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

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
****************************************************************************** ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
****************************************************************************** ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|5.0e-01|3.5e+00|2.3e+04| 5.859116e+02| 0:0:00|2.3e+04|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.901|0.901|4.9e-02|3.4e-01|2.6e+03| 4.221328e+02| 0:0:00|3.3e+02|1.1e+00|1.1e-01| ↙
chol 1  1
 2|0.780|0.780|1.1e-02|7.4e-02|4.4e+02| 8.134312e+01| 0:0:00|9.0e+00|1.4e+00|2.9e-02| ↙
chol 1  1
 3|0.994|0.994|2.0e-04|1.4e-03|7.3e+00|-3.743893e+01| 0:0:00|4.1e+00|1.5e+00|6.0e-04| ↙
chol 1  1
 4|0.982|0.982|5.1e-06|2.3e-04|1.7e-01|-3.973967e+01| 0:0:00|1.2e-01|1.6e+00|1.6e-05| ↙
chol 1  1
 5|0.951|0.951|4.3e-07|9.6e-05|1.8e-02|-3.976679e+01| 0:0:00|1.7e-03|1.7e+00|1.4e-06| ↙
chol 1  1
 6|1.000|1.000|4.7e-08|3.6e-05|2.3e-03|-3.976747e+01| 0:0:00|1.4e-04|1.8e+00|1.6e-07| ↙
chol 1  1
 7|1.000|1.000|1.4e-08|1.4e-05|3.2e-04|-3.976752e+01| 0:0:00|2.9e-05|1.8e+00|2.5e-08| ↙
chol 1  1
 8|1.000|1.000|1.8e-08|5.7e-06|4.5e-05|-3.976753e+01| 0:0:00|4.7e-06|1.9e+00|3.5e-09| ↙
chol 1  1
 9|1.000|1.000|5.2e-08|2.3e-06|6.6e-06|-3.976753e+01| 0:0:00|7.1e-07|1.9e+00|0.0e+00| ↙
chol 1  1
10|1.000|1.000|2.4e-07|2.3e-06|2.4e-07|-3.976754e+01| 0:0:00|1.1e-07|1.9e+00|0.0e+00|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 10
 primal objective value = -3.97675313e+01
 dual   objective value = -3.97675275e+01
 gap := trace(XZ)       = 6.57e-06
 relative gap           = 1.61e-07
 actual relative gap    = -4.73e-08
 rel. primal infeas     = 5.19e-08
 rel. dual   infeas     = 2.28e-06
 norm(X), norm(y), norm(Z) = 1.4e+00, 4.0e+01, 7.7e+00
 norm(A), norm(b), norm(C) = 1.6e+02, 1.0e+00, 5.7e+01
 Total CPU time (secs)  = 0.09
 CPU time per iteration = 0.01
```

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 termination code       = -1
 DIMACS errors: 5.2e-08  0.0e+00  2.3e-06  0.0e+00  -4.7e-08  8.2e-08
------------------------------------------------------------------

ans =

   39.7675


 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------- ↙
------
 0|0.000|0.000|1.2e+00|1.6e+10|2.3e+16| 6.286848e+14| 0:0:00|2.3e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|6.2e-02|8.4e+08|3.0e+15| 7.478572e+14| 0:0:00|8.8e+15|9.7e-01|5.0e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 4.3e+35.
  switch to LU factor lu  1  1
 2|0.953|0.953|5.6e-03|7.5e+07|4.7e+14| 1.809487e+14| 0:0:00|2.4e+14|1.0e+00|4.7e-03| ↙
lu  1  1
 3|0.985|0.985|1.2e-04|1.6e+06|8.7e+12| 2.194809e+12| 0:0:00|3.9e+12|1.0e+00|9.8e-05| ↙
lu  1  1
 4|0.985|0.985|2.6e-06|3.5e+04|2.1e+11| 2.559360e+10| 0:0:00|1.1e+11|1.0e+00|2.3e-06| ↙
lu  1  1
 5|0.963|0.963|1.3e-07|1.7e+03|1.2e+10| 7.989375e+08| 0:0:00|1.6e+09|1.1e+00|1.2e-07| ↙
lu  1  1
 6|0.993|0.993|2.2e-09|2.9e+01|2.1e+08| 9.388760e+06| 0:0:00|1.2e+08|1.1e+00|2.0e-09| ↙
lu  1  1
 7|0.992|0.992|1.1e-10|1.4e+00|1.6e+07| 1.033198e+05| 0:0:00|3.8e+06|1.1e+00|9.5e-11| ↙
lu  1  1
 8|0.995|0.995|5.5e-11|2.4e-02|1.6e+05| 2.814654e+03| 0:0:00|1.9e+05|1.1e+00|1.6e-12| ↙
lu  1  1
 9|0.989|0.989|2.9e-11|4.6e-04|1.8e+03| 3.475731e+01| 0:0:00|5.0e+03|1.1e+00|3.1e-14| ↙
lu  1  1
10|0.987|0.987|1.2e-11|1.9e-05|2.4e+01|-6.105374e+00| 0:0:00|1.2e+02|1.1e+00|6.7e-16| ↙
lu  1  1
11|0.890|0.890|1.9e-10|1.6e-05|7.1e+00|-5.510818e+00| 0:0:00|1.5e+01|1.1e+00|9.9e-17| ↙
lu  1  1
12|0.610|0.610|6.5e-10|1.6e-05|9.4e+00|-4.514048e+00| 0:0:00|5.9e+00|1.1e+00|7.1e-17| ↙
lu  1  1
13|0.882|0.882|9.0e-11|1.6e-05|1.5e+00|-6.291398e+00| 0:0:00|8.1e-01|1.1e+00|1.1e-17| ↙
lu  1  1
```

```
14|0.670|0.670|1.6e-09|1.6e-05|1.3e+00|-6.307672e+00| 0:0:00|2.8e-01|1.1e+00|7.4e-18| ↙
lu  1  1
15|0.907|0.907|1.6e-10|1.6e-05|1.3e-01|-6.590563e+00| 0:0:00|3.9e-02|1.1e+00|8.1e-19| ↙
lu  2  2
16|0.698|0.698|5.7e-09|1.6e-05|1.1e-01|-6.596343e+00| 0:0:00|1.3e-02|1.1e+00|5.6e-19| ↙
lu  2  1
17|0.917|0.917|5.5e-10|1.6e-05|9.5e-03|-6.620323e+00| 0:0:00|2.0e-03|1.1e+00|5.4e-20| ↙
