FINAL YEAR PROJECT AND INTERNSHIP REPORT

ON

An approach to study Seasonal variations and to enumerate the height of sea level acceleration for Global Mean Sea Level and Bay of Bengal using Time Series Analysis

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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DAFFODIL INTERNATIONAL UNIVERSITY

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APPROVAL

This Project Titled "**An approach to study Seasonal variations and to enumerate the height of sea level acceleration for Global Mean Sea Level and Bay of Bengal using Time Series Analysis**" submitted by Anika Tabassum (ID: 151-15-4858), Saad Bin Omar (151-15-5383) and Mustafizur Rahman (ID:151-15-5356) to the Department of Computer Science and Engineering. Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 26th November 2018.

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of Masud Rabbani, Lecturer, Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRUCT

According to the recent problem of Global Climate Change, our focus was on Sea Level Rising which is the most threatening phenomenon in our era hence we have predicted the level of rising surface for both Global Mean Sea Level (GMSL) and Bay of Bengal using time series analysis. Since the time series analysis (TSA) has some components, we brought out those components from our data set and merged them again to match with our real data. By doing that, we have constructed our training part and set up a method to predict the results for next years. We have tried to **test** the prediction results with a known data set as well as the computation was carried out in order to forecast for unknown data. In our work, the prediction has been done with respect to seasonal effects so that result can be accurate with seasonal variation. With extensive data set, other inconsistency has been considered easily. Mathematical enumeration has added a dynamism with this forecasting thoughtlessly. This study can be used to raise up a wariness among people. Besides this, this research can be used as a grounding for further study.

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CHAPTER: 01

INTRODUCTION

1.1 Introduction

First and foremost is Mean sea level (MSL) which is an average level of the surface of one or more of Earth's oceans from which heights such as rising may be measured [1]. Sea level rise will not be the equivalent at every location on earth. It is proved that local factors always thrust into tectonic upshots, and mitigation of the ground, tides, stream storms and so on. The most dangerous thing is, Sea level rise is hoped to sustain for centuries. It has been accounted that we are committed to a sea-level rise of approximately 2.3 meters (7.5 ft.) within the next 2,000 years for each Celsius degree of temperature rise, because of long repercussion times for parts of the climate system [2]. It has been found that Reputable geologic testimony gives a total rise in global sea level of 120 meters since the Last Glacial Maximum of 18,000 years ago. After rising rapidly, the rate of SLR slowed considerably about 5000 BP (before present). Before 1940, the rate during the 20th century was only about 18 cm/century and in spite of a rapid climate warming as measured by tide gauges, there was no acceleration [3]. We know that sea level are rising and most of the people just without knowing the ravages of this are spending their life and also doing many negative things and that is why the problem is being accelerated gradually. We are desiring to do some research regarding this and build an application for people to let them know about terrible effect of sea level rising.

1.2 Motivation

We know that sea level are rising and most of the people just without knowing the ravages of this are spending their life and also doing many negative things and that is why the problem is being accelerated gradually. We are desiring to do some research regarding this and build an application for people to let them know about terrible effect of sea level rising. There are no common application for people to know about raising the level of sea as well as they don’t know what the cause is. Whereas our aim was to do research on sea level rising with time series forecasting, we wanted to find out the exact quantity of level of rising and causes of it.

1.3 Rational of the study

Woodworth has inquired into past discernible sea level acceleration. But the fact is, he did not set the regional spatial correlation of the sea level signal at low frequencies in his study, which has the outcome of overemphasizing the importance of the very large number of tide gauges in northern Europe [4] and IPCC (Intergovernmental Panel on Climate Change) report gives for the business-as-usual scenario of global warming an excessive sea level change. Corroboration of these or resembling forecasts at a promptly date is necessary for establishing dependence in climate models and forecasts [5].

In our study, our result has been overemphasized on seasonal change. Thus, we have extracted trend from our data. It should be clarified that our frequency was month wise and it can be claimed that we have enumerated all the prediction at high frequency. In the last, our forecasting has been proceeded on year with specific month according to a certain model. So, we can claim that we have established a dependence in climate model and forecast which is why our technique is quite different from them and obviously diaphanous.

1.4 Research questions

The first thing will come into our mind about the accuracy of prediction. Thus the other questions can be come off and they are given below-

- Is there any certainty about finding a proper model?
- What will be the approaches to establish the model if the proper model is found?
- Will the result satisfy the causes of sea level?
- Will it give an accurate result?

When machine learning has its own categories to measure or define the problems then how it can be impossible for finding a proper model. E.g. we want to know whether it is A or B and for this, we have to quest the answer with classification algorithm. Now, if we want to find out some weird occurrences and analyze a pattern then the anomaly detection algorithm will be the assistant to define the answer. To find out any structure behind a certain data set, clustering algorithm will be subsidiary to prescribe the quest about "how is this organized?". For any kind of decision making the reinforcement learning will be helpful. Thus if we want to pop out any numerical value, we have to do it by performing regression analysis. So, it was the first step to find out a proper model for forecasting purpose.

