

Machine Learning approach for predicting temperature in Bangladesh

By

MD. ARIF RIZVEE

ID: 173-25-627

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Supervised By

Md Zahid Hasan

Assistant Professor

Department of CSE

Daffodil International University




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APPROVAL

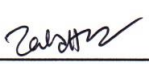
This Project titled “Machine Learning approach for predicting temperature in Bangladesh”, submitted by Md. Arif Rizvee (ID:173-25-627) to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 12th December, 2018.

BOARD OF EXAMINERS


Dr. Syed Akhter Hossain
Professor & Head

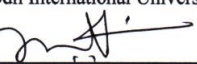
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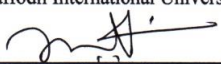
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner


Md Zahid Hasan

Assistant Professor & Coordinator of MIS
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner


Dr. Mohammad Shorif Uddin
Professor

Department of Computer Science and Engineering
Jahangirnagar University

External Examiner

DECLARATION

I am declaring that, this project has been done by me under the supervision of **Md Zahid Hasan, Assistant Professor, Department of CSE, Daffodil International University**. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised By

Md Zahid Hasan
Assistant Professor & Coordinator of MIS
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Submitted By

Md. Arif Rizvee
ID: 173-25-627
Department of CSE,
Daffodil International University

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ABSTRACT

Our country has six seasons. Though temperature remain high during summer season in Bangladesh. For global warming Bangladesh weather is also changing. As a result temperature in Bangladesh is increasing day by day. For this reason there are many natural disasters like cyclone, flood, drought are happening in Bangladesh regularly. As a result so many problems like death of people, food shortage, adequate of pure drinking water are arising. But currently Bangladesh doesn't have any modern temperature prediction technique. It is difficult to predict the weather temperature due to non-linear characteristics of natural calamities in the country. It is proved that artificial intelligence is very helpful for predicting weather temperature. We use machine learning technique for predicting temperature of weather. Linear regression technique is a popular method for predicting temperature. Besides temperature, humidity, rain fall, dew point is used as predictors.

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CHAPTER 1

INTRPDUCTION

1.1 Introduction

Temperature is increasing day by day all over the world. As a result it is effecting in our natural and social life. It is proved that human behavior is the main player for the environment changes in our world. Ocean level increased, changing in seasonal start and end and also changes in agricultural work. So everything is effecting through climate change. Weather change will make lots of effect in our society and future generation. So we will have to conscious about the weather change from today. Climate change is causing serious effect in our society. Especially fossil fuel and emission of carbon di oxide are the main reasons for temperature increased. After the industrial revolution energy become key factor for economic development and many other changes. As a result lots of fossil fuels and other power sources like coal, nuclear reactors are the main factors of air pollution and temperature increase. Dry zones which increment or lessening atmosphere defenselessness. Local impacts of an Earth-wide temperature boost change in nature. Some are the consequence of a summed up worldwide change, for example, rising temperature, bringing about neighborhood impacts, for example, and liquefying ice. In different cases, a change might be identified with an adjustment in a specific sea momentum or climate framework. In such cases, the territorial impact might be unbalanced and won't really pursue the worldwide pattern. There are three noteworthy manners by which an Earth-wide temperature boost will make changes to territorial atmosphere: liquefying or shaping ice, changing the hydrological cycle (of dissipation and precipitation) and changing flows in the seas and wind streams in the environment. The drift can likewise be viewed as a district, and will experience the ill effects of ocean level ascent. The Ice, Africa, little islands and Asian uber deltas are locales that are probably going to be particularly influenced by environmental change. Low-scope, less-created districts are at most danger of encountering negative effects because of environmental change. Created nations are additionally powerless against environmental change. For instance, created nations will be adversely influenced by increments. Worldwide temperature increase also affects so many areas of our lives. All districts, a few people can be especially in danger from environmental change, for example, poor people, youthful kids and the elderly. Projections of future atmosphere changes at the territorial scale don't

hold as high a dimension of logical certainty as projections made at the worldwide scale. It is, notwithstanding, expected that future warming 10 will pursue a comparative geological example to that observed as of now, with mostb prominent warming over land and various parts of the sea in the world. About all land territories will probably warm more than the worldwide. Climate forecast is critical for our 11 everyday exercises. Without legitimate expectation of climate we may confront numerous issues. Rancher require climate forecast for develop arrive. Climate expectation for fundamental for fisher man to get angle in the waterway or see, carriers require neighborhood climate condition to fly on the sky, so climate guaging causes us to settle on progressively educated day by day choices, and may even help keep us out of peril. To take care of these issues exact climate is exceptionally important.