lu  2  2
18|0.729|0.729|2.2e-08|1.6e-05|7.0e-03|-6.621421e+00| 0:0:00|6.3e-04|1.1e+00|3.1e-20| ↙
lu  2  2
19|0.920|0.920|1.8e-09|1.6e-05|5.9e-04|-6.622417e+00| 0:0:00|1.1e-04|1.1e+00|3.7e-21| ↙
lu  2  2
20|0.864|0.864|7.9e-08|1.6e-05|3.9e-04|-6.620495e+00| 0:0:00|2.1e-05|1.1e+00|2.1e-20| ↙
lu  2  2
21|0.931|0.931|3.5e-09|1.6e-05|2.8e-05|-6.622512e+00| 0:0:00|4.9e-06|1.1e+00|9.9e-22| ↙
lu  2  3
22|1.000|1.000|7.8e-08|1.6e-05|1.7e-05|-6.624599e+00| 0:0:00|2.9e-07|1.1e+00|0.0e+00| ↙
lu  3  2
23|1.000|1.000|2.2e-08|1.6e-05|3.1e-06|-6.623177e+00| 0:0:00|1.6e-07|1.1e+00|0.0e+00| ↙
lu  3  3
24|1.000|1.000|2.3e-08|1.6e-05|5.3e-07|-6.623208e+00| 0:0:00|2.9e-08|1.1e+00|0.0e+00|
  Stop: relative gap < infeasibility
  lack of progess in infeas
-----------------------------------------------------------------
 number of iterations   = 24
 primal objective value = -6.62241771e+00
 dual   objective value = -6.62260681e+00
 gap := trace(XZ)       = 2.78e-05
 relative gap           = 3.65e-06
 actual relative gap    = 1.33e-05
 rel. primal infeas     = 3.46e-09
 rel. dual   infeas     = 1.62e-05
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
 norm(A), norm(b), norm(C) = 1.1e+12, 2.4e+12, 5.7e+01
 Total CPU time (secs)  = 0.20
 CPU time per iteration = 0.01
 termination code       = -9
 DIMACS errors: 3.5e-09  0.0e+00  1.6e-05  0.0e+00  1.3e-05  2.0e-06
-----------------------------------------------------------------

ans =

    6.6226

Iteration   2   Total error is: 0.045565

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
****************************************************************************** ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
```

```
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|1.3e+10|1.5e+16| 4.075288e+14| 0:0:00|1.5e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|6.7e-02|7.2e+08|2.1e+15| 4.985790e+14| 0:0:00|6.2e+15|9.7e-01|5.4e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 2.2e+35.
  switch to LU factor lu  1  1
 2|0.964|0.964|6.7e-03|7.2e+07|4.1e+14| 1.538167e+14| 0:0:00|1.9e+14|9.8e-01|5.5e-03| ↙
lu  1  1
 3|0.984|0.984|1.5e-04|1.6e+06|7.9e+12| 1.927748e+12| 0:0:00|2.3e+12|1.0e+00|1.2e-04| ↙
lu  1  1
 4|0.984|0.984|3.4e-06|3.7e+04|1.9e+11| 2.283062e+10| 0:0:00|8.3e+10|1.0e+00|2.9e-06| ↙
lu  1  1
 5|0.962|0.962|1.7e-07|1.9e+03|1.1e+10| 7.024713e+08| 0:0:00|1.2e+09|1.1e+00|1.6e-07| ↙
lu  1  1
 6|0.994|0.994|2.9e-09|3.1e+01|1.9e+08| 8.421636e+06| 0:0:00|1.0e+08|1.1e+00|2.6e-09| ↙
lu  1  1
 7|0.992|0.992|1.4e-10|1.6e+00|1.4e+07| 9.275588e+04| 0:0:00|3.4e+06|1.1e+00|1.3e-10| ↙
lu  1  1
 8|1.000|1.000|5.5e-11|9.9e-02|1.0e+06| 2.565414e+03| 0:0:00|1.6e+05|1.1e+00|8.3e-12| ↙
lu  1  1
 9|0.989|0.989|1.0e-10|1.9e-03|1.1e+04| 6.177120e+01| 0:0:00|1.2e+04|1.1e+00|1.6e-13| ↙
lu  1  1
10|0.989|0.989|8.1e-11|3.6e-05|1.2e+02|-5.827423e+00| 0:0:00|3.2e+02|1.1e+00|3.1e-15| ↙
lu  1  1
11|0.922|0.922|4.1e-11|3.5e-06|1.0e+01|-6.463102e+00| 0:0:00|2.9e+01|1.1e+00|2.7e-16| ↙
lu  1  1
12|0.177|0.177|1.4e-09|3.4e-06|1.3e+01|-5.246309e+00| 0:0:00|2.4e+01|1.1e+00|2.6e-16| ↙
lu  1  1
13|0.965|0.965|2.8e-11|1.5e-06|6.4e-01|-6.532082e+00| 0:0:00|1.1e+00|1.1e+00|1.2e-17| ↙
lu  1  1
14|0.969|0.969|1.0e-09|1.5e-06|5.5e-01|-6.488586e+00| 0:0:00|5.0e-02|1.1e+00|4.4e-18| ↙
lu  1  1
15|0.911|0.911|9.1e-11|1.5e-06|5.2e-02|-6.611267e+00| 0:0:00|9.3e-03|1.1e+00|4.4e-19| ↙
lu  2  2
16|0.930|0.930|1.9e-09|1.5e-06|2.6e-02|-6.617289e+00| 0:0:00|1.2e-03|1.1e+00|2.0e-19| ↙
lu  1  1
17|0.901|0.901|7.1e-10|1.5e-06|2.7e-03|-6.623070e+00| 0:0:00|3.3e-04|1.1e+00|2.2e-20| ↙
lu  2  2
18|0.722|0.722|1.5e-08|1.5e-06|1.9e-03|-6.623477e+00| 0:0:00|1.1e-04|1.1e+00|1.1e-20| ↙
lu  2  2
19|0.921|0.921|1.4e-09|1.5e-06|1.6e-04|-6.623651e+00| 0:0:00|2.6e-05|1.1e+00|1.7e-21| ↙
lu  2  2
20|0.816|0.816|5.1e-08|1.5e-06|1.1e-04|-6.622840e+00| 0:0:00|6.1e-06|1.1e+00|1.3e-20| ↙
lu  2  2
21|0.921|0.921|5.4e-09|1.5e-06|8.9e-06|-6.623622e+00| 0:0:00|1.4e-06|1.1e+00|1.4e-21| ↙
lu  2  3
22|0.757|0.757|2.3e-08|1.5e-06|6.4e-06|-6.624092e+00| 0:0:00|4.1e-07|1.1e+00|0.0e+00| ↙
lu  2  2
```