The approaches to establish the model are earmarked. Time series analysis has four components by which the data will be constructed or we can say that the data what we want to analyze with time series analysis, must have to be the components of time series analysis. Since we wanted to study our data with one variable which is time, we had chosen to implement our forecasting with the time series analysis. Then to train our data, we have extracted out the components of time series from that data set. These components were numerical value and to bring out these we have performed a regression analysis as we mentioned in the previous portion. After doing that, we have calculated each of them with specific laws which has been described step by step later on when that is needed.

We trained 264 data of 22 years for GMSL and 180 data of 15 years for BOB and it was month wise calculation. Causes to sea level rise have been happened thorough these years and for this the causes are lurking on in this data. Because of that causes, the time series components have been constructed with the regression analysis. So, it can be claimed that the result satisfies the causes to sea level rise.

What prediction can be guaranteed after all? It can only be more in the proximity so that a rationalization can be built up though we have tried to give an approximate shape with our result.

1.5 Expected output

Our expectation was, after calculation the outcome will be more than a prediction. So, we performed all the section so accurately. Then the error calculation has been shown to consider the estimation. Aftermath will show the acceleration or deceleration of sea level as prediction.

1.6 Report layout

Rest of the paper has been organized into some segments- part 2 has been abbreviated as related works, in the part 3, methodology of SLR using TSA has been described, and part 4 has been expounded as experimental studies and in fine conclusion has been drawn in the part 5.

CHAPTER 02:

BACKGROUND

2.1 Introduction

At first, for making way to our study, some of the works have been observed. For researching of sea level rise, spatial and seasonal variations have been redacted in a study and it was for three different places in the red sea. An interesting research was for predicting the raise of Arabian Sea level which was done by exponential smoothing state space models and ARIMA. There are huge studies about global sea level acceleration. Another two studies which were also interesting to us, are about time and tide analysis which was of sea level time series and the second one is about measuring sea level rise at tropical pacific and Indian Ocean Islands. All of these works were as incentive to us and we were much more assisted by these to compare our work with their.

2.2 Related works

Tide gauges make the most genuine measurements of sea level that count the height of the sea relative to a neighbor geodetic benchmark. Beyond instrument platform effects, mitigation or appearance of the land at any specific location modifies the rate of relative sea level rise in that certain area. Because of showing common sea level fluctuations persisting over decades, a long and continuous record of such measurements plays a crucial role [6].

In the Red Sea, long-term sea level alternatives are mainly influenced by the effect of wind stress and the assembled effect of exhalation and water exchange through the Strait of Bab al-Mandab [7]. However, the main processes, wind stress and exhalation, contest with each other and their influence on sea level change is disclosed over several time scales. Besides that, former studies in the area, which inquired the seasonal sea level changes in the Red Sea, elicited high sea level values in winter and low values in summer [8].

The changes cannot yet be predicted with confidence using models based on physical processes, despite the large number of studies leaded focusing on sea level rise. One of the main obstructions to advancement seems to be the fact that sea level rise is highly subject to the dynamics of ice sheets and glaciers which are not yet adequately understood [9].

To analyze the use of dynamical models for sea level rise forecasting [10] or statistical models based on climate-related predictors [11] for sea level forecasting, some research studies have been leaded. Computational intelligence accesses have also been represented for sea level forecasting in recent decenniers; some originators have even used mess doctrine techniques for water level prediction [12].

2.3 Research summary

All of the study have been accomplished for specific local sea level or Global sea level. We groped a concernment of researching about raising the sea level of Bay of Bengal. Further we were enthused about the acceleration of GMSL for which we also discerned a necessity of studying about that. However, in our study, the aftermath of the acceleration measurement was calculated using TSA and we gave much more emphasized on seasonal component of our data. We have described all the calculations in the methodology section. We implemented all of that calculation in the excel file at first and converted it into csv file to show the results in weka finally.

2.4 Scope of the problems

There were some scope of elevation some problems. E.g.

- To gate authentic data
- Accuracy of calculation
- Difference from reality

It is true that having the authentic data was not so easy. We had to send some emails to get these data from some renowned organizations.

Calculation by using excel, gave credibility to this study. By calculating error, the difference between our study and reality has been plotted.

2.5 Challenges

- To conduct a different type of exploration.
- To bring a variety to this study.
- To perform a rational measurement.
- To lead a dynamic enumeration.
- To overcome unexpected error.

