

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

```
num. of constraints = 65
dim. of socp var = 66, num. of socp blk = 1
dim. of linear var = 800
*****
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|3.5e+01|4.3e+06| 2.221660e+04  0.000000e+00| 0:0:00| chol 1✓
1
1|1.000|0.979|3.6e-06|8.3e-01|1.2e+05| 2.217488e+04 -1.147397e+02| 0:0:00| chol 1✓
1
2|0.737|0.823|2.3e-06|1.7e-01|4.7e+04| 2.386384e+04 -1.579307e+02| 0:0:00| chol 1✓
1
3|0.812|1.000|4.1e-07|1.0e-02|1.9e+04| 1.753803e+04 -1.979232e+02| 0:0:00| chol 1✓
1
4|0.970|0.982|6.3e-07|3.1e-03|5.7e+02| 3.774179e+02 -1.837059e+02| 0:0:00| chol 1✓
1
5|0.266|0.442|6.4e-07|1.9e-03|5.3e+02| 3.856460e+02 -1.372429e+02| 0:0:00| chol 1✓
1
6|0.384|1.000|4.0e-07|3.0e-05|4.4e+02| 3.435275e+02 -1.002199e+02| 0:0:00| chol 1✓
1
7|1.000|1.000|1.3e-09|3.1e-06|2.8e+02| 1.956896e+02 -8.629687e+01| 0:0:00| chol 1✓
1
8|1.000|1.000|5.2e-10|3.0e-07|1.5e+02| 8.343685e+01 -7.114383e+01| 0:0:00| chol 1✓
1
9|1.000|1.000|8.4e-12|3.0e-08|6.4e+01|-1.442101e+00 -6.582098e+01| 0:0:00| chol 1✓
1
10|1.000|1.000|1.4e-13|3.0e-09|3.0e+01|-2.705257e+01 -5.657484e+01| 0:0:00| chol 1✓
1
11|1.000|1.000|2.2e-13|3.0e-10|1.2e+01|-4.255926e+01 -5.428354e+01| 0:0:00| chol 1✓
1
12|1.000|1.000|2.0e-14|3.1e-11|4.4e+00|-4.802792e+01 -5.244239e+01| 0:0:00| chol 1✓
1
13|1.000|1.000|1.0e-14|4.0e-12|1.6e+00|-5.038130e+01 -5.194094e+01| 0:0:00| chol 1✓
1
14|1.000|1.000|1.5e-14|1.3e-12|6.0e-01|-5.107527e+01 -5.167205e+01| 0:0:00| chol 1✓
1
15|1.000|1.000|1.0e-14|1.0e-12|1.9e-01|-5.141016e+01 -5.159702e+01| 0:0:00| chol 1✓
1
16|1.000|1.000|6.9e-15|1.0e-12|7.5e-02|-5.149030e+01 -5.156519e+01| 0:0:00| chol 1✓
1
17|1.000|1.000|5.1e-15|1.0e-12|2.0e-02|-5.153552e+01 -5.155554e+01| 0:0:00| chol 1✓
1
18|1.000|1.000|8.0e-13|1.0e-12|8.5e-03|-5.154402e+01 -5.155248e+01| 0:0:01| chol 1✓
1
19|0.972|0.968|2.3e-12|1.0e-12|1.8e-03|-5.154961e+01 -5.155137e+01| 0:0:01| chol 1✓
2
```

```

20|0.830|1.000|1.1e-12|1.0e-12|8.9e-04|-5.155035e+01 -5.155124e+01| 0:0:01| chol 2✓
1
21|1.000|1.000|2.3e-11|1.0e-12|1.8e-04|-5.155099e+01 -5.155116e+01| 0:0:01| chol 2✓
2
22|0.888|1.000|2.8e-12|1.5e-12|7.2e-05|-5.155108e+01 -5.155116e+01| 0:0:01| chol 2✓
2
23|0.969|0.926|1.4e-12|1.1e-12|1.7e-05|-5.155114e+01 -5.155115e+01| 0:0:01| chol 2✓
2
24|0.769|0.995|1.6e-12|1.0e-12|7.1e-06|-5.155115e+01 -5.155115e+01| 0:0:01|
stop: max(relative gap, infeasibilities) < 1.00e-07