1.2 Motivation

Climate change is the process by which environment is polluting day by day. Environment is polluting for many reasons. Today's technology has invented many scopes to identify the climate change in our environment. Previously there was no system to measure weather condition. For predicting we will have to wait for a long time on traditional system. On that it is necessary to gather collective information, and then using various methods all the predictions was done. It was not so much accurate and lengthy process. After the invention of computer it is very much easy to give the forecast of weather temperature. We can analyze wind, temperature, rain and other data very easily shortly and quickly. Using computer we can predict best model which is necessary for predicting accurate weather of our country. Previously we cannot predict the accurate weather in our traditional system. It was very much lengthy and time consuming, so current system is very blessing for us. Climate forecasting is very important because our economy totally depend on the climate change, we can explain it as, our agriculture, shipment of product everything is related to weather change.

1.3 Objective

With no destinations it is beyond the realm of imagination to expect to end up fruitful in the related work. So the primary target of our work is to discover exact climate method with the utilization of current machine learning. Man-made brainpower based machine learning method assist us with predicting climate gauge and climate temperature physically. Our theory works endeavor to utilize a logical based technique utilizing machine learning calculation to take care of the issues. Different determining techniques have been proposed and conveyed to estimate temperature for various terms. In this venture, we propose new novel strategies for foreseeing month to month temperature utilizing machine learning calculations. These methodologies depend on counterfeit neural systems and outfits of fake neural systems. Two kinds of gauges are focused in this venture: numerical and all out. Numerical expectation is the way toward guaging the real measure of temperature. While with downright expectation, precipitation is ordered into classes contrasted with a specific edge (generally normal). To foresee temperature, distinctive worldwide and nearby climate properties were gathered as conceivable indicators. These indicators included temperature, sun oriented characteristic and atmosphere lists. An atmosphere list speaks to a marvel over a chose zone in seas including Pacific, Indian and so on. Australian precipitation inconstancy is related with these nearby and worldwide climate characteristics. Distinctive areas were focused in this investigation: Innis fail, Plane creek, Marlborough, Yamba and so forth. Different methodologies have been proposed and connected including: highlight choice, neural system parameters choice, highlights and system parameters choice. Advancement and determination were connected utilizing Hereditary Calculation (GA), Molecule Swarm Streamlining (PSO) and another proposed Cross breed Hereditary Calculation (HGA) that coordinates PSO functionalities in a GA. Besides, we proposed diverse group techniques for temperature forecast. The point of the groups was to fuse parts assorted varieties. This included enhancing the combination techniques and choosing outfit parts.

CHAPTER 2

RELATED WORK

2.1 Introduction

Bangladesh weather is changing rapidly; current weather scenario is not same as 10 or 15 years ago. So current weather change has become a great concern for the people of Bangladesh. Weather change will cause a great havoc for Bangladesh.

2.2 Literature Review

Work on climate forecast is an extremely authentic methodology; it is done from a few centuries. During the year 904 Promotion, ‘Abu Bakr Ahmad bin Ali an alchemist, agriculturalist first talked about the climate change and its impact in our world. Rain forecast also depend on lunar system. If it is seen that the wind is very dusty than it is also the indication of pollution of weather. Previously this type of weather prediction system is used but there is no accurate process for predicting the result. It was not until the creation of the electric broadcast in 1835 that the advanced period of climate gauging started. Prior to that, the quickest that far off climate daily huge distance like 150 km of is needed. Francis Beaufort and his protégé Robert FitzRoy of Royal navy force were credited for the first time of history inventing the scientific prediction of the weather. There invention was approved by then Imperial Naval force. Beaufort built up the Breeze Power Scale and Climate Documentation coding, which he was to use in his diaries for an amazing rest. He likewise advanced the improvement of dependable tidal system for various English shores, and with his companion William Whewell. In 1840 Robert FitzRoy was appointed as a head of leading group of Exchange to manage the accumulation of climate information adrift as an administration to 17 sailors. With his effort there was metrological predicting process for the new development process. This was the precursor of the cutting edge Meteorological Office. All ship skippers were entrusted with ordering information on the climate and figuring it, with the utilization of tried instruments that were credited for this reason. Climate guide of Europe, December 10, 1887. A tempest in 1859 that caused the loss of the Illustrious Contract motivated FitzRoy to create diagrams to enable expectations to be made, which he called "gauging the climate", therefore

