Table of Contents

..... 1
fetching data 1
feasible start point for optimization 1
plotting training data for 2d case 2
solving optimization problem 2
plotting separating hyperplane 4


```
clear all; clc;
global t;
t = 0.2; % log barrier function scaling parameter
```

fetching data

```
[xt, yt] = getData();
siz = size(xt);
numData = siz(1);
dimData = siz(2);
```

feasible start point for optimization

```
x0 = get_start_point();
disp("---------Feasible start point optimization result (w; b;
 s_min)-----------");
disp(x0);
```

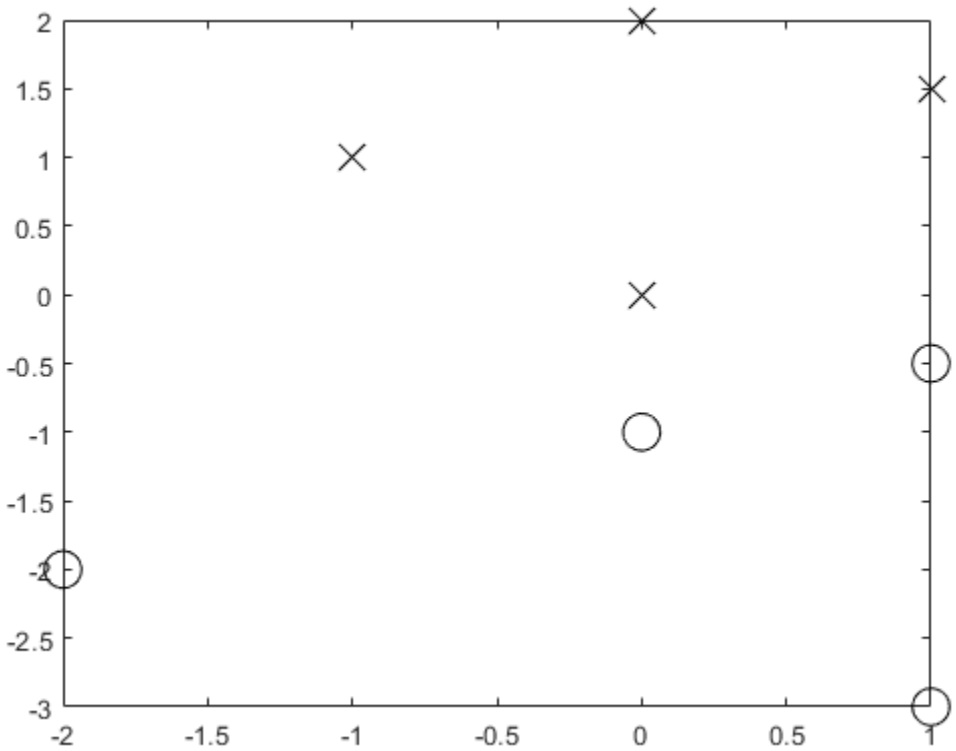
```
x0=x0(1:dimData+1);
% x0=[-1.3574;5.1205;1.8035];
% x0=[-1.0024;5.1205;1.8035];
disp("---------Feasible start point (w; b)-----------");
disp(x0);
```

```
Local minimum found that satisfies the constraints.

Optimization completed because the objective function is non-
decreasing in
feasible directions, to within the default value of the optimality
 tolerance,
and constraints are satisfied to within the default value of the
 constraint tolerance.



---------Feasible start point optimization result (w; b;
 s_min)-----------
  -11.7019
   58.7848
    7.0786
```

```
   -2.0000

---------Feasible start point (w; b)-----------
  -11.7019
   58.7848
    7.0786
```

plotting training data for 2d case

```
fig = figure;
hold off;
msize=14;
for i = 1:numData
    if(yt(i)==1)
        plot(xt(i,1),xt(i,2),'xblack','MarkerSize',msize);
    else
        plot(xt(i,1),xt(i,2),'oblack','MarkerSize',msize);
    end
    hold on;
end
```



