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// HW #9

// MATLAB Analysis of Temp data with interpolation and regression.

**1.0 Objective**

* Description of the objective

**2.0 Data Analysis**

* MATLAB script listing
* Output of script
* Plot of Raw Data
* Histogram of Raw Data

**3.0 Linear Interpolation**

* MATLAB script
* Output of script
* Linear interpolation plot (with interpolated point)

**4.0 Regression Analysis**

* MATLAB script listing
* Output of script
* 3 plots, each with future point
* Conclusion

**5.0 C++ vs. MATLAB**

* A comparison between C++ and MATLAB

**6.0 Raw Data with Source**

* Raw Data
* Link to source

**1.0 Objective**

Data analysis of State College, PA temperature (in Fahrenheit) by the hour in August 2, 2016 using MATLAB tool.

**2.0 Data Analysis**

* MATLAB script listing

time = 0:1:24; %time in hours for each temperature value

temp = [66 65 65 65 64 64 64 65 67 70 73 77 80 82 84 85 86 85 84 82 79 77 75 72 69]; %temperature values

fprintf('Minimum temperature')

min(temp)

fprintf('Maximum temperature')

max(temp)

fprintf('Mean temperature')

mean(temp)

fprintf('Median temperature')

median(temp)

fprintf('Standard deviation of temperature')

std(temp)

fprintf('Hours when temperature values above mean')

find(temp>mean(temp))

disp('Time(hours) Temperature(F)') %raw data table

disp([time' temp'])

figure, plot(time,temp'-o') %raw data plot

figure, hist(temp)

* Output of script

Minimum temperature

ans =

64

Maximum temperature

ans =

86

Mean temperature

ans =

73.8000

Median temperature

ans =

73

Standard deviation of temperature

ans =

8.1035

Hours when temperature values above mean

ans =

12 13 14 15 16 17 18 19 20 21 22 23

* Plot of Raw Data

Table

Time(hours) Temperature(F)

0 66

1 65

2 65

3 65

4 64

5 64

6 64

7 65

8 67

9 70

10 73

11 77

12 80

13 82

14 84

15 85

16 86

17 85

18 84

19 82

20 79

21 77

22 75

23 72

24 69

In a Plot

Figure 2.1



* Histogram of Raw Data

Figure 2.2



**3.0 Linear Interpolation**

* MATLAB script

time = 0:1:24; %time in hours for each temperature value

temp = [66 65 65 65 64 64 64 65 67 70 73 77 80 82 84 85 86 85 84 82 79 77 75 72 69]; %temperature values

plot(time, temp, '-o')

newtemp=interp1(time, temp, 12.5, 'linear') %Interpolating new point at 12.5 (12:30) hour

plot(time, temp, '-o', 12.5, newtemp, 'ro') %Adding new point to plot

* Output of script

>> HW9B

newtemp =

81

* Linear interpolation plot (with interpolated point)

Figure 3.1



**4.0 Regression Analysis**

* MATLAB script listing

time = 0:1:24; %time in hours for each temperature value

temp = [66 65 65 65 64 64 64 65 67 70 73 77 80 82 84 85 86 85 84 82 79 77 75 72 69]; %temperature values

%Linear fit

coef = polyfit(time, temp, 1);

newTemp = polyval(coef, time);

tempPredict = polyval(coef, 25)

figure, plot(time, temp, 'o',time, newTemp, 25, tempPredict, '\*')

%Quadratic fit

coef = polyfit(time, temp, 2);

newTemp = polyval(coef, time);

tempPredict = polyval(coef, 25)

figure, plot (time, temp, 'o',time, newTemp, 25, tempPredict, '\*')

%3rd Order fit

coef = polyfit(time, temp, 3);

newTemp = polyval(coef, time);

tempPredict = polyval(coef, 25)

figure, plot (time, temp, 'o',time, newTemp, 25, tempPredict, '\*')

* Output of script

>> HW9C

tempPredict =

83.1500

tempPredict =

73.5696

tempPredict =

58.9553

* 3 plots, each with future point

1st Order

Figure 4.1



2nd Order

Figure 4.2



3rd Order

Figure 4.3



* Conclusion

The 2nd order regression fit seems to have the closest prediction to reality, while the 3rd order regression fit seems to have the best matching of the raw data points.

**5.0 C++ vs. MATLAB**

* A comparison between C++ and MATLAB

*MATLAB* is a numerical computing environment that has the ability to be to do various tasks that aids specialists in many fields, it allows matrices manipulation, plotting of functions, performing simulations, and even taking advantage of object oriented programming features. MATLAB is not a programming language, it execute commands without the need for compiling the script. MATLAB is a form of interpreted language.

*C++* is a general purpose, object oriented, programming language that first appeared in the 80’s. C++ is a compiled language, that is, it requires the compilation of the code first before executing any task. Unlike MATLAB, it cannot plot functions or data.

**6.0 Raw Data with Source**

* Raw Data

12am 66

1am 65

2am 65

3am 65

4am 64

5am 64

5am 64

7am 65

8am 67

9am 70

10am 73

11am 77

12pm 80

1pm 82

2pm 84

3pm 85

4pm 86

5pm 85

6pm 84

7pm 82

8pm 79

9pm 77

10pm 75

11pm 72

12am 69

* Link to source

http://www.accuweather.com/en/us/state-college-pa/16801/hourly-weather-forecast/335315?hour=16