```

```

-----
number of iterations    = 24
primal objective value = -5.15511453e+01
dual  objective value = -5.15511524e+01
gap := trace(XZ)       = 7.11e-06
relative gap           = 6.83e-08
actual relative gap    = 6.83e-08
rel. primal infeas     = 1.61e-12
rel. dual  infeas     = 1.01e-12
norm(X), norm(y), norm(Z) = 8.4e-01, 5.2e+01, 2.0e+01
norm(A), norm(b), norm(C) = 6.9e+02, 2.1e+01, 7.7e+01
Total CPU time (secs)   = 0.54
CPU time per iteration = 0.02
termination code        = 0
DIMACS errors: 3.0e-12  0.0e+00  1.4e-12  0.0e+00  6.8e-08  6.8e-08
-----

```

ans =

51.5512

```

num. of constraints = 65
dim. of socp var   = 66,   num. of socp blk = 1
dim. of linear var = 800
*****
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|5.1e+04|2.0e+11| 1.040433e+09  0.000000e+00| 0:0:00| chol 2✓
2
1|1.000|0.977|2.3e-07|1.2e+03|6.4e+09| 1.018763e+09 -9.041836e+05| 0:0:00| chol
linsysolve: Schur complement matrix not positive definite
switch to LU factor. lu 12 ^ 8
2|1.000|0.752|4.0e-08|2.9e+02|2.8e+09| 1.051416e+09 -2.232240e+06| 0:0:00| lu 30 ^✓
9
3|0.068|0.069|8.9e-07|2.7e+02|2.7e+09| 1.047437e+09 -2.534684e+06| 0:0:00| lu 26 ^✓
3
4|0.000|0.001|9.2e-07|2.7e+02|2.7e+09| 1.047434e+09 -2.522285e+06| 0:0:00| lu 15✓
^10
5|0.018|0.312|1.2e-06|1.9e+02|2.2e+09| 1.049287e+09 -1.042746e+06| 0:0:00| lu 23✓