solving optimization problem

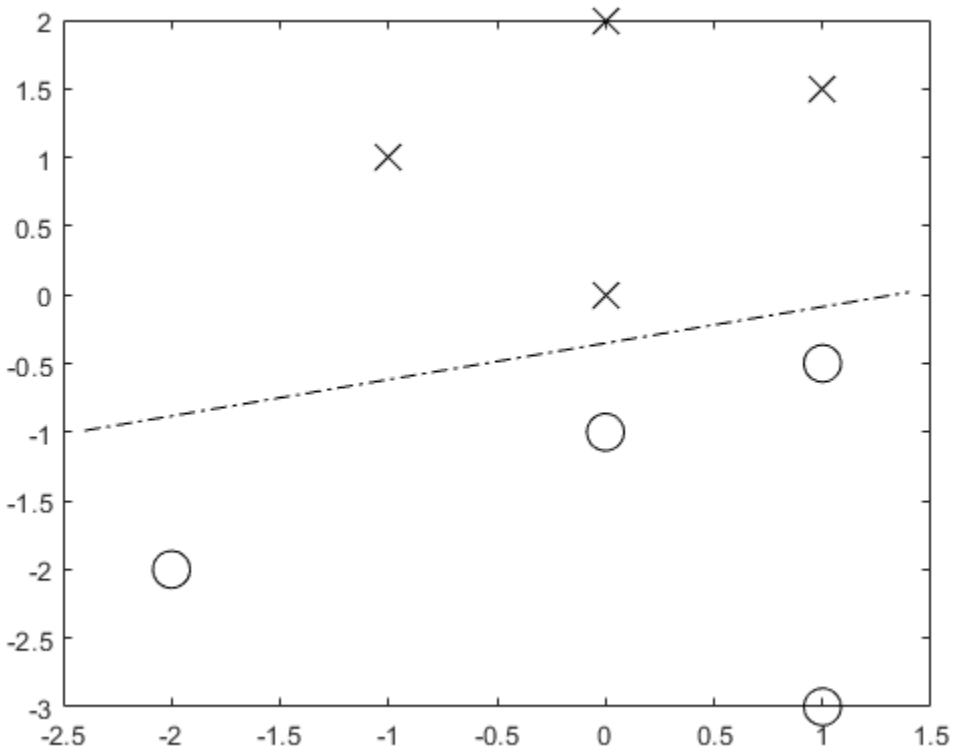
```
index=1;
```

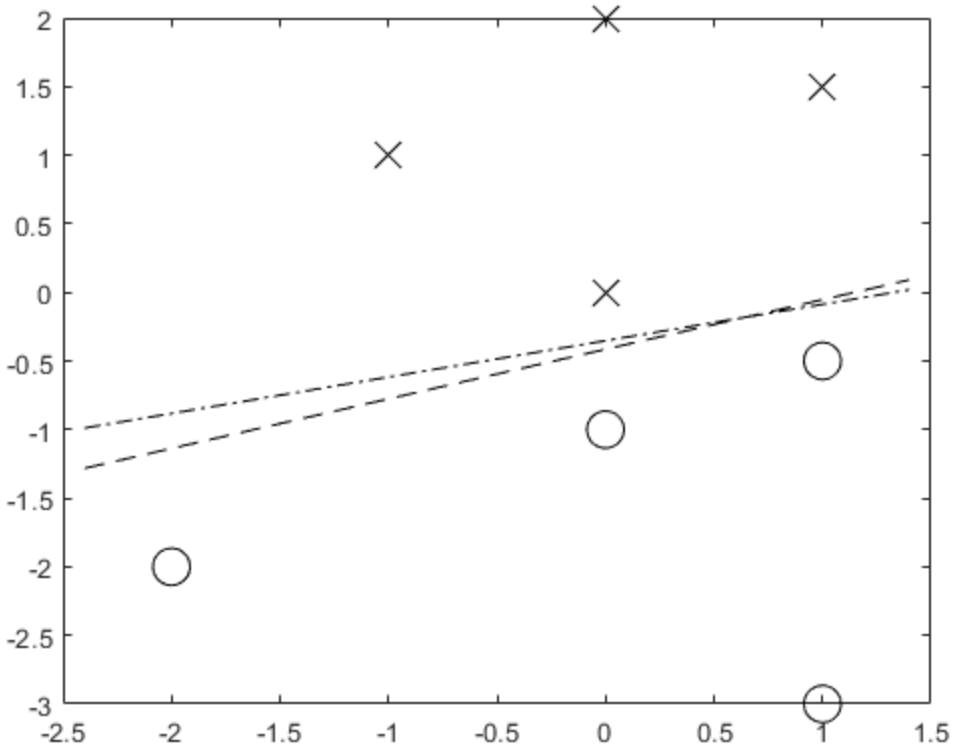
```
markerType=['-black' '-black' '-black'];
for t=[0.2,1,10]

    options = optimoptions(@fminunc,'Algorithm','quasi-newton');
    [x,fval,exitflag,output] = fminunc(@objective,x0,options);
    x0=x;
    x
```

