9.0e-08  9.0e-08
-------------------------------------------------------------------

ans =

  118.7869


 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| 2.369737e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.996|0.948|3.5e-03|1.5e+00|6.7e+06| 2.387536e+05  1.624379e+03| 0:0:00| chol  1↙
1
 2|1.000|0.915|6.2e-07|1.5e-01|8.2e+05| 2.070836e+05  1.257903e+02| 0:0:00| chol  1↙
1
 3|0.293|1.000|5.1e-07|1.6e-02|2.6e+05| 1.959876e+05 -3.870464e+02| 0:0:00| chol  1↙
1
 4|1.000|1.000|5.9e-08|7.9e-03|4.3e+04| 3.273051e+04 -1.818060e+02| 0:0:00| chol  1↙
1
 5|0.856|0.856|7.5e-08|4.5e-03|1.3e+04| 1.074579e+04 -9.812173e+01| 0:0:00| chol  1↙
1
 6|1.000|1.000|2.3e-08|1.2e-03|7.0e+03| 6.400939e+03 -7.697835e+01| 0:0:00| chol  1↙
1
```

```
 7|1.000|1.000|1.5e-08|3.6e-04|2.2e+03| 2.056114e+03 -5.367088e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|2.1e-09|1.1e-04|1.1e+03| 1.040848e+03 -4.965016e+01| 0:0:00| chol  1↙
1
 9|1.000|0.983|6.6e-10|3.3e-05|2.1e+02| 1.672875e+02 -4.342468e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|3.9e-11|3.2e-06|1.1e+02| 7.097527e+01 -4.187593e+01| 0:0:00| chol  1↙
1
11|1.000|1.000|1.1e-11|3.2e-07|6.0e+01| 1.834371e+01 -4.152569e+01| 0:0:00| chol  1↙
1
12|0.964|0.992|7.1e-12|3.5e-08|1.2e+01|-2.875642e+01 -4.112704e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|3.8e-11|3.2e-09|6.3e+00|-3.476235e+01 -4.107462e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|5.6e-12|3.2e-10|8.9e-01|-4.014199e+01 -4.102822e+01| 0:0:00| chol  2↙
1
15|0.875|0.883|1.3e-11|6.7e-11|2.3e-01|-4.076337e+01 -4.099385e+01| 0:0:00| chol  2↙
1
16|1.000|1.000|1.7e-10|4.9e-12|1.2e-01|-4.086670e+01 -4.098270e+01| 0:0:00| chol  1↙
2
17|0.809|0.812|1.2e-12|3.7e-12|3.3e-02|-4.094563e+01 -4.097828e+01| 0:0:00| chol  2↙
3
18|0.665|1.000|6.1e-10|1.0e-12|2.5e-02|-4.095342e+01 -4.097813e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|1.7e-11|1.5e-12|8.3e-03|-4.096888e+01 -4.097718e+01| 0:0:00| chol  2↙
2
20|1.000|0.955|2.0e-10|2.3e-12|3.6e-03|-4.097343e+01 -4.097701e+01| 0:0:00| chol  3↙
2
21|1.000|1.000|1.7e-10|3.4e-12|1.4e-03|-4.097548e+01 -4.097687e+01| 0:0:00| chol  2↙
3
22|0.758|0.743|2.5e-11|5.9e-12|8.0e-04|-4.097606e+01 -4.097686e+01| 0:0:00| chol  3↙
4
23|1.000|1.000|4.3e-10|5.0e-12|2.9e-04|-4.097655e+01 -4.097684e+01| 0:0:00| chol  5↙
5
24|0.980|1.000|9.5e-10|7.5e-12|1.8e-04|-4.097666e+01 -4.097684e+01| 0:0:00| chol  4↙
4
25|1.000|1.000|7.1e-10|1.1e-11|5.5e-05|-4.097678e+01 -4.097684e+01| 0:0:00| chol  4↙
4
26|1.000|1.000|6.5e-10|1.7e-11|1.0e-05|-4.097682e+01 -4.097684e+01| 0:0:00| chol  5↙
5
27|1.000|0.993|1.6e-09|2.5e-11|5.3e-07|-4.097683e+01 -4.097684e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 27
 primal objective value = -4.09768346e+01
 dual   objective value = -4.09768351e+01
 gap := trace(XZ)       = 5.30e-07
 relative gap           = 6.39e-09
 actual relative gap    = 5.74e-09
 rel. primal infeas     = 1.57e-09
 rel. dual   infeas     = 2.54e-11
 norm(X), norm(y), norm(Z) = 9.0e+01, 3.0e+02, 1.8e+02
 norm(A), norm(b), norm(C) = 3.0e+03, 7.9e+02, 2.5e+02
 Total CPU time (secs)  = 0.34
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```
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 3.2e-09  0.0e+00  3.6e-11  0.0e+00  5.7e-09  6.4e-09
------------------------------------------------------------------