authoring the expression "climate conjecture". Fifteen land stations were set up to utilize the broadcast to transmit to him every day reports of climate at set occasions prompting the main storm cautioning administration. His notice benefit for delivery was started in February 1861, with the utilization of transmit correspondences. The primary day by day climate gauges were distributed in The Occasions in 1861. In the next year a framework was presented of raising tempest cautioning cones at the chief ports when a storm was expected. The "Climate Book" which FitzRoy distributed in 1863 was far ahead of time of the logical conclusion of the time. As the electric broadcast organize extended, taking into account the more fast spread of admonitions, a national observational system was produced, which could then be utilized to give concise examinations. Instruments to constantly record varieties in meteorological parameters utilizing photography were provided to the watching stations from Kew Observatory these cameras had been created by Francis Ronald's in 18 1845 and his barograph had before been utilized by Fitzroy. To pass on exact data, it before long wound up important to have a standard vocabulary depicting mists; this was accomplished by methods for a progression of arrangements initially accomplished by Luke Howard in 1802, and institutionalized in the Worldwide Cloud Map book of 1896. It was not until the twentieth century that propels in the comprehension of barometrical material science prompted the establishment of present day numerical climate expectation. In 1922, English researcher Lewis Broil Richardson distributed "Climate Expectation by Numerical Process", subsequent to discovering notes and determinations he took a shot at as a rescue vehicle driver in World War I. He portrayed in that how little terms in the prognostic liquid elements conditions overseeing barometrical stream could be disregarded, and a limited differencing plan in existence could be concocted, to enable numerical expectation answers for be found. Richardson imagined an expansive hall of thousands of individuals playing out the figuring's and passing them to other people. Be that as it may, the sheer number of counts required was too expansive to be in any way finished without the utilization of PCs, and the measure of the framework and time steps prompted improbable outcomes in extending frameworks Bangladesh Metrological Division is absolutely manual. So precise climate is beyond the realm of imagination to expect to quantify. In addition, now and again it is seen that wrong climate forecast is making numerous issues. Current satellites, radar, sensors, combined with quickly diminishing expenses of putting away and circulating data have catalyzed a blast in amounts of climate information accessible for studies. Most work in climate guaging to date depends on the utilization of generative methodologies, where the climate

frameworks are recreated by means of numerical strategies. Scarcely any inquiries about have been presented in the field of current climate forecast. In spite of the fact that it isn't absolutely rely upon computerized reasoning framework or machine learning based. They are additionally doing work based on few dataset. By utilizing these information precise climate temperature is beyond the realm of imagination to expect to anticipate. A large portion of the explores don't pursue machine learning process. In spite of the fact that if some examination utilizes machine learning system yet their technique, calculation isn't refreshed. Additionally, as of now there is no exploration have been done on temperature forecast of Bangladesh. In this paper we have proposed a procedure of machine figuring out how to foresee the temperature of all over Bangladesh. This will push everybody to precise temperature everywhere throughout the year.

CHAPTER 3

PROPOSED METHODOLOGY

3.1 Introduction

Machine learning system has such a significant number of calculations to perform different undertakings. For anticipating climate temperature, we utilize direct relapse method. Direct relapse is a standout amongst the most prominent and surely knew calculations in machine learning. Direct relapse has been around for such a long time (over 200 years). It has been contemplated from each conceivable point and it has distinctive names. Straight relapse is a direct model, for instance a model we can expect a direct connection between two variable x and y . Specifically y is depend on the variable of the x . So if we change the variable x then the value of y will be changed. Writing from insights regularly alludes to the technique as numerous straight relapse. Numerous methods can be utilized to plan or train the direct relapse condition from information, the most widely recognized of which is called Standard Minimum Squares. Usually to along these lines allude to a model arranged thusly as Normal Minimum Squares Direct Relapse or simply Slightest Squares Relapse. For instance, in a straightforward relapse issue (a solitary x and a solitary y), the type of the model would be:

$$y = A0 + A1*x$$

In higher measurements when we have in excess of one info (x), the line is known as a plane or a hyper-plane. The portrayal along these lines is the type of the condition and the explicit qualities utilized for the coefficients (e.g. $A0$ and $A1$ in the above model).

