# ps6_matlab

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## 1 Problem Set 6

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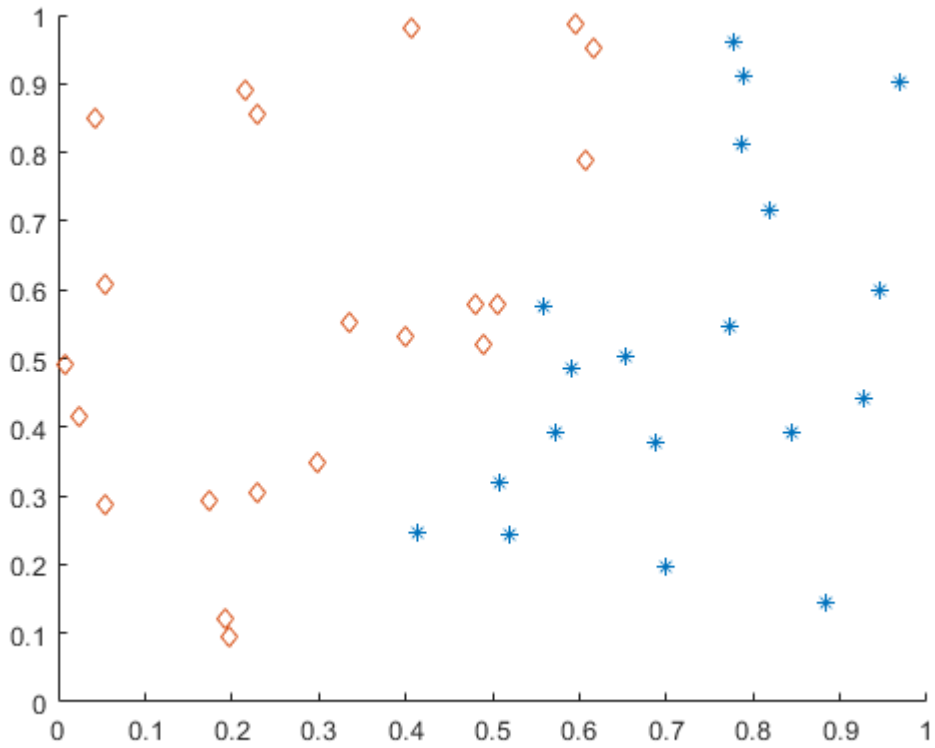
**Note:**

- This was created in a jupyter notebook with a Matlab Kernel extension added to use matlab.

### 1.0.1 Problem 3

**Input Data:**

```
In [10]: rand('seed', 314);
         x = rand(40, 1); y = rand(40, 1);
         class = [ 2*x < y+0.5 ] + 1 ;
         A1 = [x(find(class==1)) , y(find(class==1))];
         A2 = [x(find(class==2)) , y(find(class==2))];
         figure(1); hold on;
         plot(A1(:, 1), A1(: ,2), '*', 'MarkerSize', 6);
         plot(A2(:, 1), A2(:,2), 'd', 'MarkerSize', 6);
```

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**Call to CVX:**

```
In [11]: cvx_begin
             variables a(2) b(1)
             A1*a - b >= 1;
             A2*a - b <= -1;
         cvx_end
```

```
Calling SDPT3 4.0: 40 variables, 3 equality constraints
   For improved efficiency, SDPT3 is solving the dual problem.
------------------------------------------------------------

 num. of constraints =  3
 dim. of linear var  = 40
*****************************************************************
   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|8.2e+01|9.5e+00|4.0e+03|-4.000000e+02  0.000000e+00| 0:0:00| chol  1  1
 1|0.664|0.958|2.7e+01|4.8e-01|1.3e+03|-2.302054e+02  0.000000e+00| 0:0:00| chol  1  1
 2|0.947|1.000|1.5e+00|8.6e-03|5.3e+01|-2.867473e+01  0.000000e+00| 0:0:00| chol  1  1
 3|0.988|1.000|1.7e-02|8.6e-04|6.4e-01|-3.431845e-01  0.000000e+00| 0:0:00| chol  1  1
 4|0.989|1.000|1.9e-04|3.6e-03|7.1e-03|-3.794117e-03  0.000000e+00| 0:0:00| chol  1  1
 5|0.989|1.000|2.2e-06|4.7e-05|8.1e-05|-4.272904e-05  0.000000e+00| 0:0:00| chol  1  1
 6|0.989|1.000|2.4e-08|4.3e-07|8.9e-07|-4.698507e-07  0.000000e+00| 0:0:00| chol  1  1
 7|0.972|1.000|6.7e-10|4.8e-09|2.9e-08|-9.053445e-09  0.000000e+00| 0:0:00| chol  1  1
 8|0.970|1.000|2.0e-11|1.3e-10|9.5e-10|-2.134723e-10  0.000000e+00| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.49e-08
-------------------------------------------------------------------
 number of iterations   =  8
 primal objective value = -2.13472264e-10
 dual   objective value =  0.00000000e+00
 gap := trace(XZ)       = 9.51e-10
 relative gap           = 9.51e-10
 actual relative gap    = -2.13e-10
 rel. primal infeas (scaled problem)   = 2.03e-11
 rel. dual     "        "       "      = 1.34e-10
 rel. primal infeas (unscaled problem) = 0.00e+00
 rel. dual     "        "       "      = 0.00e+00
 norm(X), norm(y), norm(Z) = 4.9e-11, 5.8e+01, 8.7e+01
 norm(A), norm(b), norm(C) = 9.2e+00, 1.0e+00, 7.3e+00
 Total CPU time (secs)  = 0.11
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS: 2.0e-11  0.0e+00  4.9e-10  0.0e+00  -2.1e-10  9.5e-10
-------------------------------------------------------------------

------------------------------------------------------------
Status: Solved
Optimal value (cvx_optval): +2.13472e-10
```

In [18]: a

```
a =

   51.1449
  -23.5476
```

```
In [13]: b
```

```
b =

   13.9878
```

```
In [20]: x = linspace(0,1);
         y = (b - a(1)*x)/a(2);
```

```
In [21]: figure(1); hold on ;
         plot(A1(:, 1),A1(:,2), '*', 'MarkerSize', 6 );
         plot(A2(:, 1),A2(:,2), 'd', 'MarkerSize', 6 );
         plot(x,y);
```