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23|0.987|0.987|5.8e-09|1.5e-06|7.9e-07|-6.623810e+00| 0:0:00|6.6e-08|1.1e+00|0.0e+00| ↙
lu  2  2
24|1.000|1.000|6.9e-09|1.5e-06|2.5e-07|-6.623825e+00| 0:0:00|7.7e-09|1.1e+00|0.0e+00|
  Stop: relative gap < infeasibility
  lack of progess in infeas
-----------------------------------------------------------------
 number of iterations   = 24
 primal objective value = -6.62353050e+00
 dual   objective value = -6.62371379e+00
 gap := trace(XZ)       = 8.88e-06
 relative gap           = 1.16e-06
 actual relative gap    = 1.29e-05
 rel. primal infeas     = 5.40e-09
 rel. dual   infeas     = 1.46e-06
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
 norm(A), norm(b), norm(C) = 8.5e+11, 1.6e+12, 5.7e+01
 Total CPU time (secs)  = 0.20
 CPU time per iteration = 0.01
 termination code       = -9
 DIMACS errors: 5.4e-09  0.0e+00  1.5e-06  0.0e+00  1.3e-05  6.2e-07
-----------------------------------------------------------------

ans =

    6.6237

Iteration   3   Total error is: 0.045565

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|2.0e+10|3.1e+16| 8.413618e+14| 0:0:00|3.1e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|6.1e-02|1.0e+09|4.0e+15| 9.953755e+14| 0:0:00|1.2e+16|9.7e-01|5.0e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 7.3e+35.
  switch to LU factor lu  1  1
 2|0.950|0.950|5.4e-03|9.2e+07|5.9e+14| 2.251551e+14| 0:0:00|3.1e+14|1.0e+00|4.5e-03| ↙
lu  1  1
 3|0.986|0.986|1.1e-04|1.9e+06|1.1e+13| 2.719043e+12| 0:0:00|5.2e+12|1.0e+00|9.3e-05| ↙
lu  1  1
 4|0.985|0.985|2.5e-06|4.2e+04|2.6e+11| 3.159386e+10| 0:0:00|1.4e+11|1.0e+00|2.1e-06| ↙
```