3.2 Selecting Features for Our Model

Machine learning method has such a large number of calculations to perform different errands. For anticipating climate temperature, we utilize straight relapse method. Direct relapse is a standout amongst the most mainstream and surely knew calculations in machine learning. Straight relapse has been around for such a long time (over 200 years). It has been contemplated from each conceivable point and it has distinctive names. Straight relapse is a direct model, for instance a model we can accept a direct connection between the information factors (x) and the single yield variable (y). Specifically we can state, that y can be determined from a straight blend of the

information factors (x). When there is a solitary info variable (x), the strategy is said as basic direct relapse. At the point when there are different information factors, writing from insights regularly alludes to the strategy as numerous straight relapse. Numerous procedures can be utilized to get ready or train the straight relapse condition from information, the most widely recognized of which is called Normal Minimum Squares. Usually to accordingly allude to a model arranged along these lines as Common Slightest Squares Straight Relapse or simply Minimum Squares Relapse. For instance, in a straightforward relapse issue (a solitary x and a solitary y), the type of the model would be used.

3.3 Description of Our Work

We utilize an altered adaptation of Direct Relapse to play out the forecast of temperature in our framework. The procedure of this technique is clarified in these following advances:

1. At first we collect the data and then analyzed them. We make a month long plan to how to execute our project.
2. The preparation and test information are framed from the information informational indexes.
3. We will clean all the data and then will load the dataset.
4. Then we will summarize the dataset.
5. We will visualize the data to show our data current shape.
6. Then we will evaluate our linear regression algorithm to predict the temperature.
7. We will validate our dataset, we will split our data set into training and testing dataset. 80% of our data we will use train our dataset and 20% of our data will be used for the testing the validation of our dataset.
8. We will use 10 cross fold validation for estimating accuracy.
9. We will use linear regression sample algorithm for our data accuracy prediction.

Year	Month	Day	Dew Point Temp.	Max Temp.	Min Temp.	Avg. Temp.
1988	January	1	14	26.7	14	19
.....
1997	January	1	13.4	26.8	12	19.6
2007	January	1	10	11.3	25	10.5
2017	January	1	16	26.8	11.3	20.6

Table-1. Input training data sheet of Dhaka district January month last 30 years

Here given table is the sample data set of our weather temperature for last 30 years; we use Bangladesh metrological department data to make prediction of our temperature. We only use Dhaka city temperature data set for testing and training our dataset.

