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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% Using the two given data sets, find the linear model of each data
% collection from the years 1993 to 2013. Then plot the given data
 with
% thel best fit equation based of the linear model for both the tide
 gauge
% and the satellite model.
%
% Assigment Information
%   Assignment:     PS 04, Problem 03
%   Author:         Ranjan Behl, rbehl@purdue.edu
%   Team ID:        008-14
%   Contributor:    Name, login@purdue [repeat for each]
%   My contributor(s) helped me:
%     [ ] understand the assignment expectations without
%         telling me how they will approach it.
%     [ ] understand different ways to think about a solution
%         without helping me plan my solution.
%     [ ] think through the meaning of a specific error or
%         bug present in my code without looking at my code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

```
%Part A
Data_CSIRO = csvread('Data_CSIRO_gmsl_mo_2013.csv',1,0); % loading the
 CSIRO data
Data_altimeter = load('Data_NASA_altimeter_gmsl_meas.txt'); %loading
 the altimeter data
```

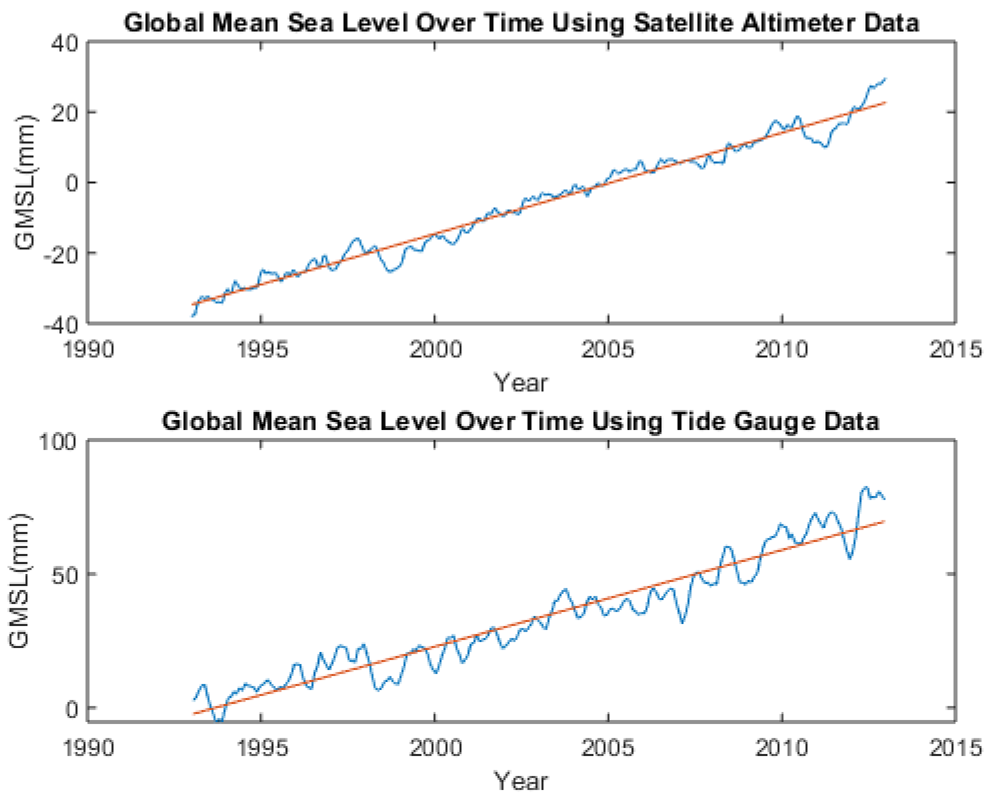
```
CSIRO_year = Data_CSIRO(:,1); % The years info from the CSIRO data as
 a column vector
CSIRO_gmsl = Data_CSIRO(:,2); % The GMSL info(the units are mm) from
 the CSIRO data as a column vector
altimeter_year = Data_altimeter(:,2); %loading the years info from the
 NASA alitimeter data
altimeter_gmsl = Data_altimeter(:,5); %loading the gmsl(the units are
 mm) info from the NASA alitimeter data
```

CALCULATIONS

```
%Part B
Data_CSIRO_1993_2013 = [CSIRO_year(find(CSIRO_year >= 1993 &
 CSIRO_year <=2013)),CSIRO_gmsl(find(CSIRO_year >= 1993 & CSIRO_year
 <=2013))]; % filtering the CSIRO data so the data from 1993 to 2013
 is taken and put into its own martix
Data_altimeter_1993_2013 = [altimeter_year(find(altimeter_year >= 1993
 & altimeter_year <= 2013)),altimeter_gmsl(find(altimeter_year >= 1993
 & altimeter_year <= 2013))]; % filtering the altimeter data so the
 data from 1993 to 2013 is taken and put into its own martix
%Part C
Linearreg_CSIRO = polyfit(Data_CSIRO_1993_2013(:,1),
 Data_CSIRO_1993_2013(:,2),1);
GMSL_CSIRO = Linearreg_CSIRO(1) *Data_CSIRO_1993_2013(:,1) +
 Linearreg_CSIRO(2);  % finding the best fit equation for the CSIRO
 data
Linearreg_altimeter =
 polyfit(Data_altimeter_1993_2013(:,1),Data_altimeter_1993_2013(:,2),1);
GMSL_altimeter = Linearreg_altimeter(1) *
 Data_altimeter_1993_2013(:,1) + Linearreg_altimeter(2); % finding the
 best fit equation for the altimeter data
%Part D
SSE_CSIRO = sum((Data_CSIRO_1993_2013(:,2) - GMSL_CSIRO).^2); %
 caculating the SSE for the CSIRO data
SST_CSIRO = sum((Data_CSIRO_1993_2013(:,2) -
 mean(Data_CSIRO_1993_2013(:,2))).^2);% caculating the SST of the
 CSIRO data
rsqaured_CSIRO = (1-(SSE_CSIRO/SST_CSIRO));% caculating the r^2 value
 of the CSIRO data
SSE_altimeter = sum((Data_altimeter_1993_2013(:,2) -
 GMSL_altimeter).^2); % caculating the SSE for the altimeter data
SST_altimeter = sum((Data_altimeter_1993_2013(:,2) -
 mean(Data_altimeter_1993_2013(:,2))).^2);% caculating the SST of the
 altimeter data
rsqaured_altimeter = (1-(SSE_altimeter/SST_altimeter));% caculating
 the r^2 value of the altimeter data
```

