

## CS5402 Assignment 3 (Regression for Classification)

Due Oct28 2016 11:00AM

One data set (X,Y) is provided in 'RegressionData.mat', where matrix X (40\*3) contains 40 training samples of dimension 3 and Y (1\*40) is a row vector containing binary labels.

1. Implement your Linear Regression algorithm on this dataset and obtain your  $w_{LinearRegression}$  (3\*1 column vector). Apply your  $w_{LinearRegression}$  to the training dataset and compute your error rate;
2. Implement your Logistic Regression algorithm on this dataset and obtain your  $w_{LogisticRegression}$  (3\*1 column vector). Apply your  $w_{LogisticRegression}$  to the training dataset and compute your error rate;
3. Implement your Logistic Regression algorithm with Stochastic Gradient Descent (SGD) on this dataset and obtain your  $w_{LogisticRegressionSGD}$  (3\*1 column vector). Apply your  $w_{LogisticRegressionSGD}$  to the training dataset and compute your error rate;

Something to think about:

- (a) Change the step size in your logistic regression and logistic regression with SGD, what will you observe?
- (b) Use  $w_{LinearRegression}$  as the initialization in your logistic regression and logistic regression with SGD, what will you observe?

You can compare your above algorithms with your PLA algorithm.  
In your codes, add enough comments so our GTA can understand it.  
Upload your code and report to Canvas.

If you want to visualize your results, you can use the following Matlab scripts:

```
%get the minimum and maximum of the data
maxX1 = max(X(2,:)); minX1 = min(X(2,:));
maxX2 = max(X(3,:)); minX2 = min(X(3,:));
posIdx = find(Y==1);
negIdx = find(Y==-1);
figure(1); clf; axis([minX1 maxX1 minX2 maxX2]); hold on;
if w(2)~=0
    minVal = - (w(3) * minX2 + w(1)) / w(2);
    maxVal = - (w(3) * maxX2 + w(1)) / w(2);
    plot([minVal, maxVal],[minX2, maxX2],'Linewidth',2,'Color','r');
elseif w(3)~=0
    minVal = - (w(2) * minX1 + w(1)) / w(3);
    maxVal = - (w(2) * maxX1 + w(1)) / w(3);
    plot([minX1, maxX1],[minVal, maxVal],'Linewidth',2,'Color','r');
end
legend('PLA');
plot(X(2,posIdx), X(3,posIdx), 'o', 'Linewidth', 2, 'Markersize', 10, 'Color', 'm');
plot(X(2,negIdx), X(3,negIdx), 'x', 'Linewidth', 2, 'Markersize', 10, 'Color', 'c');
drawnow;
```