CHAPTER 03

RESEARCH METHODOLOGY

3.1 Introduction

First and foremost, a forecasting model was needed to implement that prediction. Under machine learning, time series analysis was selected to forecast by using some specific rules of it. Some of the study were regarding the different types of time series analysis which are Auto Regression (AR), Moving Average (MA) and ARIMA. Moving Average was picked because of smoothing out our data. Thus the remaining tasks were accomplished gradually.

3.2 Research subject and instrument

Enumeration of sea level acceleration is the main subject of our study. This an approach to study Seasonal variations and to enumerate the height of sea level acceleration for Global Mean Sea Level and Bay of Bengal using Time Series Analysis. Mainly we have performed all the parts of our research on excel then we have shown the result on weka. Apart from this, we are desiring to establish an app to show the result of our experiment as prediction in the future.

To conquer our target, we had to step out to several stages which are figured out as follows. “Fig. 1” has illustrated a flow chart of our object to measure of sea level rising (SLR).

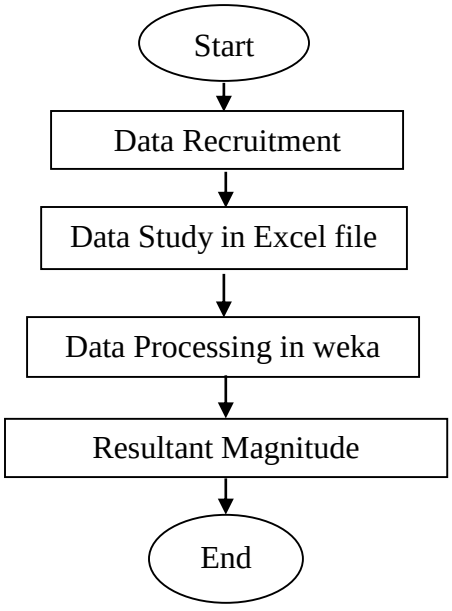

Fig. 3.1: Flow Chart of Time Series Analysis (TSA) for Sea Level Rising prediction (SLRP).

3.3 Data recruitment

After an initial research of the data, we conjectured that all the characteristics and target data could be collected from the Climate Change Knowledge Portal (CCKP) of The World Bank group (TWBG) [13], EPA (United States Environmental Protection Agency) and CSIRO (Commonwealth Scientific and Industrial Research Organization [14].

In the table 1, we have shown the starting and finishing time to proceed on forecasting firstly for Local sea level which is for Bay of Bengal and secondly for Global mean sea level.

TABLE I: ALL DATA COLLECTED FOR THE SEA LEVEL RISE ANALYSIS.

	Start	End	Frequency	Sources
Local Sea Level (Bay of Bengal)	1993	2008	Monthly	CCKP OF TWBG [13]
Global Mean Sea Level	1993	2015	Monthly	CSIRO AND EPA[14]

In the table 2, we have given the number of data for training and testing which are both for BOB and GMSL.

TABLE II: NUMBER OF EXAMPLES

	For GMSL		For Bay of Bengal	
Monthly	Training	Testing	Training	Testing
	264	12	180	12

Our data has been collected from the mentioned sources above and collecting data of BOB was not so easy. We requested to get the data from that sources since we had needed data on sea level rise per month of at least past 25 years of any ocean but especially for BOB but we have gotten the data of 23 years for GMSL and 16 years for BOB. So, the training part has been conducted to 22 years for GMSL and 15 years for BOB.

3.4 Data study in Excel file

In the data Study, we have done one part of our research in excel. All the calculation has been implemented in excel file which is shown in “Fig. 2” step by step.

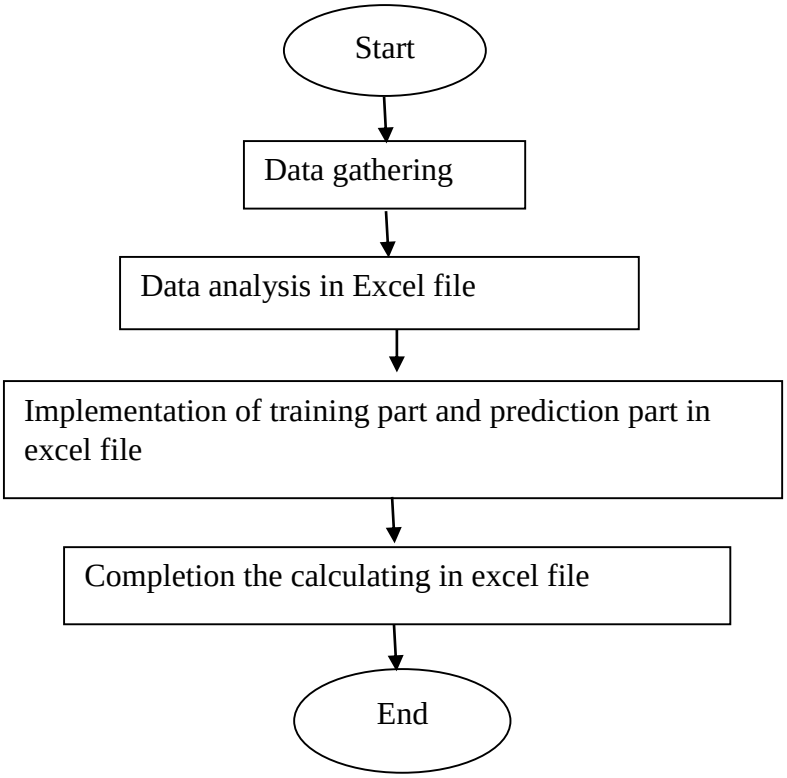

Fig. 3.2: A flow chart of processing in excel file.