```
lu  1  1
 5|0.964|0.964|1.2e-07|2.0e+03|1.5e+10| 9.830798e+08| 0:0:00|2.0e+09|1.1e+00|1.1e-07| ↙
lu  1  1
 6|0.993|0.993|2.0e-09|3.4e+01|2.5e+08| 1.150244e+07| 0:0:00|1.5e+08|1.1e+00|1.8e-09| ↙
lu  1  1
 7|0.992|0.992|8.9e-11|1.6e+00|1.9e+07| 1.265359e+05| 0:0:00|4.7e+06|1.1e+00|8.7e-11| ↙
lu  1  1
 8|0.995|0.995|6.5e-11|2.8e-02|2.0e+05| 3.420896e+03| 0:0:00|2.3e+05|1.1e+00|1.5e-12| ↙
lu  1  1
 9|0.989|0.989|3.5e-11|5.3e-04|2.2e+03| 4.351243e+01| 0:0:00|6.1e+03|1.1e+00|2.8e-14| ↙
lu  1  1
10|0.987|0.987|1.6e-11|2.0e-05|2.8e+01|-6.011308e+00| 0:0:00|1.5e+02|1.1e+00|5.9e-16| ↙
lu  1  1
11|0.883|0.883|1.8e-10|1.6e-05|5.7e+00|-5.979800e+00| 0:0:00|1.9e+01|1.1e+00|8.2e-17| ↙
lu  1  1
12|0.382|0.382|1.5e-09|1.6e-05|8.8e+00|-4.872089e+00| 0:0:00|1.2e+01|1.1e+00|7.0e-17| ↙
lu  1  1
13|0.911|0.911|8.2e-11|1.6e-05|1.2e+00|-6.380423e+00| 0:0:00|1.2e+00|1.1e+00|8.0e-18| ↙
lu  1  2
14|0.702|0.702|2.6e-09|1.6e-05|1.1e+00|-6.348913e+00| 0:0:00|3.7e-01|1.1e+00|5.3e-18| ↙
lu  1  1
15|0.890|0.890|3.1e-10|1.6e-05|1.5e-01|-6.588944e+00| 0:0:00|5.2e-02|1.1e+00|6.9e-19| ↙
lu  2  2
16|0.646|0.646|8.6e-09|1.6e-05|1.2e-01|-6.592754e+00| 0:0:00|2.0e-02|1.1e+00|5.0e-19| ↙
lu  1  1
17|0.919|0.919|6.7e-10|1.6e-05|1.1e-02|-6.620808e+00| 0:0:00|2.8e-03|1.1e+00|4.7e-20| ↙
lu  2  2
18|0.749|0.749|3.1e-08|1.6e-05|8.0e-03|-6.622457e+00| 0:0:00|7.9e-04|1.1e+00|2.4e-20| ↙
lu  2  2
19|0.920|0.920|2.3e-09|1.6e-05|6.9e-04|-6.623160e+00| 0:0:00|1.4e-04|1.1e+00|3.4e-21| ↙
lu  2  2
20|0.977|0.977|1.1e-07|1.6e-05|4.1e-04|-6.619580e+00| 0:0:00|1.0e-05|1.1e+00|2.8e-20| ↙
lu  2  2
21|0.936|0.936|9.4e-09|1.6e-05|2.7e-05|-6.623081e+00| 0:0:00|4.2e-06|1.1e+00|2.4e-21| ↙
lu  2  2
22|0.991|0.991|6.7e-08|1.6e-05|1.7e-05|-6.625693e+00| 0:0:00|3.1e-07|1.1e+00|0.0e+00| ↙
lu  2  2
23|1.000|1.000|1.9e-08|1.6e-05|6.9e-06|-6.624057e+00| 0:0:00|1.5e-07|1.1e+00|0.0e+00| ↙
lu  2  2
24|1.000|1.000|1.9e-08|1.6e-05|1.5e-07|-6.624047e+00| 0:0:00|6.4e-08|1.1e+00|0.0e+00|
  Stop: relative gap < infeasibility
  lack of progess in infeas
------------------------------------------------------------------
 number of iterations   = 24
 primal objective value = -6.62275516e+00
 dual   objective value = -6.62340727e+00
 gap := trace(XZ)       = 2.70e-05
 relative gap           = 3.54e-06
 actual relative gap    = 4.58e-05
 rel. primal infeas     = 9.36e-09
 rel. dual   infeas     = 1.62e-05
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
 norm(A), norm(b), norm(C) = 1.3e+12, 3.2e+12, 5.7e+01
 Total CPU time (secs)  = 0.19
 CPU time per iteration = 0.01
```

```
 termination code       = -9
 DIMACS errors: 9.4e-09  0.0e+00  1.6e-05  0.0e+00  4.6e-05  1.9e-06
------------------------------------------------------------------

