ENGR 231 – Linear Engineering Systems
Spring 2016-17

Lab 7: In Class Assignment

Create an .m file with the name **lastname_initials_lab7.m** in the cell mode. Upload the published document as a pdf document**.**

In this assignment, we will be using least squares polynomial fits to measured data as described in the in background. ***Note that other than the form of the design matrix, all formulae for implementation remain the same!*** Perform the following tasks:

1. Create a function called ***quadfit*** based on the information in the background file. The function has the following properties:
    a. **Inputs** – X data points (Nx1 column vector) and Y data points (Nx1 column vector).
    b. **Outputs** – Beta values (3x1 column vector) and the design matrix D.
    c. **Objective** – Use the X data points to form the ***design matrix D*** for the ***second-degree polynomial estimation***. Use this and the Y column vector to calculate the three beta parameter values. ***HINT: You may wish to use the information in the appendix at the end of the background write-up for squaring values in an array of data.***
2. Download pts_setA.mat and load the data into your script. The format of the data is similar to that in Example 2 in the lab instructions. There is a single array with two rows. The first row are the *x* values, the second row the *y* values.
3. Run the ***quadfit*** function on the data points
4. Using the resulting beta values from (3), find the estimated Y data points, $\boldsymbol{Y_{EST}}$.
5. Plot the estimated second-degree polynomial fit using the points from (4) and the actual data points.
6. Calculate the ***RMS error*** between the actual data points and the estimated data points
7. Also compute the ***RMS*** error obtained with a linear fit. You may use the ***linfit*** function from the prelab. ***Does the quadratic estimate fit the data better than a linear estimate? Or do they both fit similarly? Explain your reasoning.***