- **Data Gathering:** What we have collected in the part of data recruitment, we have accumulated it into excel file.

- **Data analysis in excel file:** After getting the data of Sea level anomaly, we smoothened out the data of SL (sea level) by the Moving Average (MA) which is an important algorithm of TSA. There is always some kind of noises or irregularities attached in a time series. So, we needed to figure out that noise. In fact, we needed to average that out. Now, whenever we try to average it out the cross and drop set of presents in that noise will be smoothen out and we can have average focused of that noise. [Equation- MA= $((x_1+x_2+\ldots. +x_n)/n)$].

For the purpose of getting numerical value, we chose Regression analysis to understand the component parts of time series analysis for collected data. After that we extracted out that components from our data by which they have been constructed. [Equations- for seasonality and irregularity: $<S_t, I_t> = Y_t/CMA$ where, Y_t = Sea Level from collected data set and CMA = Central Moving Average; from that St can be extracted by averaging the value for all matching month {averaging down the value of $<S_t, I_t>$ for all January months and so on}. It will be seasonal computation, then we have to do deseasonalization of all data; then we have to extract trend component from data (TR_t = intercept*t+t_x, where x = 1, 2, 3…. n)].

- **Implementation of training part and prediction part in excel file:** Now, if we get the components of time series for our data, it should not be so difficult to calculate them from a specific equation by which we could establish a training part [the training part can be organized by the multiplication of St and TR_t].

- **Completion the calculating in excel file:** After evaluating training part, we have tested it by a year for which we already had data and thus we could predict the acceleration of sea level rising for upcoming year. We have done the prediction by evaluating St and TR_t which I have described in the previous section. By getting the St and TR_t for the next year for which we wanted to predict, we have simply multiplied the St and TR_t to get forecasting for this year.

3.5 Data processing in weka:

After completion the calculation in excel, we imported that file into weka. The processing in weka is shown in "Fig. 3"

- At first the excel file in which we have implemented all the calculation what we have explained in the data study in excel file section, has been converted to CSV for further implementation in weka.
- Then the CSV file has been imported into weka.
- In weka, data has been processed for showing the rise and fall of real data, training data and prediction data using regression analysis.

- After that, a training part has been generated.
- In Excel prediction has been done for 2015 and 2008 which are for GSML and BOB respectively.

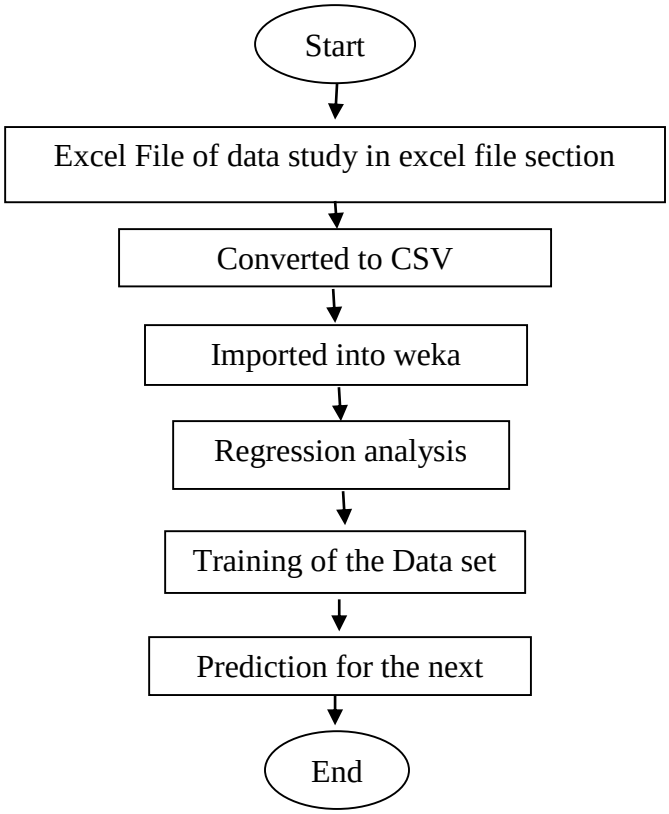

Fig. 3.3: A flow chart of processing steps in weka.