ans =

    6.6234

Iteration   4   Total error is: 0.045565

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|1.6e+10|1.5e+16| 4.228089e+14| 0:0:00|1.5e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|7.1e-02|9.6e+08|2.3e+15| 5.321020e+14| 0:0:00|7.0e+15|9.6e-01|5.8e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 2.8e+35.
  switch to LU factor lu  1  1
 2|0.972|0.972|7.6e-03|1.0e+08|5.3e+14| 1.930709e+14| 0:0:00|2.2e+14|9.7e-01|6.2e-03| ↙
lu  1  1
 3|0.981|0.981|2.0e-04|2.6e+06|1.2e+13| 3.082371e+12| 0:0:00|2.7e+12|1.0e+00|1.7e-04| ↙
lu  1  1
 4|0.984|0.984|4.6e-06|6.1e+04|2.8e+11| 3.696364e+10| 0:0:00|1.1e+11|1.0e+00|3.9e-06| ↙
lu  1  1
 5|0.962|0.962|2.4e-07|3.2e+03|1.7e+10| 1.029248e+09| 0:0:00|1.6e+09|1.1e+00|2.2e-07| ↙
lu  1  1
 6|0.994|0.994|4.2e-09|5.5e+01|3.0e+08| 1.330967e+07| 0:0:00|1.4e+08|1.1e+00|3.8e-09| ↙
lu  1  1
 7|0.992|0.992|2.3e-10|2.9e+00|2.2e+07| 1.471521e+05| 0:0:00|5.0e+06|1.1e+00|2.0e-10| ↙
lu  1  1
 8|1.000|1.000|9.4e-11|1.8e-01|1.5e+06| 3.974344e+03| 0:0:00|2.4e+05|1.1e+00|1.2e-11| ↙
lu  1  1
 9|0.989|0.989|1.7e-10|3.5e-03|1.7e+04| 9.329280e+01| 0:0:00|1.8e+04|1.1e+00|2.4e-13| ↙
lu  1  1
10|0.989|0.989|1.7e-10|6.7e-05|1.9e+02|-5.243843e+00| 0:0:00|5.0e+02|1.1e+00|4.6e-15| ↙
lu  1  1
11|0.962|0.962|4.3e-11|3.4e-06|7.2e+00|-6.588353e+00| 0:0:00|2.5e+01|1.1e+00|2.1e-16| ↙
lu  1  1
12|0.373|0.373|3.0e-09|3.0e-06|1.2e+01|-4.812487e+00| 0:0:00|1.5e+01|1.1e+00|1.8e-16| ↙
lu  1  1
13|0.926|0.926|1.9e-10|1.5e-06|1.1e+00|-6.425411e+00| 0:0:00|1.4e+00|1.1e+00|1.7e-17| ↙
```

```
lu  1  1
14|0.615|0.615|5.9e-10|1.5e-06|1.2e+00|-6.346039e+00| 0:0:00|5.4e-01|1.1e+00|1.2e-17| ↙
lu  1  1
15|0.898|0.898|3.9e-11|1.5e-06|1.5e-01|-6.590152e+00| 0:0:00|6.9e-02|1.1e+00|1.5e-18| ↙
lu  1  2
16|0.630|0.630|1.6e-09|1.5e-06|1.3e-01|-6.591707e+00| 0:0:00|2.7e-02|1.1e+00|1.1e-18| ↙
lu  1  1
17|0.916|0.916|1.2e-10|1.5e-06|1.2e-02|-6.620371e+00| 0:0:00|3.5e-03|1.1e+00|1.1e-19| ↙
lu  2  2
18|0.709|0.709|5.6e-09|1.5e-06|9.3e-03|-6.621002e+00| 0:0:00|1.1e-03|1.1e+00|7.2e-20| ↙
lu  2  1
19|0.916|0.916|4.7e-10|1.5e-06|8.4e-04|-6.622998e+00| 0:0:00|1.8e-04|1.1e+00|7.2e-21| ↙
lu  2  2
20|0.717|0.717|2.0e-08|1.5e-06|6.3e-04|-6.622713e+00| 0:0:00|5.7e-05|1.1e+00|9.6e-21| ↙
lu  2  2
21|0.921|0.921|7.8e-10|1.5e-06|5.3e-05|-6.623210e+00| 0:0:00|1.0e-05|1.1e+00|2.5e-22| ↙
lu  2  2
22|0.774|0.774|4.0e-08|1.5e-06|3.8e-05|-6.623897e+00| 0:0:00|2.7e-06|1.1e+00|0.0e+00| ↙
lu  2  2
23|0.980|0.980|6.4e-09|1.5e-06|5.1e-06|-6.623319e+00| 0:0:00|4.1e-07|1.1e+00|0.0e+00| ↙
lu  2  2
24|1.000|1.000|8.6e-09|1.5e-06|1.8e-06|-6.623359e+00| 0:0:00|4.9e-08|1.1e+00|0.0e+00| ↙
lu  3  2
25|0.979|0.979|8.0e-09|1.5e-06|2.0e-07|-6.623344e+00| 0:0:00|1.7e-08|1.1e+00|0.0e+00|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -6.62342874e+00
 dual   objective value = -6.62320992e+00
 gap := trace(XZ)       = 5.07e-06
 relative gap           = 6.66e-07
 actual relative gap    = -1.54e-05
 rel. primal infeas     = 6.45e-09
 rel. dual   infeas     = 1.46e-06
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
 norm(A), norm(b), norm(C) = 1.0e+12, 1.6e+12, 5.7e+01
 Total CPU time (secs)  = 0.19
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 6.4e-09  0.0e+00  1.5e-06  0.0e+00  -1.5e-05  3.6e-07
-----------------------------------------------------------------

