EML 3034 – Fall 2023: COMPUTER PROJECT #6

Matlab Project: Linear Least Squares

Grading:

1. [80%] Complete assignment, input results in webcourses project assignment Quiz as instructed in the results in webcourses project assignment Quiz.
2. [20%] and uploaded Matlab code files and output in single file in PDF format.

You must upload your codes and output to receive credit for this part of the assignment. Failure to upload your Matlab code will result in a loss of 50 points for the assignment.

You are provided the set of (x,y) data pairs provided in text files, X_DATA.DAT and Y_DATA.DAT, that are in the zipped file ***xy_data_LS_FA 2023.zip***. Each data file contains the x- and y-data respectively that you are to best fit these data via least-squares polynomial fits. To read in data in Matlab, use the import data command (see Matlab help):

```
x = importdata('X_DATAFA2023.DAT');
y = importdata('Y_DATAFA2023.DAT');
```

Generate a **(1) linear, (2) quadratic, and (3) fourth order polynomial least squares fit** for over the data points and for each fit:

A. **Evaluate the function at x= 1.62** $\pm SE_{xy}$, where SE_{xy} is the standard error.
B. Plot the function for $x \in [0,2]$ using steps of $\Delta x = 0.01$ using the least squares fits. Show the data on the plot as well as the interpolated function.
C. **Report the R^2 value and the standard error,** SE_{xy} **for each of the three fits.**

Recall that the R^2 value and standard error SE_{xy} are defined respectively as:

$$R^2 = \frac{SSD - SSE}{SSD}$$

$$S_{xy} = \sqrt{\frac{SSE}{(N+1)-(M+1)}}$$

Where

$$SSE = \sum_{i=0}^{N} [y_i - (a_o + a_1 x + \ldots a_M x^M)]^2$$

$$So = \sum_{i=0}^{N} [y_i - \bar{y}]^2$$

$$\bar{y} = \frac{1}{N+1} \sum_{i=0}^{N} y_i$$

$N+1 = number\ of\ data\ points$

$M = order\ of\ polynomial$

$\bar{y} = estimated\ mean$

This completes this project. Report your results on the Webcourses Project assignment quiz, and upload your Matlab code, and the PDF of the output of your Matlab code.