So, SLRP using TSA has the main target to predict the sea level of GMSL and BOB.

In “Fig. 4”, a screenshot of regression analysis for real data of GMSL has been shown which has been performed for 1993-2014 and generated by weka. In the blue line, the points are showing the rise and fall of sea level and which is for real data. In orange line, points have been smoothed by performing CMA for real data. In the gray line of training part, points are showing the difference of rise and fall from real data.

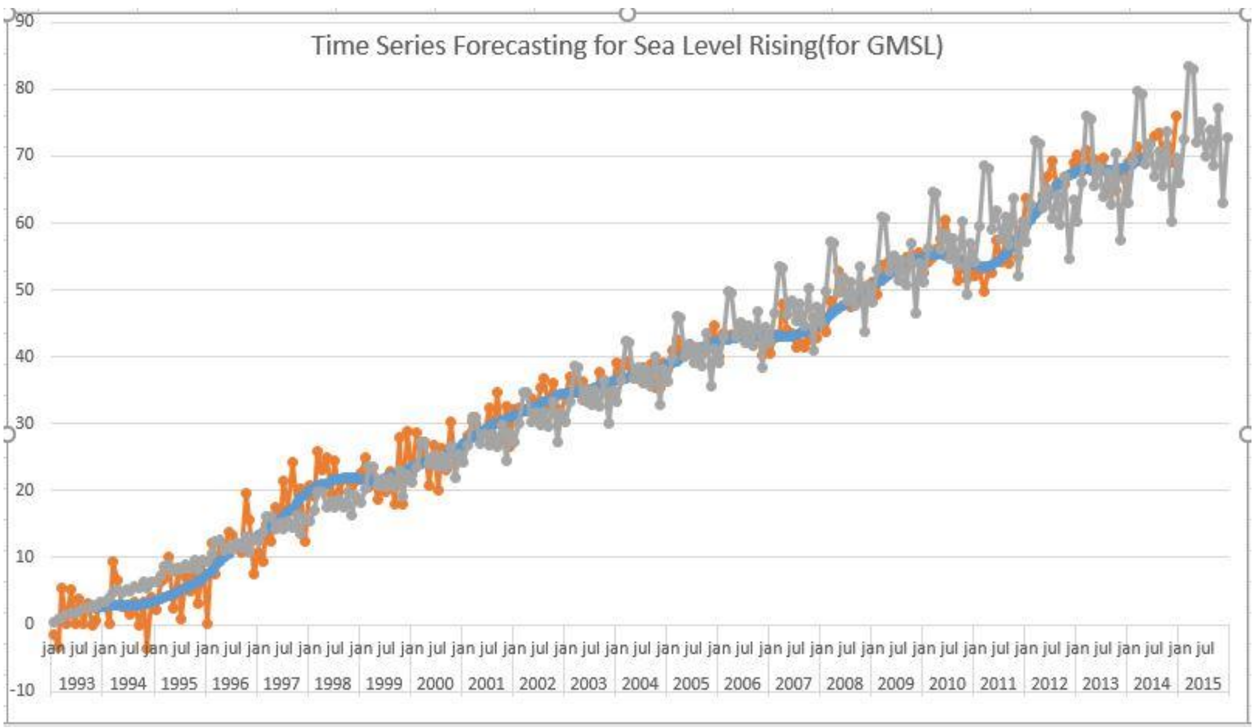

Fig. 3.4: A screenshot of Regression Analysis for real data of GMSL

In “Fig. 5”, a screenshot of regression analysis for real data of BOB has been shown which has been performed for 1993-2014 and generated by weka. In the blue line, the points are showing the rise and fall of sea level and which is for real data. In orange line, points have been smoothed by performing CMA for real data. In the gray line of training part, points are showing the difference of rise and fall from real data.