ans =

   40.9768

Iteration   2   Total error is: 0.021326

 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| 2.394978e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|0.999|0.946|6.8e-04|1.5e+00|7.1e+06| 2.410895e+05  1.798161e+03| 0:0:00| chol  1↙
1
 2|1.000|0.922|6.2e-07|1.5e-01|8.2e+05| 2.113947e+05  1.128508e+02| 0:0:00| chol  1↙
1
 3|0.390|1.000|4.6e-07|1.6e-02|2.6e+05| 1.936051e+05 -3.773628e+02| 0:0:00| chol  1↙
1
 4|0.936|1.000|5.1e-08|7.9e-03|3.6e+04| 2.838457e+04 -1.718825e+02| 0:0:00| chol  1↙
1
 5|0.941|0.922|7.7e-08|2.8e-03|1.2e+04| 1.054851e+04 -9.746046e+01| 0:0:00| chol  1↙
1
 6|1.000|1.000|3.4e-08|7.1e-04|7.1e+03| 6.650976e+03 -7.789398e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|2.1e-08|2.1e-04|2.0e+03| 1.863629e+03 -5.348186e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|3.3e-09|6.4e-05|1.0e+03| 9.421957e+02 -4.816064e+01| 0:0:00| chol  1↙
1
 9|0.965|0.965|9.9e-10|2.1e-05|2.1e+02| 1.713657e+02 -4.249521e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|1.7e-10|1.9e-06|1.3e+02| 8.517271e+01 -4.130092e+01| 0:0:00| chol  1↙
1
11|1.000|1.000|8.0e-12|1.9e-07|2.9e+01|-1.190485e+01 -4.045672e+01| 0:0:00| chol  1↙
1
12|0.999|1.000|2.3e-13|1.9e-08|1.4e+01|-2.581349e+01 -4.013560e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|2.5e-11|1.9e-09|8.3e+00|-3.176597e+01 -4.009061e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.5e-12|1.9e-10|1.8e+00|-3.825339e+01 -4.000914e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|1.2e-11|2.0e-11|7.1e-01|-3.928165e+01 -3.999567e+01| 0:0:00| chol  1↙
1
16|0.913|0.954|9.3e-12|4.3e-12|9.4e-02|-3.988804e+01 -3.998160e+01| 0:0:00| chol  2↙
```