ans =

    6.6232

Iteration   5   Total error is: 0.045565

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
```

```
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap    tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|2.1e+10|2.4e+16| 6.545202e+14| 0:0:00|2.4e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|6.8e-02|1.2e+09|3.4e+15| 8.038969e+14| 0:0:00|1.0e+16|9.7e-01|5.4e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 5.9e+35.
  switch to LU factor lu  1  1
 2|0.963|0.963|6.7e-03|1.2e+08|6.7e+14| 2.493175e+14| 0:0:00|3.0e+14|9.8e-01|5.5e-03| ↙
lu  1  1
 3|0.984|0.984|1.5e-04|2.6e+06|1.3e+13| 3.136981e+12| 0:0:00|3.7e+12|1.0e+00|1.2e-04| ↙
lu  1  1
 4|0.984|0.984|3.4e-06|6.1e+04|3.1e+11| 3.716492e+10| 0:0:00|1.3e+11|1.0e+00|2.9e-06| ↙
lu  1  1
 5|0.962|0.962|1.8e-07|3.1e+03|1.8e+10| 1.138478e+09| 0:0:00|1.9e+09|1.1e+00|1.6e-07| ↙
lu  1  1
 6|0.994|0.994|2.9e-09|5.2e+01|3.1e+08| 1.365911e+07| 0:0:00|1.7e+08|1.1e+00|2.7e-09| ↙
lu  1  1
 7|0.992|0.992|1.4e-10|2.6e+00|2.3e+07| 1.503947e+05| 0:0:00|5.5e+06|1.1e+00|1.4e-10| ↙
lu  1  1
 8|1.000|1.000|9.2e-11|1.6e-01|1.6e+06| 4.121861e+03| 0:0:00|2.6e+05|1.1e+00|8.4e-12| ↙
lu  1  1
 9|0.989|0.989|1.8e-10|3.2e-03|1.8e+04| 9.276888e+01| 0:0:00|1.9e+04|1.1e+00|1.6e-13| ↙
lu  1  1
10|0.989|0.989|1.7e-10|6.1e-05|2.0e+02|-5.312110e+00| 0:0:00|5.2e+02|1.1e+00|3.1e-15| ↙
lu  1  1
11|0.948|0.948|6.2e-11|3.9e-06|1.0e+01|-6.550008e+00| 0:0:00|3.3e+01|1.1e+00|1.9e-16| ↙
lu  1  1
12|0.233|0.233|4.3e-09|3.7e-06|1.4e+01|-4.892102e+00| 0:0:00|2.5e+01|1.1e+00|1.7e-16| ↙
lu  1  1
13|0.952|0.952|1.6e-10|1.5e-06|9.7e-01|-6.476917e+00| 0:0:00|1.5e+00|1.1e+00|1.1e-17| ↙
lu  1  2
14|0.782|0.782|1.7e-09|1.5e-06|1.1e+00|-6.378465e+00| 0:0:00|3.5e-01|1.1e+00|6.3e-18| ↙
lu  1  1
15|0.866|0.866|1.2e-10|1.5e-06|1.7e-01|-6.583834e+00| 0:0:00|5.8e-02|1.1e+00|1.0e-18| ↙
lu  2  2
16|0.580|0.580|3.8e-09|1.5e-06|1.5e-01|-6.586508e+00| 0:0:00|2.6e-02|1.1e+00|8.1e-19| ↙
lu  1  2
17|0.925|0.925|2.6e-10|1.5e-06|1.2e-02|-6.620782e+00| 0:0:00|3.4e-03|1.1e+00|7.1e-20| ↙
lu  2  2
18|0.764|0.764|1.3e-08|1.5e-06|9.1e-03|-6.621843e+00| 0:0:00|9.1e-04|1.1e+00|4.2e-20| ↙
lu  2  2
19|0.913|0.913|1.1e-09|1.5e-06|8.5e-04|-6.623505e+00| 0:0:00|1.6e-04|1.1e+00|4.8e-21| ↙
lu  2  2
20|0.742|0.742|4.7e-08|1.5e-06|6.2e-04|-6.622336e+00| 0:0:00|4.8e-05|1.1e+00|1.4e-20| ↙
lu  2  2
21|0.926|0.926|9.3e-10|1.5e-06|4.8e-05|-6.623704e+00| 0:0:00|9.1e-06|1.1e+00|4.9e-22| ↙
lu  3  3
```

```
22|0.854|0.854|5.4e-08|1.5e-06|3.2e-05|-6.625170e+00| 0:0:00|1.8e-06|1.1e+00|0.0e+00| ↙
lu  3  2
23|0.974|0.974|1.4e-08|1.5e-06|4.6e-06|-6.624128e+00| 0:0:00|3.5e-07|1.1e+00|0.0e+00| ↙
lu  2  2
24|1.000|1.000|1.8e-08|1.5e-06|1.7e-06|-6.624214e+00| 0:0:00|4.4e-08|1.1e+00|0.0e+00| ↙
lu  2  3
25|0.976|0.976|1.7e-08|1.5e-06|2.0e-07|-6.624187e+00| 0:0:00|1.6e-08|1.1e+00|0.0e+00|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -6.62451537e+00
 dual   objective value = -6.62374122e+00
 gap := trace(XZ)       = 4.60e-06
 relative gap           = 6.04e-07
 actual relative gap    = -5.43e-05
 rel. primal infeas     = 1.45e-08
 rel. dual   infeas     = 1.46e-06
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
 norm(A), norm(b), norm(C) = 1.4e+12, 2.5e+12, 5.7e+01
 Total CPU time (secs)  = 0.16
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 1.4e-08  0.0e+00  1.5e-06  0.0e+00  -5.4e-05  3.2e-07
-----------------------------------------------------------------

ans =

    6.6237

Iteration   6   Total error is: 0.045565

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|1.6e+10|2.2e+16| 6.152965e+14| 0:0:00|2.2e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|6.1e-02|8.0e+08|3.0e+15| 7.307702e+14| 0:0:00|8.6e+15|9.7e-01|5.0e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 4.1e+35.
  switch to LU factor lu  1  1
 2|0.952|0.952|5.5e-03|7.2e+07|4.6e+14| 1.741176e+14| 0:0:00|2.4e+14|1.0e+00|4.6e-03| ↙
lu  1  1
```