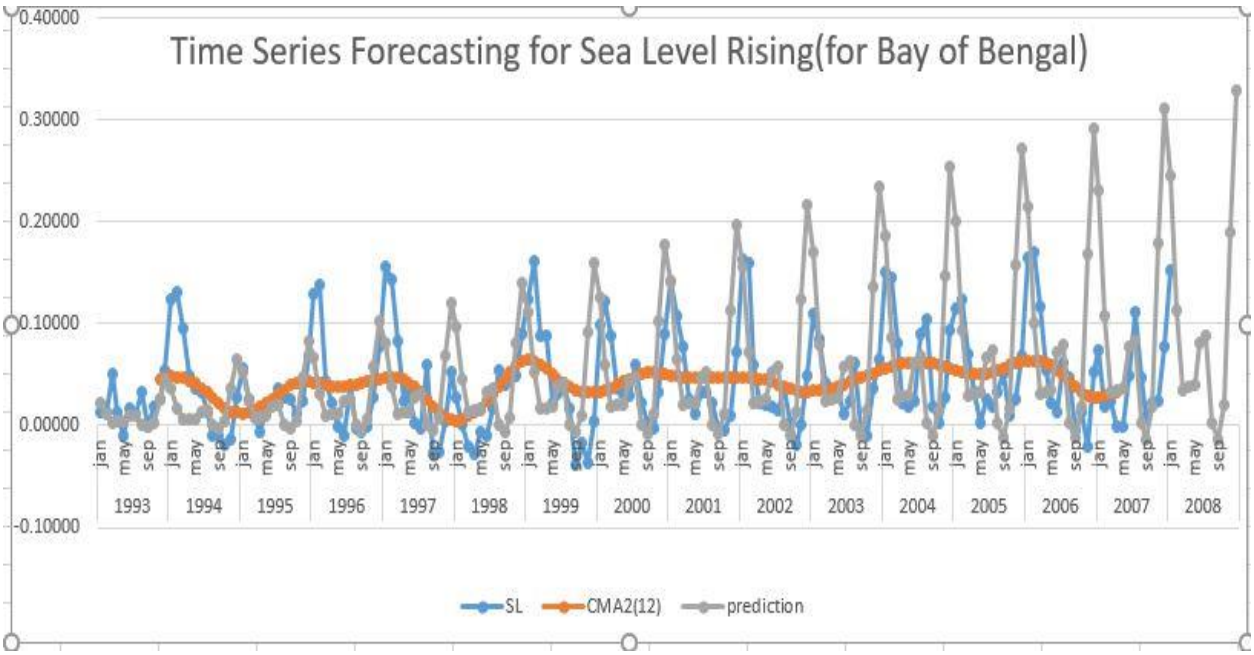

Fig. 3.5: A screenshot of Regression Analysis for real data of BOB (1993-2007).

3.6 Resultant magnitude

What I have described in the “Completion the calculating in excel file” is the process by which I have done prediction and the results have been shown in the “Fig. 8”, “Fig. 9”, “Fig. 10” and “Fig. 11” in the Experimental result and comparisons section. After predicting the value, a figure also has been plotted for prediction value with real data in which the x-axis shows years which are divided into monthly segment and y-axis shows amplifications. The predictions are shown in “Fig. 6” and “Fig. 7”.

In “Fig. 6”, A screenshot of Regression analysis after prediction for GMSL has been shown for 2015 which was our known data and we predicted it to check our prediction with that known data. Here, points are showing the rise and fall of sea level as prediction.

Fig. 3.6: A screenshot of Regression analysis after prediction for GMSL (prediction for 2015)

In “Fig. 7”, A screenshot of Regression analysis after prediction for BOB has been shown for 2008 which was our known data and we predicted it to check our prediction with that known data. Here, points are showing the rise and fall of sea level as prediction.

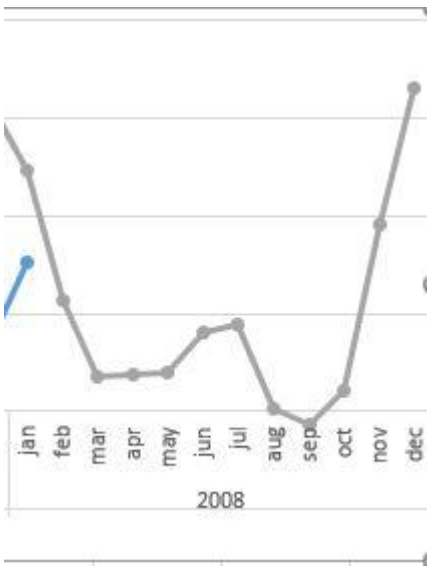

Fig. 3.7: A screenshot of Regression analysis after prediction for BOB (prediction for 2008).

CHAPTER 04:

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Introduction

After studying about time series analysis, it was the part of doing some calculation for forecasting purposes. Excel was the medium of doing our calculation. Several parts of calculation have been done in excel with reliability. After doing some computations in this regard, we realized it can also be shown in weka.

4.2 Experimental Setup

Sea level rising prediction using time series analysis has been developed under the environment on Intel Core i3-3.30 [15] GHZ processor with 8.0 GB of Ram running on windows 10 [16] operating system. SLRP using TSA has been calculated in Microsoft Excel and developed in Weka (version 3.8) [17] for preparing a model.

4.3 Experimental results and comparisons

The whole experimental results are shown in “Fig. 8”, “Fig. 9” for GMSL and “Fig. 10”, “Fig. 11” for BOB.

In the “Fig. 8” prediction for GSML has been calculated in excel and further converted into weka, which are calculated for the year 2015, when it was known data. Here, column 1,2,3,4,5 are time, year, month, seasonal component, trend and prediction respectively. Here, data has been trained from the year 1993 to 2014 and the right most values are showing the amount of GMSL in 2015 as prediction. These values were previously known to us and we predicted it to test whether the prediction values have been matched with our known data or not. Here, 74.8082mm is the total amount of GMSL in the January of 2015 and rest of the values are showing in that same way the month wise amount of GMSL in 2015.