```
2
17|0.881|1.000|2.8e-11|2.1e-12|5.1e-02|-3.992214e+01 -3.997335e+01| 0:0:00| chol  2↙
2
18|0.944|0.970|4.1e-12|2.9e-12|1.4e-02|-3.995832e+01 -3.997243e+01| 0:0:00| chol  2↙
2
19|0.948|0.868|9.2e-11|1.4e-12|3.4e-03|-3.996863e+01 -3.997199e+01| 0:0:00| chol  2↙
3
20|0.530|0.823|1.1e-10|1.7e-12|2.2e-03|-3.996974e+01 -3.997195e+01| 0:0:00| chol  3↙
3
21|1.000|1.000|7.4e-11|2.2e-12|8.6e-04|-3.997106e+01 -3.997191e+01| 0:0:00| chol  2↙
3
22|0.903|0.915|1.3e-10|3.6e-12|2.5e-04|-3.997165e+01 -3.997190e+01| 0:0:00| chol  3↙
4
23|0.942|1.000|6.1e-10|5.1e-12|7.2e-05|-3.997182e+01 -3.997190e+01| 0:0:00| chol  5↙
5
24|1.000|1.000|2.8e-10|7.6e-12|4.6e-06|-3.997189e+01 -3.997190e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 24
 primal objective value = -3.99718916e+01
 dual   objective value = -3.99718962e+01
 gap := trace(XZ)       = 4.55e-06
 relative gap           = 5.63e-08
 actual relative gap    = 5.70e-08
 rel. primal infeas     = 2.82e-10
 rel. dual   infeas     = 7.59e-12
 norm(X), norm(y), norm(Z) = 9.5e+01, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 3.3e+03, 7.9e+02, 2.5e+02
 Total CPU time (secs)  = 0.31
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 5.7e-10  0.0e+00  1.1e-11  0.0e+00  5.7e-08  5.6e-08
-----------------------------------------------------------------

ans =

   39.9719

Iteration   3   Total error is: 0.021056

 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| 2.385714e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|1.000|0.945|2.9e-06|1.6e+00|7.2e+06| 2.400881e+05  1.794944e+03| 0:0:00| chol  1↙
1
```

```
 2|1.000|0.923|6.3e-07|1.5e-01|8.2e+05| 2.111823e+05  1.041726e+02| 0:0:00| chol  1↙
1
 3|0.416|1.000|4.3e-07|1.6e-02|2.6e+05| 1.920884e+05 -3.839073e+02| 0:0:00| chol  1↙
1
 4|0.918|1.000|4.8e-08|7.9e-03|3.6e+04| 2.882640e+04 -1.802335e+02| 0:0:00| chol  1↙
1
 5|1.000|1.000|7.9e-08|2.4e-03|1.3e+04| 1.167127e+04 -1.049303e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|4.2e-08|7.1e-04|6.7e+03| 6.306519e+03 -8.344520e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|2.2e-08|2.1e-04|2.6e+03| 2.518016e+03 -5.790018e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|3.8e-09|6.4e-05|9.5e+02| 8.929837e+02 -4.945627e+01| 0:0:00| chol  1↙
2
 9|1.000|1.000|6.7e-10|1.9e-05|3.9e+02| 3.480948e+02 -4.316514e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|6.1e-11|1.9e-06|1.2e+02| 7.883864e+01 -4.178398e+01| 0:0:00| chol  1↙
1
11|1.000|1.000|8.5e-12|1.9e-07|5.0e+01| 9.872409e+00 -4.039350e+01| 0:0:00| chol  1↙
1
12|0.810|1.000|4.4e-12|1.9e-08|2.5e+01|-1.479580e+01 -3.985511e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|6.6e-12|1.9e-09|1.4e+01|-2.538177e+01 -3.956472e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.4e-12|1.9e-10|5.3e+00|-3.408322e+01 -3.941136e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|1.5e-13|2.0e-11|2.2e+00|-3.706177e+01 -3.930583e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|4.7e-13|2.9e-12|5.6e-01|-3.870851e+01 -3.926725e+01| 0:0:00| chol  1↙
1
17|1.000|1.000|7.2e-12|1.2e-12|2.2e-01|-3.903353e+01 -3.925024e+01| 0:0:00| chol  1↙
1
18|0.925|0.956|2.4e-11|1.5e-12|3.5e-02|-3.920618e+01 -3.924069e+01| 0:0:00| chol  2↙
1
19|1.000|1.000|2.8e-11|2.2e-12|1.4e-02|-3.922450e+01 -3.923867e+01| 0:0:00| chol  2↙
2
20|0.966|0.954|7.6e-11|3.4e-12|3.0e-03|-3.923497e+01 -3.923799e+01| 0:0:00| chol  2↙
3
21|0.556|1.000|3.9e-10|4.9e-12|2.1e-03|-3.923584e+01 -3.923794e+01| 0:0:00| chol  2↙
3
22|0.886|1.000|2.2e-11|7.3e-12|9.3e-04|-3.923695e+01 -3.923788e+01| 0:0:00| chol  3↙
3
23|0.847|1.000|2.8e-10|4.4e-12|4.1e-04|-3.923745e+01 -3.923786e+01| 0:0:00| chol  3↙
3
24|1.000|1.000|3.9e-10|6.6e-12|1.3e-04|-3.923772e+01 -3.923785e+01| 0:0:00| chol  4↙
4
25|0.949|1.000|3.8e-10|9.9e-12|4.1e-05|-3.923781e+01 -3.923785e+01| 0:0:00| chol  4↙
3
26|1.000|0.969|5.9e-10|1.5e-11|8.8e-06|-3.923784e+01 -3.923785e+01| 0:0:00| chol  6↙
5
27|0.960|0.967|9.2e-10|2.3e-11|8.0e-07|-3.923785e+01 -3.923785e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 27
```

