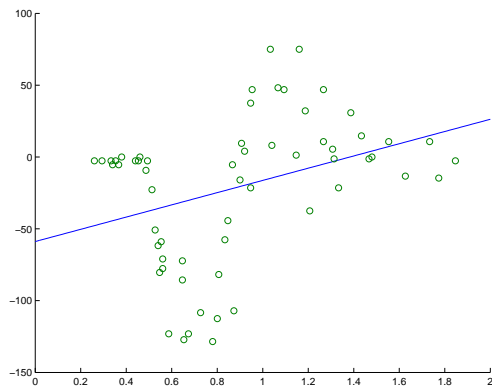


Kyle Benson
CS 273A - Machine Learning: Fall 2013
Homework 2

Problem 1: Linear Regression

(a) Done

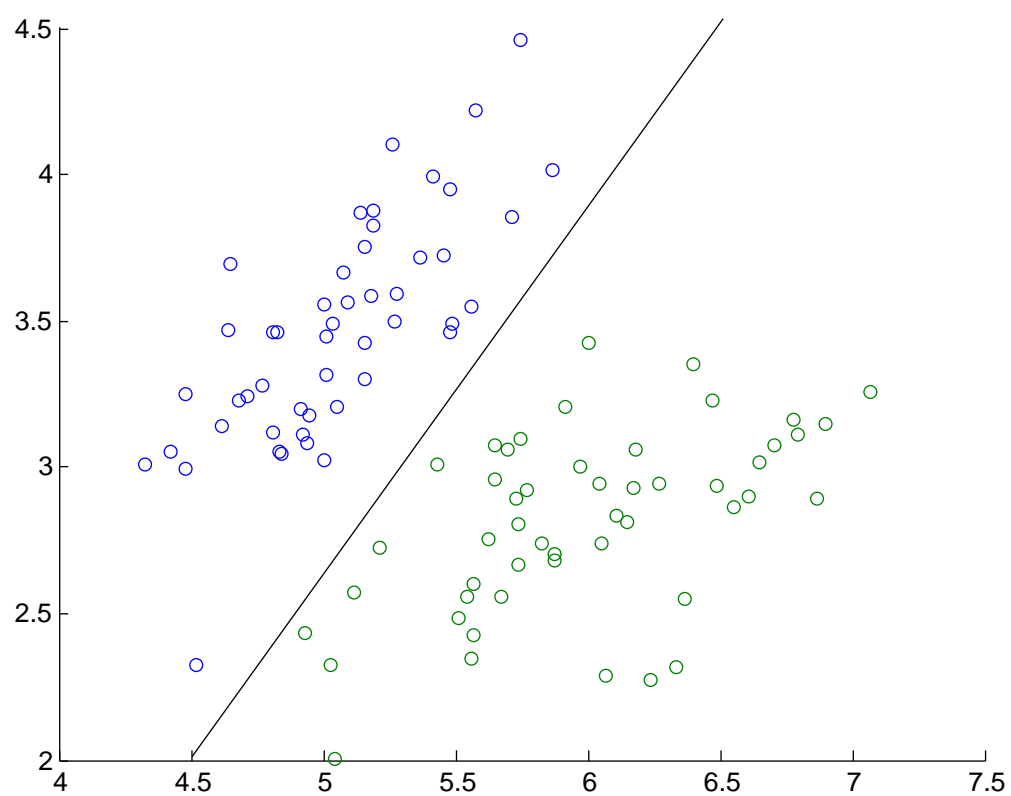


(b)
Training MSE: 2235.8
Test MSE: 2414.7

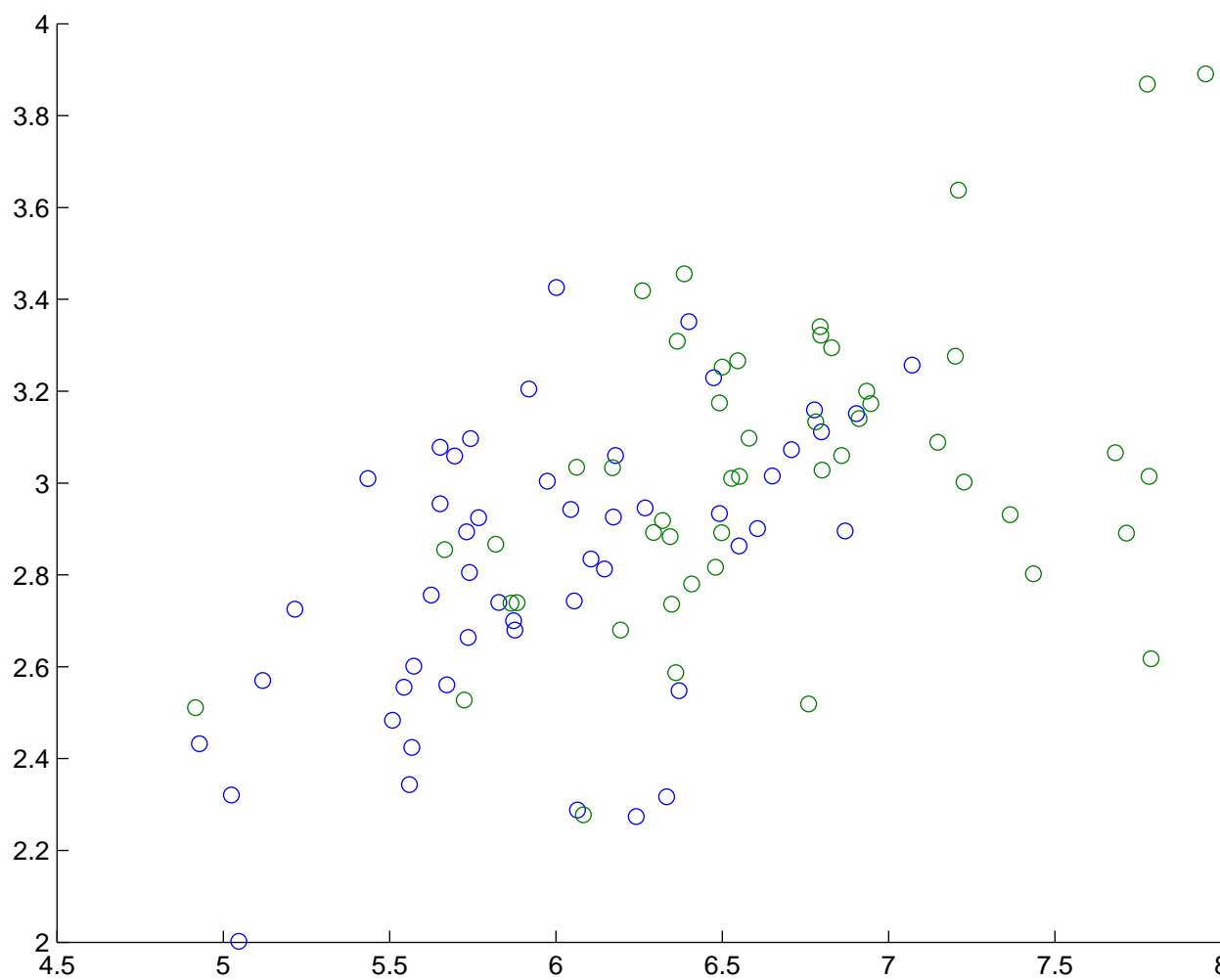
(c)

