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```
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);
```

```
x0copy=x0;
x0=x0(1:dimData+1);
% x0=[-1.3574;5.1205;1.8035];
% x0=[-1.0024;5.1205;1.8035];
x0 = [x0; (max(x0copy(dimData+2)*-1+1,1))*ones(numData,1)];
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.*

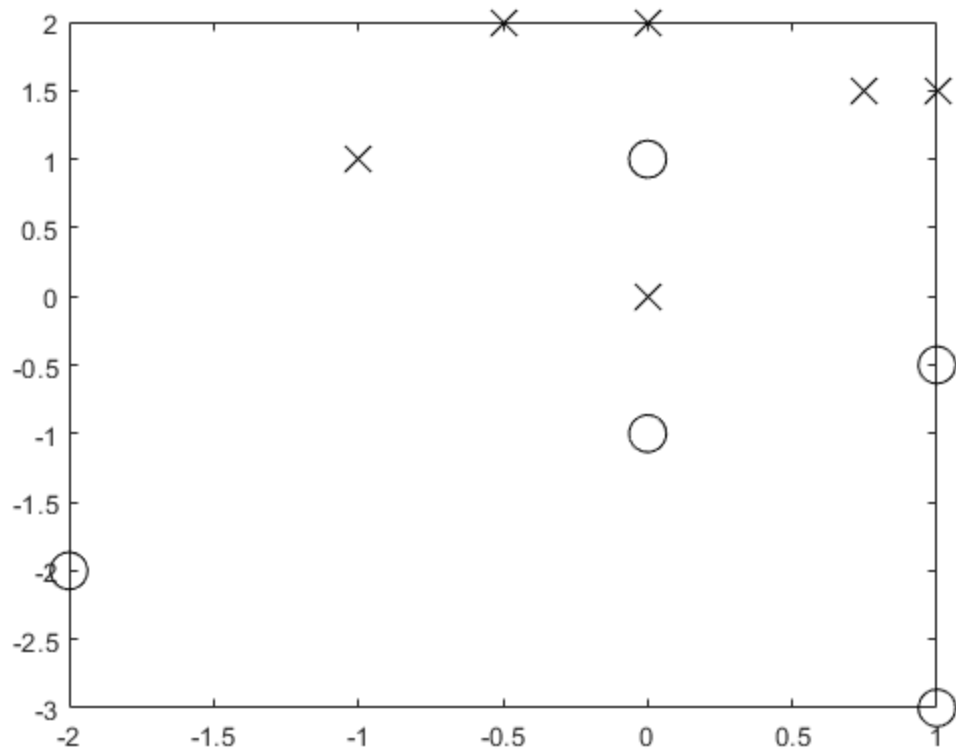
---

```
-----Feasible start point optimization result (w; b;
s_min)-----
-0.2938
 1.5167
-0.7465
-2.0000

-----Feasible start point (w; b)-----
-0.2938
 1.5167
-0.7465
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
 3.0000
```

## 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
end
hold on;
end
```



## solving optimization problem

```
index=1;
markerType=['-black' '-black' '-black'];
for t=[0.2,1,10,100]