```
 primal objective value = -3.92378473e+01
 dual   objective value = -3.92378481e+01
 gap := trace(XZ)       = 7.98e-07
 relative gap           = 1.00e-08
 actual relative gap    = 1.05e-08
 rel. primal infeas     = 9.17e-10
 rel. dual   infeas     = 2.27e-11
 norm(X), norm(y), norm(Z) = 9.6e+01, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 3.3e+03, 8.0e+02, 2.5e+02
 Total CPU time (secs)  = 0.31
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.9e-09  0.0e+00  3.2e-11  0.0e+00  1.0e-08  1.0e-08
------------------------------------------------------------------

ans =

   39.2378

Iteration   4   Total error is: 0.02086

 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| 2.331706e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|1.000|0.944|2.2e-06|1.6e+00|7.2e+06| 2.346993e+05  1.837722e+03| 0:0:00| chol  1↙
1
 2|1.000|0.922|5.0e-07|1.5e-01|8.2e+05| 2.069666e+05  1.121904e+02| 0:0:00| chol  1↙
1
 3|0.409|1.000|3.3e-07|1.6e-02|2.5e+05| 1.897416e+05 -3.918430e+02| 0:0:00| chol  1↙
1
 4|0.933|1.000|3.3e-08|7.9e-03|3.7e+04| 2.859990e+04 -1.900420e+02| 0:0:00| chol  1↙
1
 5|0.958|0.939|6.7e-08|2.7e-03|1.3e+04| 1.085868e+04 -1.088924e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|2.9e-08|7.1e-04|7.3e+03| 6.862359e+03 -8.721541e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|1.8e-08|2.1e-04|2.3e+03| 2.235824e+03 -5.839210e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|3.2e-09|6.4e-05|1.1e+03| 9.991005e+02 -5.121890e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|3.6e-10|1.9e-05|3.9e+02| 3.409556e+02 -4.439985e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|3.2e-11|1.9e-06|1.1e+02| 6.792656e+01 -4.236499e+01| 0:0:00| chol  1↙
1
11|1.000|0.883|5.2e-12|4.0e-07|5.1e+01| 1.046723e+01 -4.030237e+01| 0:0:00| chol  1↙
```