Problem 2: Perceptron Classifiers

(a) classes 0 vs. 1



classes 1 vs. 2



```

(b) iris=load('~/repos/cs273a/hw3/src/data/iris.txt');
X = iris(:,1:2); Y=iris(:,end);
XA = X(Y<2,:); YA=Y(Y<2); % 0 vs 1
XB = X(Y>0,:); YB=Y(Y>0); % 1 vs 2

%%%% PART A %%%%

%hold on;
%scatter(X(Y==0,1), X(Y==0,2));
%scatter(X(Y==1,1), X(Y==1,2));
%hold off;
%%saveas(gcf, '../figs/prob2a_0v1', 'pdf');
%close
%
%hold on;
%scatter(X(Y==1,1), X(Y==1,2));
%scatter(X(Y==2,1), X(Y==2,2));
%hold off;
%%saveas(gcf, '../figs/prob2a_1v2', 'pdf');
%close

%%%% PART C %%%%
step = 0.01;
nIter = 1e3;

%pc = perceptClassify(XB,YB, step,nIter);

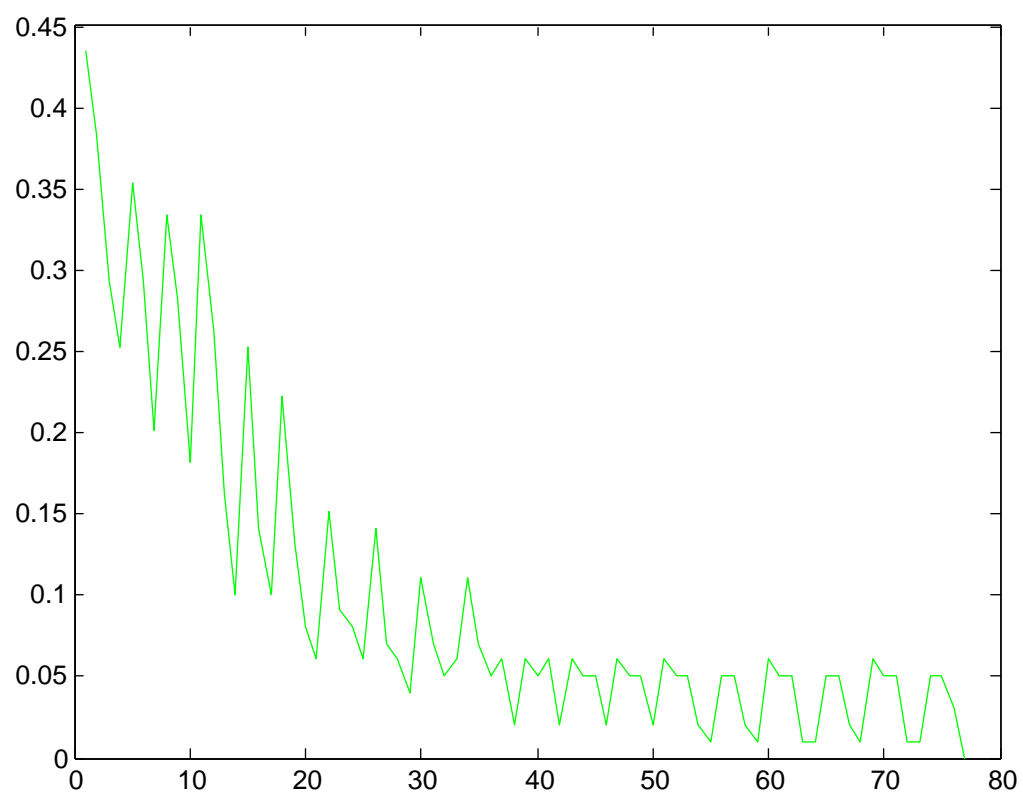
pc = perceptClassify(XA,YA, step, nIter);

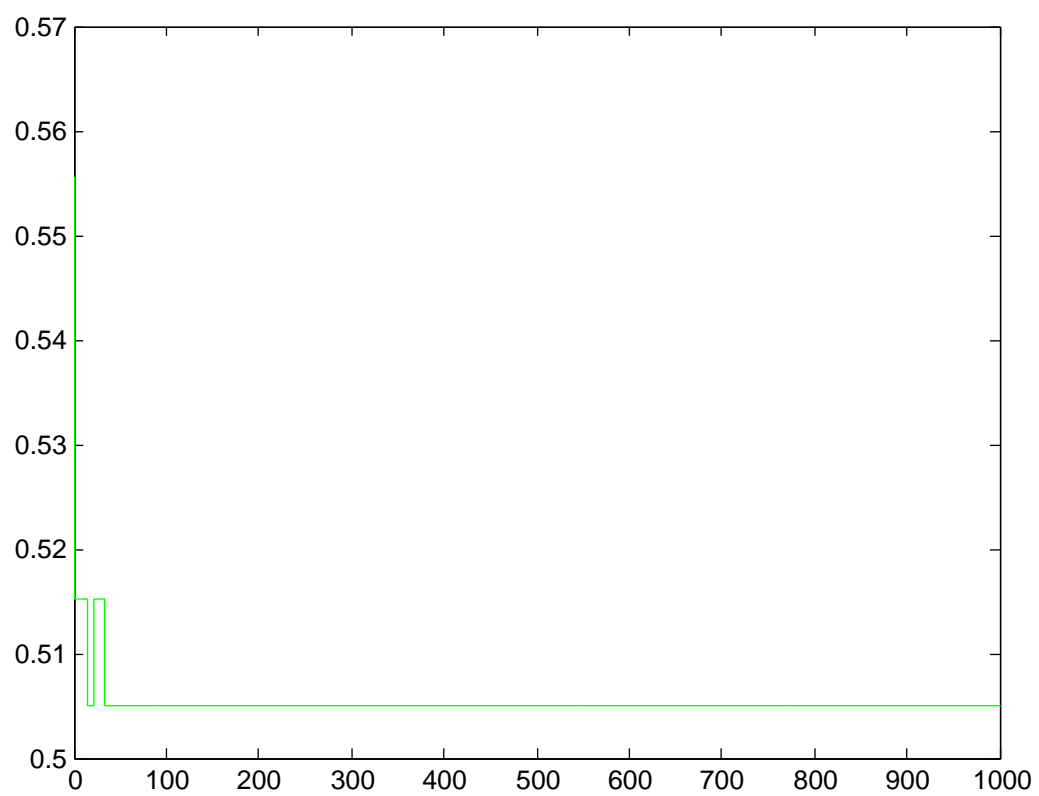
%%%% PART D %%%%
% xs = XA;
% %xs = XB;
% ys = YA.*2-1;
% %ys = (YB-1).*2-1;

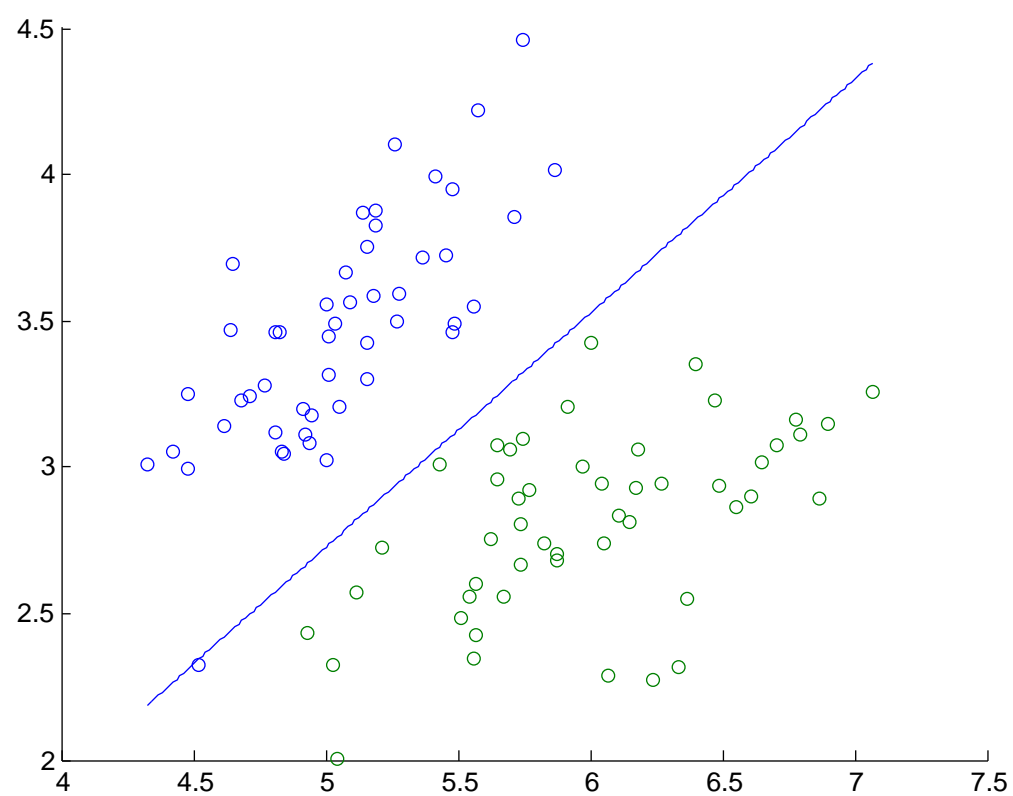