3.4 Logical Data Model

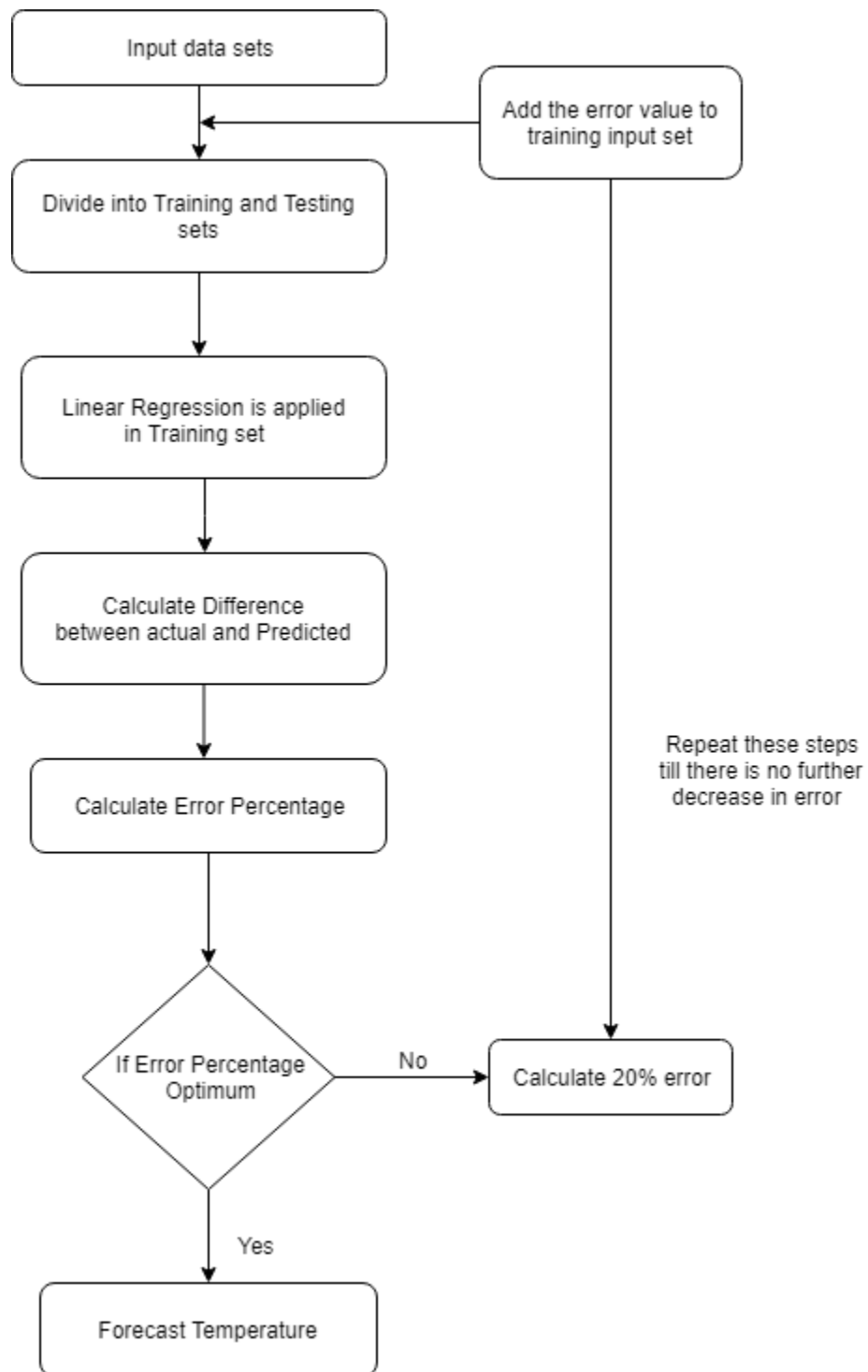


Figure: 3.1 Logical Data Model

CHAPTER 4

RESULT AND ANALYSIS

4.1 Introduction

For our research purpose, we use python script language and various algorithms of python to read the dataset and get the predicted result.

4.2 Linear Regression Algorithm Applying Procedure

At first we will peruse the temperature informational index. At that point will clean the informational index and evacuate all the inadequate information. Since we have experienced the means to choose factually important indicators (highlights), we can utilize SciKit-Figure out how to make a forecast model and test its capacity to foresee the mean temperature. SciKit-Learn is an extremely entrenched machine learning library that is generally utilized in both industry and the scholarly community. One thing that is exceptionally noteworthy about SciKit-Learn is that it keeps up an extremely steady Programming interface of "fit", "foresee", and "test" crosswise over numerous numerical methods and calculations which makes utilizing it exceptionally straightforward. Notwithstanding this predictable Programming interface plan, SciKit-Learn additionally accompany a few helpful devices for handling information basic to many machine learning venture. The following move to make is to fabricate the relapse display utilizing the preparation dataset. To do this I will import and utilize the Direct Relapse class from the `sklearn.linear_model` module. As referenced beforehand, scikit-learn scores significant ease of use extra focuses by executing a typical `fit()` and `foresee()` Programming interface over its various numerical methods which makes utilizing the library exceptionally easy to understand.

4.3 Visualization & Result of Our Data

We will have to find out the visual relations between the data and others aspects of the process.