```
1
12|0.927|1.000|4.2e-13|1.9e-08|3.1e+01|-9.061584e+00 -3.968011e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|1.0e-12|1.9e-09|1.6e+01|-2.291053e+01 -3.893993e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|2.2e-12|1.9e-10|6.9e+00|-3.171666e+01 -3.866653e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|1.6e-13|2.0e-11|2.4e+00|-3.599795e+01 -3.841061e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|6.6e-13|2.9e-12|6.2e-01|-3.773130e+01 -3.834777e+01| 0:0:00| chol  1↙
1
17|0.939|0.884|4.4e-11|1.5e-12|1.7e-01|-3.814426e+01 -3.831894e+01| 0:0:00| chol  2↙
2
18|1.000|1.000|3.4e-12|1.5e-12|6.0e-02|-3.824758e+01 -3.830776e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|6.0e-12|1.0e-12|2.7e-02|-3.827903e+01 -3.830569e+01| 0:0:00| chol  2↙
2
20|1.000|0.936|2.0e-10|1.3e-12|9.0e-03|-3.829549e+01 -3.830450e+01| 0:0:00| chol  2↙
2
21|1.000|1.000|7.5e-11|1.8e-12|4.0e-03|-3.830012e+01 -3.830411e+01| 0:0:00| chol  3↙
3
22|1.000|1.000|2.1e-10|2.7e-12|2.4e-03|-3.830158e+01 -3.830398e+01| 0:0:00| chol  3↙
3
23|0.926|0.957|4.4e-10|4.1e-12|6.3e-04|-3.830324e+01 -3.830387e+01| 0:0:00| chol  3↙
3
24|1.000|1.000|4.5e-10|6.0e-12|3.5e-04|-3.830351e+01 -3.830386e+01| 0:0:00| chol  3↙
3
25|1.000|1.000|1.5e-10|9.0e-12|1.0e-04|-3.830375e+01 -3.830385e+01| 0:0:00| chol  3↙
4
26|0.934|1.000|4.1e-10|1.4e-11|2.9e-05|-3.830382e+01 -3.830385e+01| 0:0:00| chol  4↙
4
27|1.000|0.954|7.2e-10|2.1e-11|3.8e-06|-3.830385e+01 -3.830385e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 27
 primal objective value = -3.83038459e+01
 dual   objective value = -3.83038497e+01
 gap := trace(XZ)       = 3.78e-06
 relative gap           = 4.87e-08
 actual relative gap    = 4.91e-08
 rel. primal infeas     = 7.20e-10
 rel. dual   infeas     = 2.10e-11
 norm(X), norm(y), norm(Z) = 9.7e+01, 3.1e+02, 1.9e+02
 norm(A), norm(b), norm(C) = 3.4e+03, 1.1e+03, 2.5e+02
 Total CPU time (secs)  = 0.31
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.9e-09  0.0e+00  3.0e-11  0.0e+00  4.9e-08  4.9e-08
------------------------------------------------------------------

ans =

   38.3038
```

```
Iteration   5   Total error is: 0.020612

 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| 2.267102e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|1.000|0.942|1.8e-06|1.6e+00|7.2e+06| 2.283513e+05  1.942033e+03| 0:0:00| chol  1↙
1
 2|1.000|0.923|3.8e-07|1.5e-01|8.1e+05| 2.019385e+05  1.230771e+02| 0:0:00| chol  1↙
1
 3|0.409|1.000|2.6e-07|1.6e-02|2.5e+05| 1.857453e+05 -3.881335e+02| 0:0:00| chol  1↙
1
 4|0.946|1.000|2.1e-08|7.9e-03|3.6e+04| 2.794877e+04 -1.896173e+02| 0:0:00| chol  1↙
1
 5|0.931|0.919|5.3e-08|4.3e-03|1.3e+04| 1.089289e+04 -1.043480e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|1.4e-08|1.2e-03|7.2e+03| 6.613464e+03 -8.612365e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|9.2e-09|3.6e-04|2.2e+03| 2.118615e+03 -5.793705e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|8.8e-10|1.1e-04|1.1e+03| 1.005263e+03 -5.200890e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|3.4e-10|3.2e-05|3.7e+02| 3.263140e+02 -4.487395e+01| 0:0:00| chol  1↙
1
10|1.000|1.000|3.2e-11|3.2e-06|1.2e+02| 7.573778e+01 -4.277718e+01| 0:0:00| chol  1↙
1
11|1.000|0.898|1.6e-11|6.1e-07|5.7e+01| 1.652713e+01 -4.033053e+01| 0:0:00| chol  1↙
1
12|0.829|1.000|2.7e-12|3.2e-08|3.6e+01|-3.583599e+00 -3.967460e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|9.2e-13|3.2e-09|1.9e+01|-1.998043e+01 -3.865467e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|9.0e-13|3.2e-10|8.4e+00|-2.992962e+01 -3.828203e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|9.7e-13|3.3e-11|2.9e+00|-3.500671e+01 -3.791735e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|1.7e-11|4.2e-12|7.5e-01|-3.708395e+01 -3.783733e+01| 0:0:00| chol  1↙
1
17|0.951|0.858|1.0e-12|2.4e-12|1.3e-01|-3.764923e+01 -3.778250e+01| 0:0:00| chol  2↙
2
18|0.689|0.875|3.7e-12|1.3e-12|7.1e-02|-3.770307e+01 -3.777408e+01| 0:0:00| chol  2↙
2
19|0.847|0.977|1.2e-11|1.0e-12|2.5e-02|-3.774654e+01 -3.777114e+01| 0:0:00| chol  2↙
2
20|0.842|0.869|4.5e-11|1.6e-12|6.6e-03|-3.776402e+01 -3.777058e+01| 0:0:00| chol  2↙
3
```