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

*Local minimum found.*

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

*Local minimum found.*

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

---

*Local minimum found.*

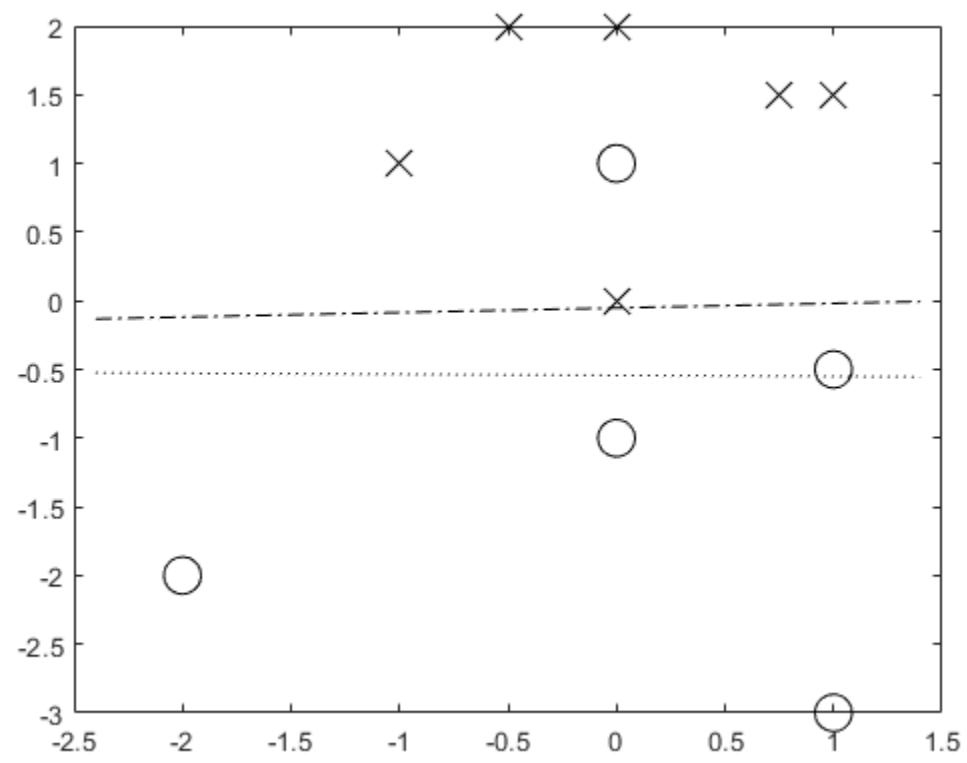
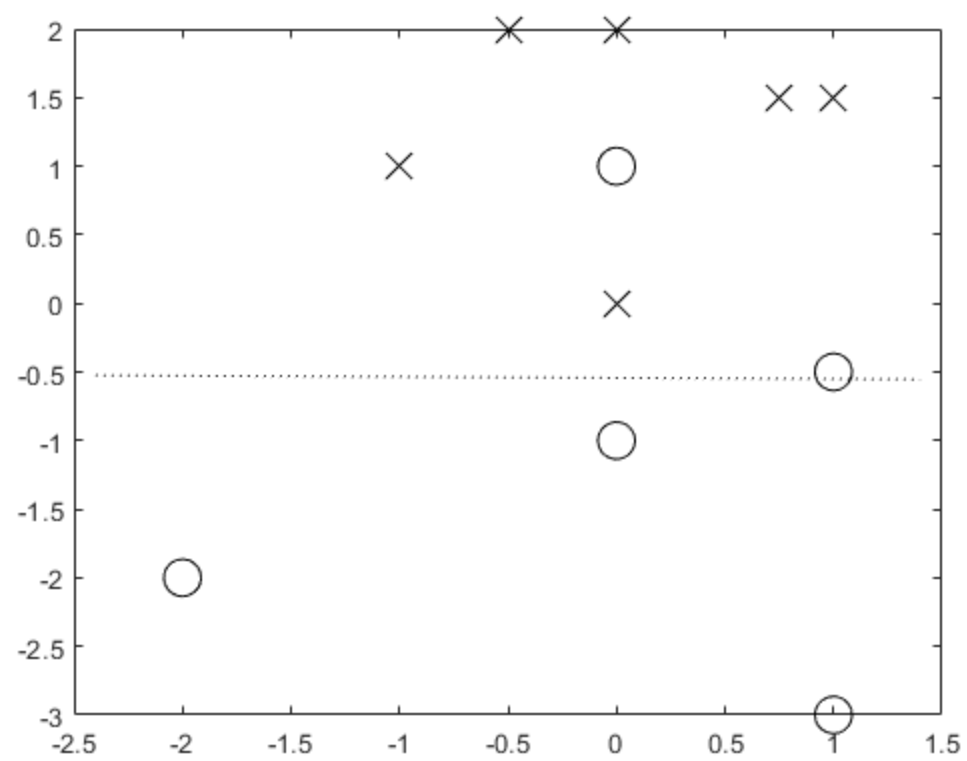
*Optimization completed because the size of the gradient is less than the default value of the optimality tolerance.*