FIGURE DISPLAY

```
%Part f
subplot(2,1,2);
plot(Data_CSIRO_1993_2013(:,1),Data_CSIRO_1993_2013(:,2)); % ploting
 the tide guage data's GMSL over the years
hold on
plot(Data_CSIRO_1993_2013(:,1),GMSL_CSIRO); % ploting the linear
 regression over the data
title("Global Mean Sea Level Over Time Using Tide Gauge
 Data"); %labeling the title
xlabel("Year"); % labeling the x axis
ylabel("GMSL(mm)");% labeing the y axis
subplot(2,1,1);
plot(Data_altimeter_1993_2013(:,1),Data_altimeter_1993_2013(:,2));%
 ploting the altimeter data's GMSL over the years
hold on
plot(Data_altimeter_1993_2013(:,1),GMSL_altimeter); % ploting the
 linear regression over the data
title("Global Mean Sea Level Over Time Using Satellite Altimeter
 Data"); %labeling the title
xlabel("Year"); % labeling the x axis
ylabel("GMSL(mm)");% labeing the y axis
```



TEXT DISPLAY

```
%part e
fprintf("\n The equation of the linear model for the tide gauge data
 is GMSL = %f * Year + %f",Linearreg_CSIRO(1),Linearreg_CSIRO(2)); %
 printing the linear model equation
fprintf("\n The SSE of the tide gauge model is %f",SSE_CSIRO); %
 printing the SSE value
fprintf("\n The SST of the tide gauge model is %f",SST_CSIRO); %
 printing the SST  value
fprintf("\n The r^2 value of the tide gauge model is
 %f",rsqaured_CSIRO); % printing the r^2 value

fprintf("\n The equation of the linear model for
 the satellite altimeter model is GMSL = %f * Year +
 %f",Linearreg_altimeter(1),Linearreg_altimeter(2)); % printing the
 linear model equation
fprintf("\n The SSE of the satellite altimeter model is
 %f",SSE_altimeter); % printing the SSE value
fprintf("\n The SST of the satellite altimeter model is
 %f",SST_altimeter); % printing the SST  value
fprintf("\n The r^2 value of the satellite altimeter model is
 %f",rsqaured_altimeter); % printing the r^2 value
```

```
 The equation of the linear model for the tide gauge data is GMSL =
 3.608064 * Year + -7193.305907
 The SSE of the tide gauge model is 8768.027982
 The SST of the tide gauge model is 112911.237958
 The r^2 value of the tide gauge model is 0.922346
 The equation of the linear model for the satellite altimeter model is
 GMSL = 2.866938 * Year + -5748.469166
 The SSE of the satellite altimeter model is 4784.555039
 The SST of the satellite altimeter model is 206744.146886
 The r^2 value of the satellite altimeter model is 0.976858
```

ANALYSIS

```
% -- Q1
%  The satellite altimeter data collection model is more accuarate
 than the
%  tide gauge(CSIRO) data collection model. The reason being is that
 the
% r^2 value of the altimeter model is higher than the tide gauge and a
% higher r^2 means that the model can explain more of the data.

% -- Q2
```

```
% The satellite altimeter data collection is the one that linear model
 best
% explains the variation in the data. The reason that this one is the
 best
% is that it SSE is almost half that of the tide gauge data
% collection(4.7846e+03 compared to 8.7680e+03). Having a smaller SSE
 the
% statellite altimeter data's model line is closer to the data points
 than
% its counterpart.

% -- Q3
% The satellite altimeter data's linear model showcases the fastest
 gobal
% mean sea level rise.

% -- Q4
% Based on the tide gauge model predicted the GMSL in  2019 will be
 75.1 mm. This
% value was predicted using the slope of the tide gauge's linear model
 which
% is 3.6 and a y-int of -7193.3. On the other hand the satellite
 altimeter
% model predicted the GMSL in 2019 to be 106.6 mm. This value was
 predicted
% using the slope of the satellite model which is 2.9 and a y-int of
% -5748.5. Based on theses results one can see that the satellite
 altimeter
% predictes a GMSL value that is higher than 30mm when compared to the
% value predicted by the tide gauge model.
```

ACADEMIC INTEGRITY STATEMENT

I have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I provided access to my code to another. The script I am submitting is my own original work.

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