```
21|0.752|0.973|1.3e-10|2.3e-12|2.6e-03|-3.776792e+01 -3.777048e+01| 0:0:00| chol  3↙
3
22|0.884|1.000|1.7e-10|3.4e-12|8.3e-04|-3.776963e+01 -3.777046e+01| 0:0:00| chol  4↙
4
23|1.000|1.000|1.9e-09|5.1e-12|3.0e-04|-3.777015e+01 -3.777045e+01| 0:0:00| chol  3↙
3
24|1.000|0.972|3.8e-10|7.7e-12|1.1e-05|-3.777043e+01 -3.777044e+01| 0:0:00| chol  8↙
9
25|0.999|0.993|1.5e-09|1.1e-11|3.4e-07|-3.777044e+01 -3.777044e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -3.77704414e+01
 dual   objective value = -3.77704417e+01
 gap := trace(XZ)       = 3.42e-07
 relative gap           = 4.47e-09
 actual relative gap    = 3.77e-09
 rel. primal infeas     = 1.49e-09
 rel. dual   infeas     = 1.14e-11
 norm(X), norm(y), norm(Z) = 9.8e+01, 3.1e+02, 2.0e+02
 norm(A), norm(b), norm(C) = 3.4e+03, 1.4e+03, 2.5e+02
 Total CPU time (secs)  = 0.31
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 3.5e-09  0.0e+00  1.6e-11  0.0e+00  3.8e-09  4.5e-09
-----------------------------------------------------------------

ans =

   37.7704

Iteration   6   Total error is: 0.020465

 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| 2.210896e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|1.000|0.940|1.6e-06|1.7e+00|7.2e+06| 2.228165e+05  2.016752e+03| 0:0:00| chol  1↙
1
 2|1.000|0.923|3.3e-07|1.6e-01|8.0e+05| 1.974651e+05  1.317302e+02| 0:0:00| chol  1↙
1
 3|0.408|1.000|2.2e-07|1.6e-02|2.4e+05| 1.821337e+05 -3.850614e+02| 0:0:00| chol  1↙
1
 4|0.960|1.000|1.9e-08|7.9e-03|3.5e+04| 2.717196e+04 -1.902950e+02| 0:0:00| chol  1↙
1
 5|0.892|0.889|4.4e-08|4.4e-03|1.3e+04| 1.060110e+04 -1.045157e+02| 0:0:00| chol  1↙
```

