SVM and Perceptron HW:

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q3 - svm_test and svm_train:

```
function [accuaracy] = svm_test( theta, X_test, y_test)

            predicted_y = theta' * X_test;
            comparison_y = sign(predicted_y) - y_test;
            accuaracy = sum(comparison_y ~= 0) / length(y_test);

end

function [theta] = svm_train( X, y )

d = size(X,2);
H = eye(d);
f = zeros(d,1);
Dy = diag(y);
A = Dy*X;
b = ones(size(y));

theta = quadprog(H, f, -A, -b);

end
```

q4-5 - Visualization of HyperPlane and Margin:

For both Perceptron and SVM.

```
clc; clear; close all;
addpath(genpath('./materials'))

load data1.mat
[normX, sDev, means] = data_normalization(X);

[perc_theta, k] = my_perceptron_train(normX, y);
svm_theta = svm_train(normX, y);

figure('Name', 'Data1')
set(gcf, 'Position', [300, 300, 1300, 650]);
subplot(1,2,1)
title('Data1'); hold on;
```

```
plot_data_svm_percep(normX, svm_theta, perc_theta);
subplot(1,2,2)
plot_data_svm_percep(normX, svm_theta, perc_theta);
legend('off');
xlim([-1 1]); ylim([-1 1]);

load data2.mat
[normX, sDev, means] = data_normalization(X);

[perc_theta, k] = my_perceptron_train(normX, y);
svm_theta = svm_train(normX, y);

figure('Name', 'Data2')
set(gcf, 'Position', [300, 300, 1300, 650]);
subplot(1,2,1)
title('Data2'); hold on;
plot_data_svm_percep(normX, svm_theta, perc_theta);
subplot(1,2,2)
plot_data_svm_percep(normX, svm_theta, perc_theta);
legend('off');
xlim([-0.5 0.5]); ylim([-0.5 0.5]);
```

```
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.
```

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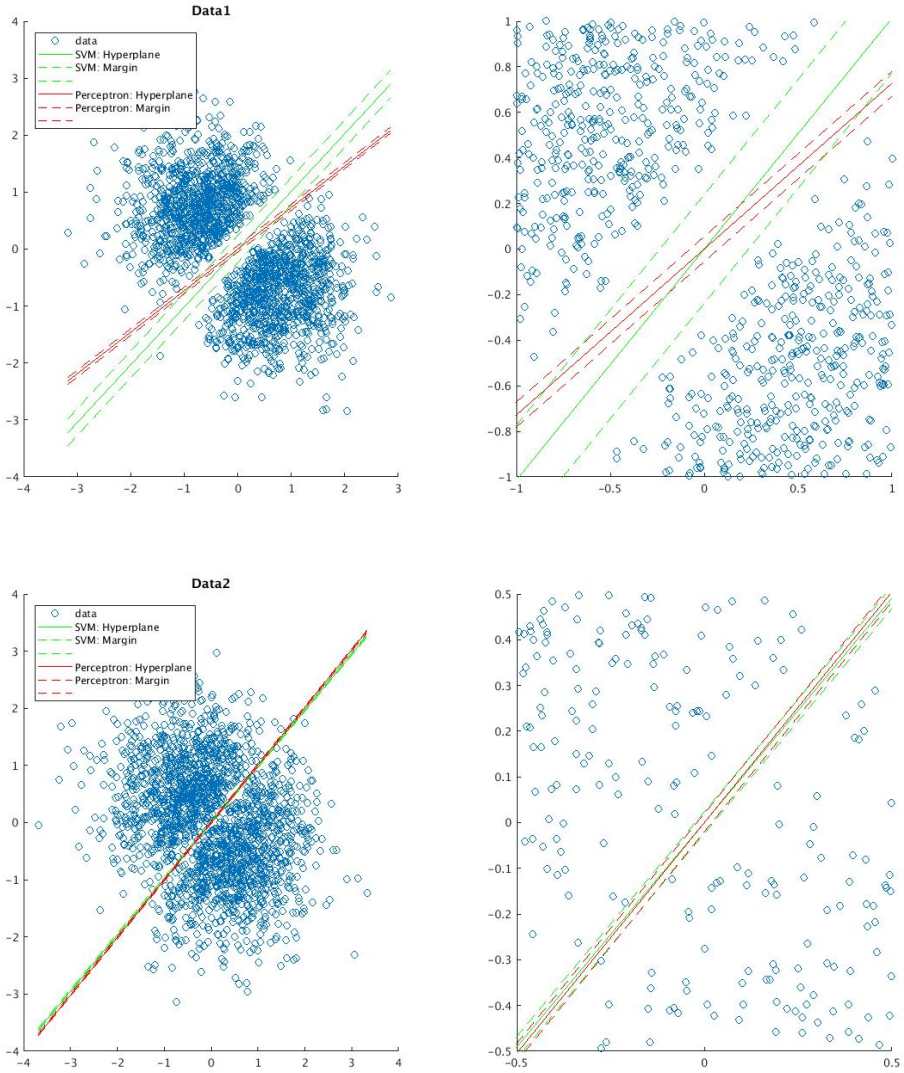
```



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