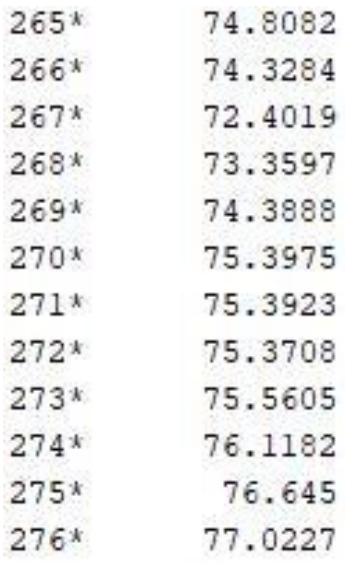

Fig. 4.1: A screenshot of prediction for GMSL (testing for known data of the year 2015).

In the "Fig. 9" prediction for GMSL has been shown in weka which are calculated for the year 2018, when they were unknown data. Here, column 1 and 2 are time and prediction respectively. Here the data also has been trained from the year 1993 to 2014. The prediction results are showing what will be the amount of GMSL in 2018 and the prediction values were unknown. Here, 86.2281mm is the total amount of GMSL in the January of 2018 and rest of the values are showing in that same way the month wise amount of GMSL in 2018.

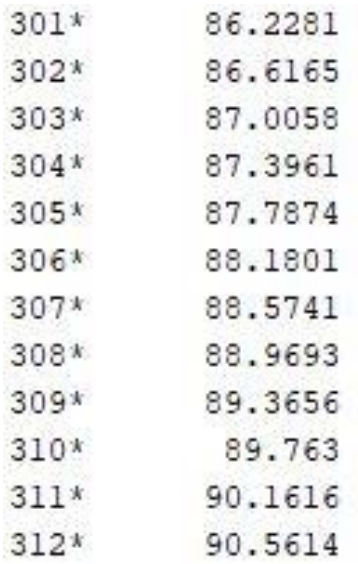

Fig. 4.2: A screenshot of prediction for GMSL (forecasting for unknown data of the year 2018 in weka).

In the “Fig. 10”prediction for BOB has been calculated in excel and further converted into weka, which are calculated for the year 2008, when it was known data. Here, column 1,2,3,4,5 are time, year, month, seasonal component, trend and prediction respectively. Here, data has been trained from the year 1993 to 2007 and the right most values are showing the amount of BOB in 2015 as prediction. These values were previously known to us and we predicted it to test whether the prediction values have been matched with our known data or not. Here, 0.1298mm is the amount of raising the level of BOB in the January of 2008 and rest of the values are showing in that same way the month wise amount of BOB in 2008.

181*	0.1298
182*	0.0622
183*	0.0112
184*	0.0046
185*	0.0304
186*	0.0591
187*	0.0702
188*	0.0625
189*	0.048
190*	0.0389
191*	0.0393
192*	0.0455

Fig. 4.3: A screenshot of prediction for BOB (testing for known data of the year 2008).

In the “Fig. 11” prediction for BOB has been shown in weka which are calculated for the year 2018, when they were unknown data. Here, column 1 and 2 are time and prediction respectively. Here the data also has been trained from the year 1993 to 2007. The prediction results are

showing what will be the amount of BOB in 2018 and the prediction values were unknown. Here, -0.0045mm is the amount of decreasing of the level of BOB in the January of 2018 and rest of the values are showing in that same way the month wise amount of BOB in 2018.

301*	-0.0045
302*	-0.0053
303*	-0.0061
304*	-0.0069
305*	-0.0078
306*	-0.0086
307*	-0.0095
308*	-0.0103
309*	-0.0112
310*	-0.012
311*	-0.0129
312*	-0.0138

Fig. 4.4: A screenshot of prediction for Bay of Bengal (forecasting for unknown data of the year in weka).

The standard deviation and standard error for real data, training data and prediction data of both GMSL and BOB are given below. Here, STD = Standard Deviation and STDE = Standard Deviation Error.

In Table III, Mean has been calculated for real data by averaging down the values of SL(sea level). Then STD has been calculated with the equation $STD = \sqrt{\{(\sum |x - \mu| 2) / N\}}$ and STDE has been calculated with the equation $STDE = STD/\sqrt{(N)}$. Where, x = all the real data of SL, μ = mean, N= number of real data. This calculation has been done for GMSL real data set.

TABLE III. STANDARD ERROR FOR REAL DATA OF THE GMSL.