```
1
 6|1.000|1.000|1.1e-08|1.2e-03|7.1e+03| 6.487026e+03 -8.588785e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|7.5e-09|3.6e-04|2.2e+03| 2.044195e+03 -5.790032e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|1.1e-09|1.1e-04|1.1e+03| 9.934078e+02 -5.285434e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|3.2e-10|3.2e-05|3.7e+02| 3.248857e+02 -4.551973e+01| 0:0:00| chol  1↙
1
10|0.999|1.000|1.6e-11|3.2e-06|1.2e+02| 7.713902e+01 -4.320950e+01| 0:0:00| chol  1↙
1
11|1.000|0.897|1.2e-12|6.2e-07|6.4e+01| 2.322355e+01 -4.045669e+01| 0:0:00| chol  1↙
1
12|0.833|1.000|1.1e-12|3.2e-08|4.0e+01| 6.061618e-02 -3.982072e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|5.5e-13|3.2e-09|2.1e+01|-1.805353e+01 -3.857477e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|7.1e-13|3.2e-10|9.3e+00|-2.887372e+01 -3.814276e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|6.6e-13|3.3e-11|3.3e+00|-3.443547e+01 -3.770060e+01| 0:0:00| chol  1↙
1
16|1.000|1.000|6.5e-12|4.2e-12|8.6e-01|-3.673556e+01 -3.759741e+01| 0:0:00| chol  1↙
1
17|1.000|0.918|5.8e-12|1.9e-12|2.3e-01|-3.730732e+01 -3.754017e+01| 0:0:00| chol  2↙
2
18|0.966|0.870|3.2e-11|1.4e-12|8.2e-02|-3.744750e+01 -3.752979e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|7.9e-12|1.8e-12|3.4e-02|-3.749248e+01 -3.752598e+01| 0:0:00| chol  2↙
2
20|1.000|0.861|1.3e-11|1.8e-12|4.9e-03|-3.751989e+01 -3.752479e+01| 0:0:00| chol  3↙
3
21|0.500|0.875|2.4e-11|2.6e-12|3.0e-03|-3.752166e+01 -3.752465e+01| 0:0:00| chol  3↙
3
22|0.820|1.000|1.7e-10|3.5e-12|9.8e-04|-3.752361e+01 -3.752459e+01| 0:0:00| chol  3↙
4
23|0.634|1.000|8.8e-10|5.3e-12|5.2e-04|-3.752407e+01 -3.752459e+01| 0:0:00| chol  5↙
5
24|1.000|1.000|6.7e-09|8.0e-12|2.8e-04|-3.752431e+01 -3.752459e+01| 0:0:00| chol  4↙
4
25|1.000|1.000|5.4e-10|1.2e-11|2.6e-05|-3.752456e+01 -3.752458e+01| 0:0:00| chol 11↙
8
26|1.000|1.000|4.1e-10|1.8e-11|5.3e-06|-3.752458e+01 -3.752458e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 26
 primal objective value = -3.75245778e+01
 dual   objective value = -3.75245829e+01
 gap := trace(XZ)       = 5.34e-06
 relative gap           = 7.02e-08
 actual relative gap    = 6.67e-08
 rel. primal infeas     = 4.11e-10
 rel. dual   infeas     = 1.80e-11
 norm(X), norm(y), norm(Z) = 9.8e+01, 3.1e+02, 2.0e+02
 norm(A), norm(b), norm(C) = 3.4e+03, 1.7e+03, 2.5e+02
```

```
 Total CPU time (secs)  = 0.33
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 9.1e-10  0.0e+00  2.5e-11  0.0e+00  6.7e-08  7.0e-08
------------------------------------------------------------------