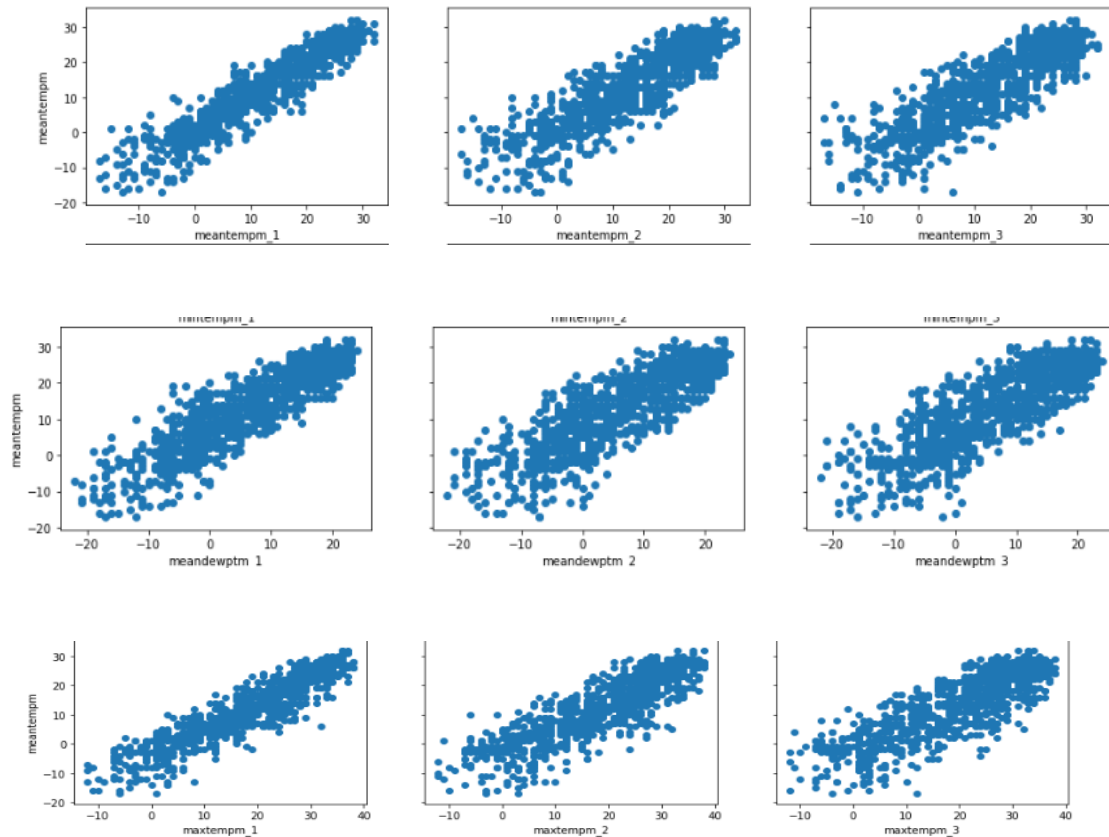


Fig. 4.1: Relations between max. min. and dew point temperature

Our predicted temperature accuracy is above 90 % accurate and the total error rate of mean absolute error and median error is also very low.

```
The Explained Variance: 0.90  
The Mean Absolute Error: 2.69 degrees celsius  
The Median Absolute Error: 2.17 degrees celsius
```

Fig 4.2: Predicted result, mean and median error

CHAPTER 5

CONCLUSION & FUTURE SCOPE

5.1 Conclusion

Temperature is the significant reason for a large number of the catastrophic events like glimmer surges, dry seasons, waves. So as to keep these characteristic cataclysms, we ought to be ready to foresee the reason for the source. The proposed framework can be utilized to gauge the temperature over the required period with the goal that the individual specialists can take precautionary measures to keep the death toll and property. The proposed framework utilizes changed straight relapse way to deal with foresee the temperature that has less mistake rate than contrasted with most information mining methods like bunching, back spread which gives the summed up qualities instead of gauge esteems.

5.2 Future Scope

We use temperature data for weather prediction of Bangladesh. We use max, min, dew points temperature of a particular district for our data analysis. We use only linear regression technique; we can further use multiple regressions, support vector machine and artificial neuron network. Then we can make a comparison which of the algorithm is better suit for our data. In future we can improve our system by adding rainfall prediction, wind prediction and also many other factors to make our projects more accurate the predict the weather.

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