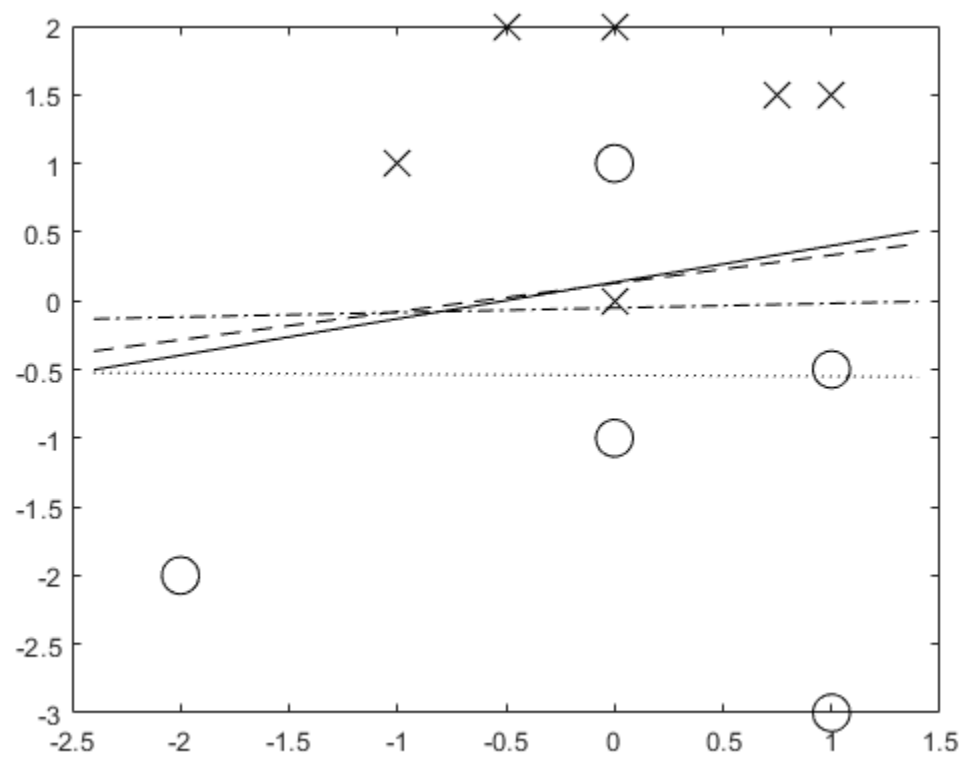
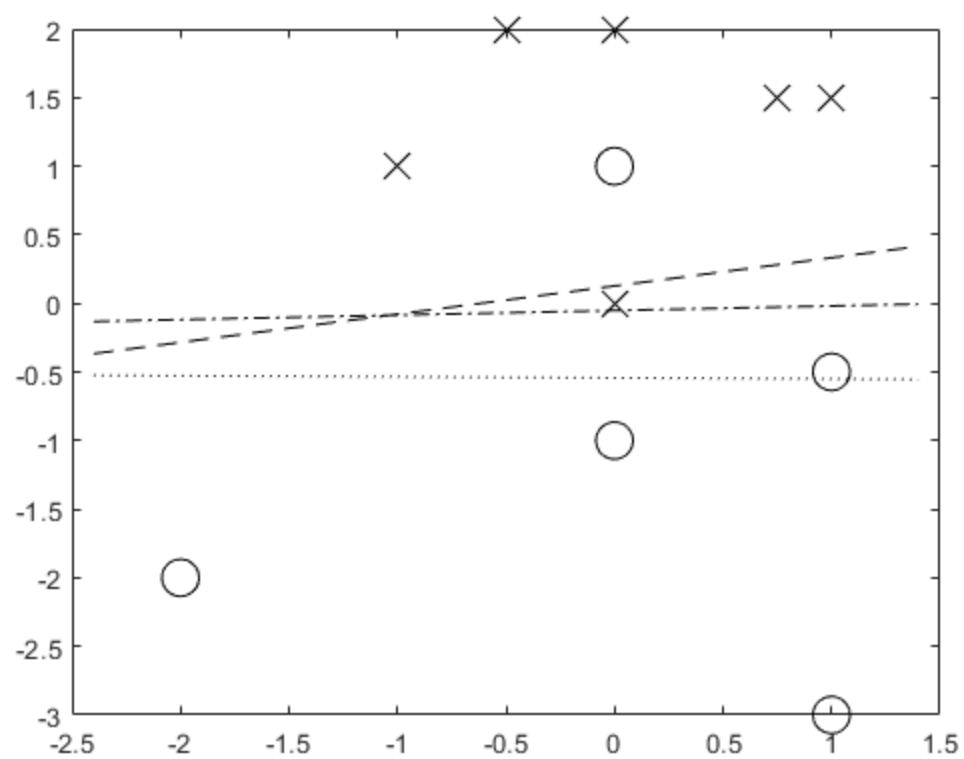
*Local minimum possible.*

*fminunc stopped because the size of the current step is less than the default value of the step size tolerance.*

## 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';
elseif(index==3)
    marker = '--black';
else
    marker = '-black';
end
% if(index == 4)
%     p(index)=plot([xMin, xMax],[yMin,
% yMax],marker,'DisplayName', 't = '+string(t));
% end
index=index+1;
```





---

```
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/
linearly_inseparable_dataset_t_100_central_path','-dpng');
print(fig, 'images/
separating_hyperplane_linearly_inseparable_data_log_barrier_method_multiple_t','-
dpng');
```

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