ans =

   37.5246

Iteration   7   Total error is: 0.020399

 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| 2.188818e+05  0.000000e+00| 0:0:00| chol  1↙
1
 1|1.000|0.940|1.5e-06|1.7e+00|7.1e+06| 2.206433e+05  2.047270e+03| 0:0:00| chol  1↙
1
 2|1.000|0.923|3.2e-07|1.6e-01|8.0e+05| 1.957420e+05  1.354037e+02| 0:0:00| chol  1↙
1
 3|0.407|1.000|2.1e-07|1.6e-02|2.4e+05| 1.809198e+05 -3.856002e+02| 0:0:00| chol  1↙
1
 4|0.976|1.000|2.2e-08|7.9e-03|3.5e+04| 2.652138e+04 -1.940031e+02| 0:0:00| chol  1↙
1
 5|0.865|0.866|4.5e-08|4.5e-03|1.3e+04| 1.035811e+04 -1.063568e+02| 0:0:00| chol  1↙
1
 6|1.000|1.000|9.8e-09|1.2e-03|7.0e+03| 6.390583e+03 -8.658837e+01| 0:0:00| chol  1↙
1
 7|1.000|1.000|6.6e-09|3.6e-04|2.1e+03| 2.016132e+03 -5.883224e+01| 0:0:00| chol  1↙
1
 8|1.000|1.000|1.1e-09|1.1e-04|1.1e+03| 9.863791e+02 -5.365054e+01| 0:0:00| chol  1↙
1
 9|1.000|1.000|2.8e-10|3.2e-05|3.6e+02| 3.091079e+02 -4.618857e+01| 0:0:00| chol  1↙
1
10|0.989|1.000|4.9e-11|3.2e-06|1.3e+02| 8.169305e+01 -4.361808e+01| 0:0:00| chol  1↙
1
11|1.000|0.909|6.4e-12|5.8e-07|6.8e+01| 2.756352e+01 -4.061952e+01| 0:0:00| chol  1↙
1
12|0.822|1.000|1.3e-12|3.2e-08|4.3e+01| 2.805084e+00 -4.008196e+01| 0:0:00| chol  1↙
1
13|1.000|1.000|6.3e-13|3.2e-09|2.2e+01|-1.675258e+01 -3.859334e+01| 0:0:00| chol  1↙
1
14|1.000|1.000|1.7e-12|3.2e-10|1.0e+01|-2.817835e+01 -3.813016e+01| 0:0:00| chol  1↙
1
15|1.000|1.000|5.0e-13|3.3e-11|3.4e+00|-3.417773e+01 -3.762677e+01| 0:0:00| chol  1↙
1
```

```
16|1.000|1.000|6.6e-14|4.2e-12|9.2e-01|-3.659533e+01 -3.751253e+01| 0:0:00| chol  1↙
1
17|0.996|0.926|3.5e-12|1.6e-12|2.5e-01|-3.719702e+01 -3.744816e+01| 0:0:00| chol  2↙
2
18|1.000|0.895|3.5e-11|1.2e-12|8.6e-02|-3.735190e+01 -3.743807e+01| 0:0:00| chol  2↙
2
19|1.000|1.000|2.2e-11|1.5e-12|3.4e-02|-3.739970e+01 -3.743408e+01| 0:0:00| chol  2↙
2
20|1.000|0.838|9.6e-11|2.5e-12|4.5e-03|-3.742833e+01 -3.743286e+01| 0:0:00| chol  2↙
2
21|0.488|0.820|1.3e-10|3.8e-12|2.5e-03|-3.743019e+01 -3.743270e+01| 0:0:00| chol  3↙
3
22|0.538|0.869|2.4e-10|5.6e-12|1.3e-03|-3.743134e+01 -3.743266e+01| 0:0:00| chol  3↙
3
23|0.859|0.676|1.2e-10|9.4e-12|2.7e-04|-3.743237e+01 -3.743264e+01| 0:0:00| chol  4↙
4
24|1.000|0.867|3.1e-09|1.3e-11|1.1e-04|-3.743253e+01 -3.743264e+01| 0:0:00| chol  5↙
5
25|0.917|0.971|1.0e-09|1.7e-11|3.1e-05|-3.743261e+01 -3.743264e+01| 0:0:00| chol 12↙
10
26|1.000|1.000|1.2e-09|2.6e-11|2.7e-06|-3.743263e+01 -3.743264e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 26
 primal objective value = -3.74326346e+01
 dual   objective value = -3.74326372e+01
 gap := trace(XZ)       = 2.70e-06
 relative gap           = 3.56e-08
 actual relative gap    = 3.32e-08
 rel. primal infeas     = 1.24e-09
 rel. dual   infeas     = 2.56e-11
 norm(X), norm(y), norm(Z) = 9.8e+01, 3.1e+02, 2.0e+02
 norm(A), norm(b), norm(C) = 3.5e+03, 1.7e+03, 2.5e+02
 Total CPU time (secs)  = 0.35
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 2.7e-09  0.0e+00  3.6e-11  0.0e+00  3.3e-08  3.6e-08
------------------------------------------------------------------

ans =

   37.4326

Iteration   8   Total error is: 0.020376
The total representation error of the testing signals is: 0.20526
>>
```