Mohammadreza ARani

Convex Optimization

810100511

```matlab
% Q7:
% Load Data:
clear; clc; close all;
run('blend_design_data')
```

```matlab
% Solve Using what we achieved in bare hands:
cvx_begin
    variable Theta(k)

    log(P)*Theta <= log(P_spec);
    log(A)*Theta <= log(A_spec);
    log(D)*Theta <= log(D_spec);

    Theta >= 0;
    sum(Theta) == 1;


cvx_end
```

```
Calling SDPT3 4.0: 9 variables, 4 equality constraints
-------------------------------------------------------------

 num. of constraints =  4
 dim. of linear var  =  9
******************************************************************
   SDPT3: Infeasible path-following algorithms
******************************************************************
 version  predcorr  gam  expon  scale_data
    NT       1     0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
 0|0.000|0.000|5.7e+01|3.7e+01|1.1e+03| 0.000000e+00  0.000000e+00| 0:0:00| chol  1  1
 1|0.835|1.000|9.5e+00|1.0e-01|1.9e+02| 0.000000e+00 -1.086825e+01| 0:0:00| chol  1  1
 2|0.965|1.000|3.3e-01|1.0e-02|1.4e+01| 0.000000e+00 -8.787936e+00| 0:0:00| chol  1  1
 3|0.535|0.777|1.5e-01|3.0e-03|5.2e+00| 0.000000e+00 -1.516268e+00| 0:0:00| chol  1  1
 4|0.799|1.000|3.1e-02|1.0e-04|1.8e+00| 0.000000e+00 -9.226626e-01| 0:0:00| chol  1  1
 5|1.000|1.000|9.8e-08|6.2e-03|2.4e-01| 0.000000e+00 -2.389663e-01| 0:0:00| chol  2  2
 6|1.000|0.989|5.4e-07|6.8e-05|2.6e-03| 0.000000e+00 -2.605616e-03| 0:0:00| chol  2  2
 7|1.000|0.989|1.5e-07|8.9e-07|2.9e-05| 0.000000e+00 -2.881288e-05| 0:0:00| chol  2  2
 8|1.000|0.989|6.0e-08|4.0e-08|3.3e-07| 0.000000e+00 -3.172048e-07| 0:0:00| chol  2  2
 9|1.000|0.999|5.5e-10|1.2e-09|4.3e-09| 0.000000e+00 -3.892726e-09| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.49e-08
-------------------------------------------------------------------
 number of iterations   =  9
 primal objective value =  0.00000000e+00
 dual    objective value = -3.89272650e-09
 gap := trace(XZ)       = 4.29e-09
 relative gap           = 4.29e-09
 actual relative gap    = 3.89e-09
```

```
rel. primal infeas (scaled problem)   = 5.53e-10
rel. dual      "         "         "   = 1.17e-09
rel. primal infeas (unscaled problem) = 0.00e+00
rel. dual      "         "         "   = 0.00e+00
norm(X), norm(y), norm(Z) = 6.9e-01, 2.9e-06, 7.3e-07
norm(A), norm(b), norm(C) = 1.8e+01, 7.2e+00, 1.0e+00
Total CPU time (secs)  = 0.32
CPU time per iteration = 0.04
termination code       = 0
DIMACS: 7.8e-10  0.0e+00  1.2e-09  0.0e+00  3.9e-09  4.3e-09
-----------------------------------------------------------------

------------------------------------------------------------
Status: Solved
Optimal value (cvx_optval): +0
```

```matlab
% Now compare achieved w:
w = exp(log(W)*Theta)'
```

```
w = 1×10
    2.6352    3.2806    2.9671    3.2670    2.3168    3.6693    2.9277    3.6898 ···
```

```matlab
% With Given D,P,A spec --> we get the result so it is feasible;
```