```

```
4
6|0.289|0.301|2.1e-06|1.3e+02|1.9e+09| 1.050291e+09 -4.300867e+06| 0:0:00| 1u 30✓
4
7|0.055|0.373|2.1e-06|8.1e+01|1.6e+09| 1.034175e+09 -6.010303e+06| 0:0:00| 1u 30 ^✓
4
8|0.580|0.645|7.3e-07|2.9e+01|8.1e+08| 6.782129e+08 -5.193327e+06| 0:0:00| 1u 30✓
4
9|0.303|0.384|4.7e-07|1.8e+01|7.3e+08| 6.347671e+08 -8.279680e+06| 0:0:00| 1u 19✓
^12
10|0.282|0.337|5.3e-07|1.2e+01|6.5e+08| 5.780208e+08 -1.079160e+07| 0:0:00| 1u 30✓
^23
11|0.195|0.353|1.5e-06|7.6e+00|6.0e+08| 5.442452e+08 -1.165126e+07| 0:0:00| 1u 30✓
30
12|0.134|0.200|3.3e-05|6.1e+00|5.7e+08| 5.256456e+08 -1.136707e+07| 0:0:00| 1u 30✓
30
13|0.526|0.193|5.8e-05|4.9e+00|5.3e+08| 4.817500e+08 -1.438199e+07| 0:0:00| 1u 30✓
4
14|0.066|0.506|5.3e-05|2.4e+00|4.9e+08| 4.588220e+08 -6.861610e+06| 0:0:00| 1u 30✓
3
15|0.697|0.340|1.6e-05|1.6e+00|3.8e+08| 3.451727e+08 -1.182050e+07| 0:0:00| 1u 23✓
6
16|0.731|0.346|5.4e-06|1.1e+00|3.1e+08| 2.705798e+08 -1.579670e+07| 0:0:00| 1u 30✓
11
17|0.331|0.329|8.3e-06|7.1e-01|2.9e+08| 2.493036e+08 -2.083760e+07| 0:0:00| 1u 30✓
6
18|0.164|0.225|6.2e-06|5.5e-01|2.8e+08| 2.401086e+08 -1.525738e+07| 0:0:00| 1u 23✓
4
19|0.347|0.597|3.8e-06|2.2e-01|2.4e+08| 2.040158e+08 -1.876348e+07| 0:0:00| 1u 30✓
7
20|0.408|0.407|5.1e-06|1.3e-01|2.0e+08| 1.651660e+08 -1.930879e+07| 0:0:00| 1u 30✓
^14
21|0.261|0.526|1.9e-05|6.2e-02|1.8e+08| 1.524753e+08 -1.547180e+07| 0:0:00| 1u 30✓
7
22|0.256|0.383|4.4e-06|3.8e-02|1.6e+08| 1.373526e+08 -1.610526e+07| 0:0:00| 1u 17✓
^22
23|0.345|0.306|2.0e-05|2.6e-02|1.5e+08| 1.202696e+08 -1.656308e+07| 0:0:00| 1u 30 ^✓
4
24|0.365|0.407|8.0e-05|1.6e-02|1.3e+08| 1.101671e+08 -1.624932e+07| 0:0:00| 1u 18✓
^21
25|0.295|0.354|9.5e-05|1.0e-02|1.2e+08| 9.957992e+07 -1.763016e+07| 0:0:01| 1u 30✓
6
26|0.427|0.375|3.0e-04|6.3e-03|1.1e+08| 9.119319e+07 -1.308688e+07| 0:0:01| 1u 23✓
3
27|0.584|0.807|1.0e-04|1.2e-03|8.2e+07| 6.395785e+07 -1.753110e+07| 0:0:01| 1u 8✓
3
28|0.621|1.000|5.3e-05|6.6e-06|5.5e+07| 4.681652e+07 -8.534597e+06| 0:0:01| 1u 8✓
3
29|0.946|1.000|7.3e-06|9.9e-06|1.4e+07| 1.062524e+07 -3.370091e+06| 0:0:01| 1u 7✓
3
30|1.000|1.000|1.1e-06|1.5e-06|6.5e+06| 5.190746e+06 -1.347604e+06| 0:0:01| 1u 6✓
2
31|1.000|1.000|6.2e-07|2.3e-07|2.0e+06| 1.469731e+06 -5.390016e+05| 0:0:01| 1u 6✓
2
32|1.000|1.000|8.1e-08|1.2e-07|8.3e+05| 6.519141e+05 -1.826904e+05| 0:0:01| 1u 6✓
```

```

2
33|1.000|1.000|4.6e-08|1.6e-08|2.6e+05| 1.890341e+05 -7.274959e+04| 0:0:01| 1u 12✓
2
34|1.000|1.000|2.2e-08|9.2e-09|1.1e+05| 8.297918e+04 -2.359112e+04| 0:0:01| 1u 6✓
2
35|1.000|1.000|1.3e-08|4.4e-09|3.3e+04| 2.370657e+04 -9.262669e+03| 0:0:01| 1u 7✓
2