```
 3|0.985|0.985|1.1e-04|1.5e+06|8.4e+12| 2.108949e+12| 0:0:00|3.8e+12|1.0e+00|9.7e-05| ↙
lu  1  1
 4|0.985|0.985|2.6e-06|3.3e+04|2.1e+11| 2.457238e+10| 0:0:00|1.1e+11|1.0e+00|2.2e-06| ↙
lu  1  1
 5|0.963|0.963|1.3e-07|1.6e+03|1.2e+10| 7.667942e+08| 0:0:00|1.5e+09|1.1e+00|1.1e-07| ↙
lu  1  1
 6|0.993|0.993|2.1e-09|2.8e+01|2.0e+08| 9.001555e+06| 0:0:00|1.1e+08|1.1e+00|1.9e-09| ↙
lu  1  1
 7|0.992|0.992|1.1e-10|1.3e+00|1.5e+07| 9.905795e+04| 0:0:00|3.7e+06|1.1e+00|9.3e-11| ↙
lu  1  1
 8|0.995|0.995|5.3e-11|2.3e-02|1.6e+05| 2.699895e+03| 0:0:00|1.8e+05|1.1e+00|1.6e-12| ↙
lu  1  1
 9|0.989|0.989|2.8e-11|4.3e-04|1.7e+03| 3.269468e+01| 0:0:00|4.8e+03|1.1e+00|3.0e-14| ↙
lu  1  1
10|0.986|0.986|1.2e-11|1.9e-05|2.4e+01|-6.126043e+00| 0:0:00|1.2e+02|1.1e+00|6.6e-16| ↙
lu  1  1
11|0.903|0.903|2.3e-10|1.6e-05|7.6e+00|-5.293866e+00| 0:0:00|1.3e+01|1.1e+00|9.5e-17| ↙
lu  1  1
12|0.728|0.728|5.5e-10|1.6e-05|8.8e+00|-4.564027e+00| 0:0:00|3.6e+00|1.1e+00|5.9e-17| ↙
lu  1  1
13|0.871|0.871|1.1e-10|1.6e-05|1.4e+00|-6.291240e+00| 0:0:00|5.6e-01|1.1e+00|9.5e-18| ↙
lu  1  1
14|0.656|0.656|1.6e-09|1.6e-05|1.2e+00|-6.326459e+00| 0:0:00|2.0e-01|1.1e+00|6.8e-18| ↙
lu  1  1
15|0.914|0.914|1.6e-10|1.6e-05|1.1e-01|-6.595824e+00| 0:0:00|2.9e-02|1.1e+00|6.9e-19| ↙
lu  2  2
16|0.725|0.725|6.1e-09|1.6e-05|8.6e-02|-6.601753e+00| 0:0:00|8.9e-03|1.1e+00|4.6e-19| ↙
lu  1  2
17|0.916|0.916|6.2e-10|1.6e-05|7.8e-03|-6.621408e+00| 0:0:00|1.5e-03|1.1e+00|4.4e-20| ↙
lu  2  2
18|0.727|0.727|2.4e-08|1.6e-05|5.7e-03|-6.622455e+00| 0:0:00|4.8e-04|1.1e+00|2.4e-20| ↙
lu  2  2
19|0.922|0.922|1.9e-09|1.6e-05|4.7e-04|-6.623120e+00| 0:0:00|8.9e-05|1.1e+00|3.2e-21| ↙
lu  2  2
20|0.905|0.905|8.8e-08|1.6e-05|3.0e-04|-6.620995e+00| 0:0:00|1.3e-05|1.1e+00|2.3e-20| ↙
lu  2  2
21|0.932|0.932|5.8e-09|1.6e-05|2.1e-05|-6.623133e+00| 0:0:00|3.5e-06|1.1e+00|1.5e-21| ↙
lu  2  2
22|1.000|1.000|7.2e-08|1.6e-05|1.3e-05|-6.625088e+00| 0:0:00|2.2e-07|1.1e+00|0.0e+00| ↙
lu  3  2
23|1.000|1.000|1.5e-08|1.6e-05|2.9e-06|-6.623653e+00| 0:0:00|1.2e-07|1.1e+00|0.0e+00| ↙
lu  3  3
24|1.000|1.000|2.1e-08|1.6e-05|5.4e-07|-6.623796e+00| 0:0:00|2.7e-08|1.1e+00|0.0e+00|
  Stop: relative gap < infeasibility
  lack of progess in infeas
-----------------------------------------------------------------
 number of iterations   = 24
 primal objective value = -6.62298187e+00
 dual   objective value = -6.62328445e+00
 gap := trace(XZ)       = 2.12e-05
 relative gap           = 2.78e-06
 actual relative gap    = 2.12e-05
 rel. primal infeas     = 5.79e-09
 rel. dual   infeas     = 1.62e-05
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
```

```
 norm(A), norm(b), norm(C) = 1.0e+12, 2.4e+12, 5.7e+01
 Total CPU time (secs)  = 0.13
 CPU time per iteration = 0.01
 termination code       = -9
 DIMACS errors: 5.8e-09  0.0e+00  1.6e-05  0.0e+00  2.1e-05  1.5e-06
------------------------------------------------------------------

ans =

    6.6233

Iteration   7   Total error is: 0.045565

 num. of constraints =  3
 dim. of socp   var  =  4,   num. of socp blk  =  1
 dim. of linear var  = 116
 18 linear variables from unrestricted variable.