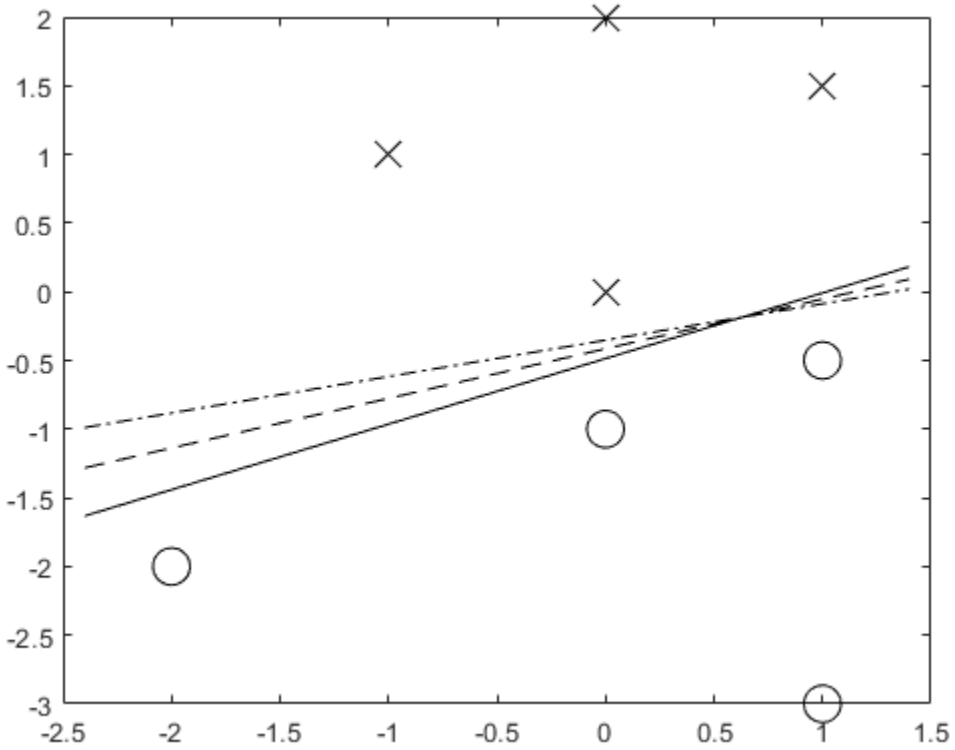
```
Local minimum found.

Optimization completed because the size of the gradient is less than
the default value of the optimality tolerance.



x =

   -1.3574
    5.1206
    1.8035



Local minimum found.

Optimization completed because the size of the gradient is less than
the default value of the optimality tolerance.



x =

   -1.0509
    2.9077
    1.2054



Local minimum found.

Optimization completed because the size of the gradient is less than
the default value of the optimality tolerance.



x =

   -1.0024
    2.0994
    1.0204
```

plotting separating hyperplane

```
    margin = 0.4;
    xMin = min(xt(:,1))-margin;
    xMax = max(xt(:,1))+margin;
    yMin = -(xMin*x(1)+x(3))/x(2);
    yMax = -(xMax*x(1)+x(3))/x(2);
    if(index==1)
        marker = '-.black';
    elseif(index==2)
        marker = '--black';
    else
        marker = '-black';
    end
    p(index)=plot([xMin, xMax],[yMin, yMax],marker,'DisplayName', 't =
'+string(t));
    index=index+1;
```




2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5


2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5

```
end
legend(p(:),'Location','northwest');
set(gca,'FontSize',14)
set(findall(gca, 'Type', 'Line'),'LineWidth',1);
xlim([xMin, xMax]);
ylim([min(xt(:,2))-margin, max(xt(:,2))+margin]);

print(fig, 'images/
separating_hyperplane_linearly_separable_data_log_barrier_method_multiple_t','-
dpng');
```

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