36|1.000|1.000|5.4e-09|2.5e-09|1.4e+04| 1.056096e+04 -2.985259e+03| 0:0:01| 1u 7✓
2
37|1.000|1.000|3.5e-09|1.1e-09|4.1e+03| 2.954479e+03 -1.166012e+03| 0:0:01| 1u 6✓
2
38|1.000|1.000|1.8e-09|6.9e-10|1.7e+03| 1.321035e+03 -3.930210e+02| 0:0:01| 1u 5✓
2
39|1.000|1.000|3.8e-09|3.6e-10|5.1e+02| 3.383452e+02 -1.681136e+02| 0:0:01| 1u 19✓
2
40|1.000|1.000|1.4e-09|5.4e-10|2.1e+02| 1.358926e+02 -7.849679e+01| 0:0:01| 1u 7✓
2
41|1.000|1.000|4.6e-10|2.8e-10|5.8e+01| 6.408123e+00 -5.175171e+01| 0:0:01| 1u 7✓
1
42|1.000|1.000|2.1e-10|9.3e-11|2.6e+01|-1.714052e+01 -4.291340e+01| 0:0:01| 1u 6✓
1
43|0.977|1.000|1.0e-10|4.1e-11|6.2e+00|-3.378835e+01 -3.996470e+01| 0:0:01| 1u 11✓
1
44|1.000|1.000|1.6e-10|2.0e-11|2.8e+00|-3.653575e+01 -3.934169e+01| 0:0:01| 1u 5✓
1
45|0.959|1.000|4.0e-11|3.1e-11|5.6e-01|-3.853520e+01 -3.909161e+01| 0:0:01| 1u 30✓
4
46|1.000|1.000|7.0e-11|8.0e-12|2.3e-01|-3.883058e+01 -3.906165e+01| 0:0:01| 1u 25 ^✓
7
47|0.965|0.941|5.8e-10|1.2e-11|3.5e-02|-3.901369e+01 -3.904888e+01| 0:0:01| 1u 30✓
^21
48|0.931|1.000|5.6e-10|1.8e-11|1.2e-02|-3.903509e+01 -3.904747e+01| 0:0:01| 1u 25✓
30
49|0.872|0.654|1.2e-09|3.3e-11|1.9e-03|-3.904519e+01 -3.904721e+01| 0:0:01| 1u 30✓
^11
50|0.926|0.625|1.2e-09|5.3e-11|6.7e-04|-3.904633e+01 -3.904718e+01| 0:0:01|
  sqlp stop: maximum number of iterations reached
-----
number of iterations      = 50
primal objective value = -3.90463259e+01
dual   objective value = -3.90471756e+01
gap := trace(XZ)         = 6.66e-04
relative gap             = 8.43e-06
actual relative gap      = 1.07e-05
rel. primal infeas       = 1.15e-09
rel. dual   infeas       = 5.25e-11
norm(X), norm(y), norm(Z) = 3.0e+03, 6.4e+01, 2.8e+01
norm(A), norm(b), norm(C) = 7.3e+06, 3.3e+06, 7.7e+01
Total CPU time (secs)    = 0.83
CPU time per iteration   = 0.02
termination code         = -6
DIMACS errors: 2.8e-09  0.0e+00  7.5e-11  0.0e+00  1.1e-05  8.4e-06
-----

```

```
ans =
```

```
39.0468
```

```
Iteration    2    Total error is: 0.029089
```

```
ans =
```

```
NaN
```

```
Iteration    3    Total error is: NaN
```

```
Error using svd
```

```
Input to SVD must not contain NaN or Inf.
```

```
Error in pinv (line 18)
```

```
[U,S,V] = svd(A,'econ');
```

```
Error in OMP_non_normalized_atoms (line 53)
```

```
    a = pinv(normalized_D(:,indx(1:j))) * x;
```

```
Error in Polynomial_Dictionary_Learning (line 169)
```

```
    CoefMatrix = OMP_non_normalized_atoms(Dictionary,Y, param.T0);
```

```
Error in demo_Polynomial_Dictionary_Learning (line 83)
```

```
[Dictionary_Pol, output_Pol, err] = Polynomial_Dictionary_Learning(TrainSignal, ↵  
param, initial_sparsity_mx);
```

```
>>
```