HW #3

DUE OCTOBER 31, 2022, 11:59 PM

(1) Problem 3.1 LFD
(2) Problem 3.2 LFD
(3) Problem 3.17 LFD
(4) Using the image data uploaded on ELMS, perform classification using the following algorithms for non-separable data:
    (a) Linear Regression for classification followed by pocket for improvement.
    (b) Logistic regression for classification using gradient descent.

    Use your chosen algorithm to find the best separator you can using the training data only (you can create your own features). The output is +1 if the example is a 1 and -1 for a 5.
    (a) Give separate plots of the training and test data, together with the separators.
    (b) Compute E_{in} on your training data and E_{test}, the test error on the test data.
    (c) Obtain a bound on the true out-of-sample error. You should get two bounds, one based on E_{in} and one based on E_{test}. Use a tolerance $\delta = 0.05$. Which is the better bound?
    (d) Now repeat using a 3rd order polynomial transform.
    (e) As your final deliverable to a customer, would you use the linear model with or without the 3rd order polynomial transform? Explain.
(5) Exercise 4.3 on page 125.
(6) Please demonstrate the complete derivation of the regularization of a linear regression problem as discussed in class.