Mean	35.71061
STD	20.66029
STDE	1.271553

In Table IV, Mean has been calculated for training data by averaging down the values of all data of training data set. Then STD has been calculated with the equation $STD = \sqrt{\{(\sum |x - \mu|^2) / N\}}$ and STDE has been calculated with the equation $STDE = STD/\sqrt{(N)}$. Where, x = all the training data of sea level rise, μ = mean, N= number of training data. This calculation has been done for GMSL training data set.

TABLE IV. STANDARD ERROR FOR TRAINING DATA, PREDICTION DATA OF THE GMSL.

Mean	35.90
STD	20.85132
STDE	1.28331

In Table V, Mean has been calculated for training data by averaging down the values of all data of prediction data set. Then STD has been calculated with the equation STD = $\sqrt{\{(\sum |x - \mu|^2) / N\}}$ and STDE has been calculated with the equation STDE = STD/$\sqrt{(N)}$. Where, x = all the prediction data of sea level rise, μ = mean, N= number of prediction data. This calculation has been done for GMSL prediction data set.

TABLE V. STANDARD ERROR FOR PREDICTION DATA OF THE GMSL.

Mean	73.16
STD	6.080223
STDE	1.755209

In Table VI, Mean has been calculated for real data by averaging down the values of SL (sea level). Then STD has been calculated with the equation STD = $\sqrt{\{ (\sum | x - \mu | 2) / N\}}$ and STDE has been calculated with the equation STDE = STD/$\sqrt{(N)}$. Where, x = all the real data of SL, μ = mean, N= number of real data. This calculation has been done for the real data set of BOB.

TABLE VI. STANDARD ERROR FOR REAL DATA OF THE BOB.

Mean	0.051522
STD	0.064918
STDE	0.004839

In Table VII, Mean has been calculated for training data by averaging down the values of all data of training data set. Then STD has been calculated with the equation STD = $\sqrt{\{ (\sum | x - \mu | 2) / N\}}$ and STDE has been calculated with the equation STDE = STD/$\sqrt{(N)}$. Where, x = all the training data of sea level rise, μ = mean, N= number of training data. This calculation has been done for the training data set of BOB.

TABLE VII. STANDARD ERROR FOR TRAINING DATA OF THE BOB.

Mean	0.097521
STD	0.105859
STDE	0.030559

In Table VIII, Mean has been calculated for training data by averaging down the values of all data of prediction data set. Then STD has been calculated with the equation STD = $\sqrt{\{(\sum | x - \mu |^2) / N\}}$ and STDE has been calculated with the equation STDE = STD/$\sqrt{(N)}$. Where, x = all the prediction data of sea level rise, μ = mean, N= number of prediction data. This calculation has been done for the prediction data set of BOB.

TABLE VIII. STANDARD ERROR FOR PREDICTION DATA OF THE BOB.

Mean	0.04168
STD	0.047202
STDE	0.003518

4.4 Descriptive Analysis

After deciding to train our data under supervised machine learning by TSA, we smoothed out our month wise data. Until getting a central point, central moving average (CMA) was calculated. This central moving average is baseline. Using this CMA, a regression analysis has been done to detect all components of TSA and irregularities and seasonality of our data has been calculated by dividing our real data with central moving average. After extracting seasonal Components for all matching months from that previous calculation of "irregularities & seasonality", we went to derive trend components. By multiplication of trend Components with seasonality, we started to train our data. After training, we have constructed a prediction part for the next year which we wanted to predict.

4.5 Summary

There are certain reason to settle up every step of computing. For deriving component part, regression analysis has been done to get Numerical value to perform further process. Moving average was selected to smooth out our data and thus the all parts have been counted with logicality.

CHAPTER 05:

SUMMARY, CONCLUSION, RECOMMENDATION

AND

IMPLICATION FOR FUTURE RESEARCH

5.1 Summary of the Study

Whereas the data has been collected month wise, the standard deviation error can be reduced if the calculation proceeds according to day wise data. Though it is possible to remain this kind of data to some organizations, it is nearly impossible to have this kind of data from any of them. It is considerable for that the prediction shows close value for known data and standard error is small.

5.2 Conclusions

By thermal continuation of the water in the oceans and by melting of ice sheets and glaciers on land contemporary sea level rise is usually imposed to global climate change. Ice melting, glacier, ice sheet, land water storage, earth quack, ocean thermal expansions are contributed to rise the sea level. It is not possible to predict the rising of sea level only with the help of physics but when the total result has been calculated on the basis of more than 15 years, then each of the causes of rising level must have occurred. So, it can be claimed that any kind of seasonal, irregular, trend and periodical effects which are the causes of raising the level of sea, have been considered in this study.

5.3 Implication for Further Study

In order to get more exquisite result, we want to analyze day wise data in the future. If the frequency is more divisional than previous, the result will be subtle. We want to build an application to show forecasting result. In that application, year will be given to choose by people and level of sea will be shown in monthly basis.

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