% lc = linearRegress(xs, ys);

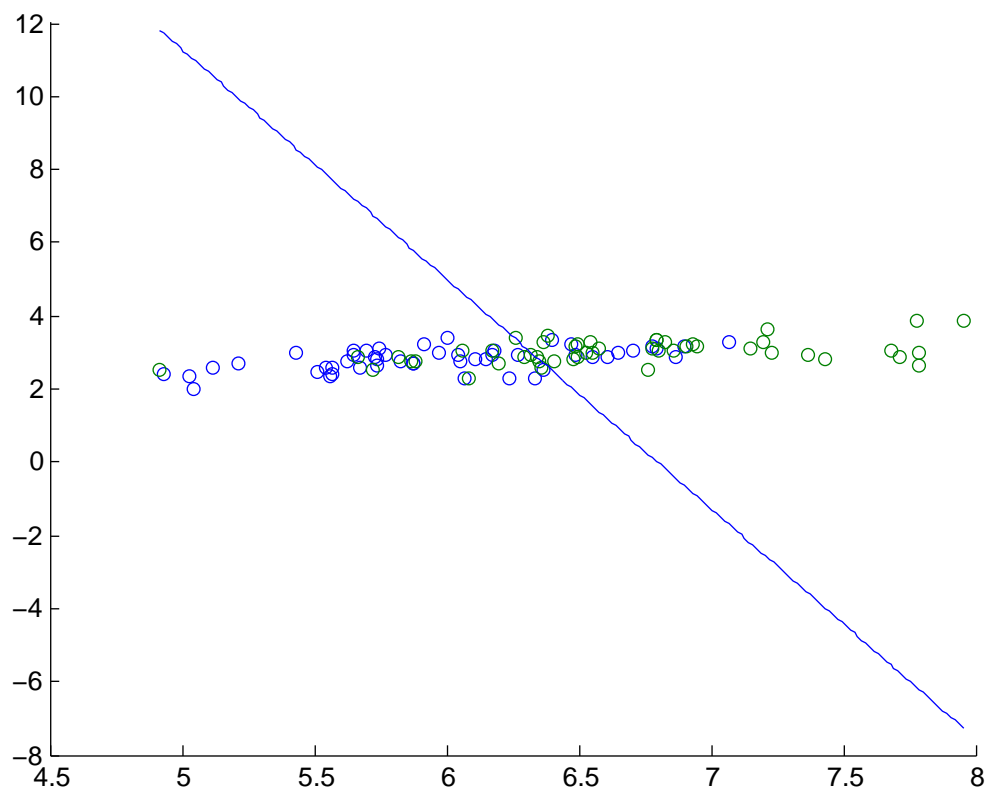
% pc = perceptClassify();
% weights = getWeights(lc);
% pc = setWeights(pc, weights);
% plot2DLinear(pc, xs, ys);

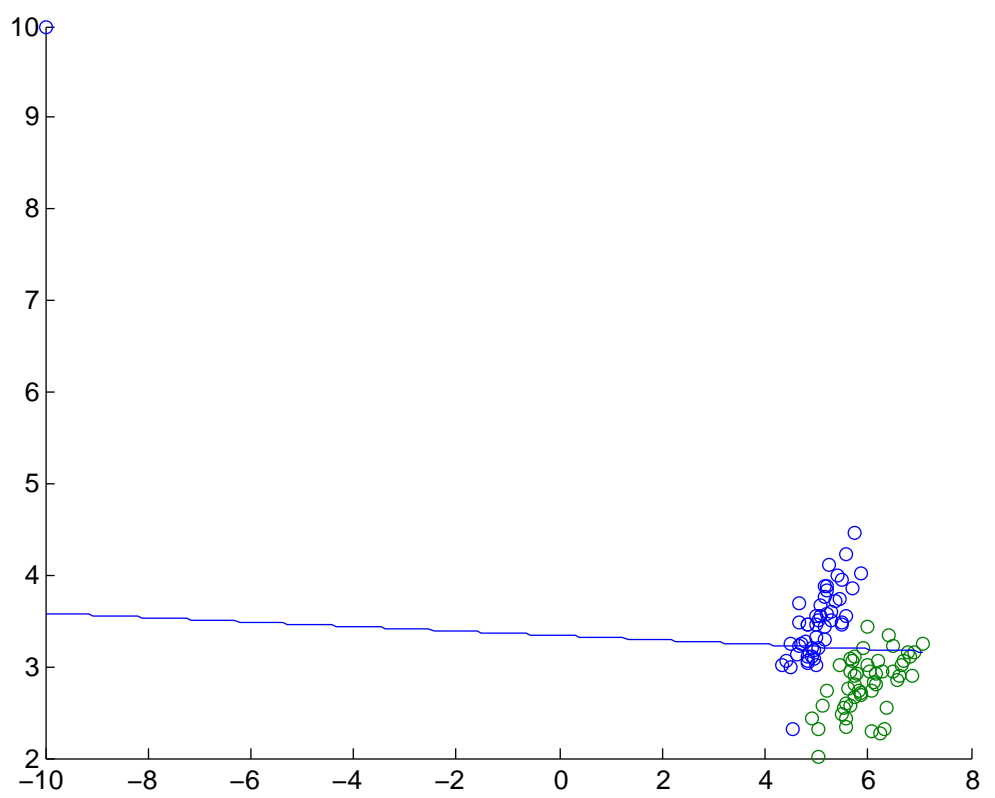
```











Problem 3: Logistic Regression

(a) Done

(b) See (c)

$$\begin{aligned} \text{(c)} \quad \frac{dJ(\theta)}{d\theta} &= \frac{d}{d\theta} \left(\frac{1}{m} \sum_j -y^{(j)} \log \sigma(\theta x^{(j)T}) - (1 - y^{(j)}) \log(1 - \sigma(\theta x^{(j)T})) \right) \\ &= \frac{1}{m} \sum_j -\frac{d}{d\theta} y^{(j)} \log \sigma(\theta x^{(j)T}) - \frac{d}{d\theta} (1 - y^{(j)}) \log(1 - \sigma(\theta x^{(j)T})) \\ &= \frac{1}{m} \sum_j -\frac{\frac{d}{d\theta} \sigma(\theta x^{(j)T}) y^{(j)}}{\sigma(\theta x^{(j)T})} - y^{(j)} \frac{\frac{d}{d\theta} \sigma(\theta x^{(j)T}) y^{(j)}}{1 - \sigma(\theta x^{(j)T})} \end{aligned}$$