 *** convert ublk to linear blk
**************************************************************************************** ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
**************************************************************************************** ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|2.6e+10|4.1e+16| 1.129809e+15| 0:0:00|4.1e+17|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|6.0e-02|1.3e+09|5.3e+15| 1.328054e+15| 0:0:00|1.5e+16|9.7e-01|4.9e-02| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 1.2e+36.
  switch to LU factor lu  1  1
 2|0.948|0.948|5.1e-03|1.1e+08|7.2e+14| 2.769795e+14| 0:0:00|4.0e+14|1.0e+00|4.3e-03| ↙
lu  1  1
 3|0.986|0.986|1.0e-04|2.2e+06|1.3e+13| 3.329311e+12| 0:0:00|7.0e+12|1.0e+00|8.7e-05| ↙
lu  1  1
 4|0.985|0.985|2.3e-06|4.9e+04|3.2e+11| 3.854364e+10| 0:0:00|1.8e+11|1.0e+00|2.0e-06| ↙
lu  1  1
 5|0.964|0.964|1.1e-07|2.3e+03|1.8e+10| 1.191790e+09| 0:0:00|2.6e+09|1.1e+00|9.8e-08| ↙
lu  1  1
 6|0.993|0.993|1.8e-09|3.9e+01|3.1e+08| 1.387761e+07| 0:0:00|1.8e+08|1.1e+00|1.6e-09| ↙
lu  1  1
 7|0.992|0.992|1.0e-10|1.8e+00|2.3e+07| 1.526134e+05| 0:0:00|5.7e+06|1.1e+00|7.8e-11| ↙
lu  1  1
 8|0.995|0.995|7.7e-11|3.2e-02|2.4e+05| 4.099235e+03| 0:0:00|2.8e+05|1.1e+00|1.3e-12| ↙
lu  1  1
 9|0.989|0.989|4.0e-11|6.0e-04|2.6e+03| 5.280700e+01| 0:0:00|7.4e+03|1.1e+00|2.5e-14| ↙
lu  1  1
10|0.988|0.988|2.0e-11|2.0e-05|3.2e+01|-5.910378e+00| 0:0:00|1.7e+02|1.1e+00|5.2e-16| ↙
lu  1  1
11|0.894|0.894|1.9e-10|1.6e-05|4.8e+00|-6.243664e+00| 0:0:00|2.0e+01|1.1e+00|6.2e-17| ↙
lu  2  2
```

```
12|0.273|0.273|3.2e-09|1.6e-05|7.6e+00|-5.287328e+00| 0:0:00|1.5e+01|1.1e+00|5.6e-17| ↙
lu  1  1
13|0.930|0.930|7.8e-11|1.6e-05|8.4e-01|-6.456082e+00| 0:0:00|1.2e+00|1.1e+00|5.2e-18| ↙
lu  2  2
14|0.732|0.732|4.6e-09|1.6e-05|9.0e-01|-6.407614e+00| 0:0:00|3.3e-01|1.1e+00|3.2e-18| ↙
lu  2  2
15|0.878|0.878|5.5e-10|1.6e-05|1.3e-01|-6.591966e+00| 0:0:00|5.0e-02|1.1e+00|4.8e-19| ↙
lu  2  2
16|0.621|0.621|1.4e-08|1.6e-05|1.2e-01|-6.594272e+00| 0:0:00|2.0e-02|1.1e+00|3.6e-19| ↙
lu  1  2
17|0.921|0.921|1.1e-09|1.6e-05|9.9e-03|-6.620917e+00| 0:0:00|2.7e-03|1.1e+00|3.3e-20| ↙
lu  2  2
18|0.788|0.788|4.7e-08|1.6e-05|7.2e-03|-6.623671e+00| 0:0:00|6.6e-04|1.1e+00|9.0e-21| ↙
lu  2  2
19|0.923|0.923|3.2e-09|1.6e-05|5.8e-04|-6.622979e+00| 0:0:00|1.2e-04|1.1e+00|2.6e-21| ↙
lu  3  3
20|1.000|1.000|1.3e-07|1.6e-05|3.2e-04|-6.617426e+00| 0:0:00|6.2e-06|1.1e+00|3.1e-20| ↙
lu  2  2
21|1.000|1.000|2.4e-08|1.6e-05|1.6e-05|-6.622156e+00| 0:0:00|3.0e-06|1.1e+00|5.9e-21| ↙
lu  3  3
22|1.000|1.000|1.7e-08|1.6e-05|1.0e-06|-6.622485e+00| 0:0:00|1.7e-07|1.1e+00|4.1e-21|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 22
 primal objective value = -6.62104763e+00
 dual   objective value = -6.62326535e+00
 gap := trace(XZ)       = 1.60e-05
 relative gap           = 2.10e-06
 actual relative gap    = 1.56e-04
 rel. primal infeas     = 2.41e-08
 rel. dual   infeas     = 1.62e-05
 norm(X), norm(y), norm(Z) = 2.4e+01, 7.3e+01, 4.9e+01
 norm(A), norm(b), norm(C) = 1.7e+12, 4.3e+12, 5.7e+01
 Total CPU time (secs)  = 0.17
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 2.4e-08  0.0e+00  1.6e-05  0.0e+00  1.6e-04  1.1e-06
-----------------------------------------------------------------

ans =

    6.6233

Iteration   8   Total error is: 0.045565
The total representation error of the testing signals is: 0.12734
>>
```