

Weather Forecast Application

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Abstract- The prediction and forecasting system application has been developed to help humans worldwide to predict historical temporal weather data in their respective region. This system is developed with the goal to supplement the productivity of already available website of India meteorological department. The system is flexible enough to predict current data. It also presents multiple weather scenarios to predict weather data. The weather data which is predicted is available from 1960 to 2010 from different weather stations, maintained by the India Meteorological Department.

I.INTRODUCTION

Over the period of time numerous weather data analysis and forecasting systems have been developed and created. Learning the change in climate is now deliberated as the major concern of many government agencies. For this purpose, many organizations are using data prediction tools to plot the evolution of inconsistent weather conditions and other environmental sensations. A technique for making pictures, outliers, or movements to impart a message is prediction. Depiction through visual symbolism has been a viable approach to convey both conceptual and solid thoughts since the beginning of mankind. The term data prediction portrays any push to individuals to figure out the importance of information by describing it in a visual setting. Trends, patterns and relations that may go unnoticed in content based information, can be shown and perceived simpler. Now a days information perception devices go past the standard diagrams already generated from previous data. Mostly figures utilized as a part of Excel spreadsheets, info graphics, dials and gages, geographic maps, Spark line, warmth maps, and definite bar and pie graphs. The pictures may include intelligent aptitudes, empowering clients to direct them or drill into the information for questioning and investigation. Prediction is used in many fields

including air traffic concept analysis and weather data predictions.

2. WEATHER OBSERVATIONS

This section describes the data provided by India Meteorological department. The parameters for which observations have been provided are temperature, wind speed, rainfall and humidity. Met office India observes these parameters on different times on a daily basis. the activity diagram of the web-based system we have developed for weather prediction. The process starts with the user having choice of selecting single station or multiple stations. Next step includes selection of single date or a range of dates. Now the parameter selection for which the user wants to see the predictions, such as temperature, wind, rainfall or humidity. He will be shown the prediction based on the input he has given. For storing the previously stored data SQL server has been used. We have performed arithmetic operations on the data of the database for the use in specific situations like calculating the average temperature. Predictions are shown using images, animations, graphs etc. Data will be retrieved from the database and the prediction will be generated according to that data. The user will be allowed to see the details of that location. If the data is not present for a situation then the user will be shown that the record is not found. Graphs will be generated for long term forecasting. In this application Open Weather Map API is used to show the location of the weather station(s).

2.1 System Architecture

This section describes the architecture of the system. The infrastructure of the whole application is defined that how the application will move ahead and will reach its goal i.e. the resulting scenario. Architecture of the system for weather prediction will be three

layered. Partitioning the system into three layers is more beneficial and attractive. It will be easier to design, use and change data in the system with the mentioned architecture. The 3 layers of the system are as follows:

2.1.1 Presentation Layer:

This is the top-most layer; functions like taking input from device or from any database are performed here. It will send the data to the next layer for more operations. Basic purpose of this layer is to make the interaction successful between user and system.

2.2.2 Business Logic Layer

This is the middle layer; it accepts data from the top layer (Presentation Layer) and applies basic operation on data and calculate the results of processing operations. It also moves data among both (top and bottom) layers.

2.2.3 Data Access Layer

Processed information is stored to the database. Data is stored or accessed to or from data base and processed information is kept to the database for user to get results.

3. PREDICTION AND FORECASTING

We have different weather parametric data. The available data covers four main domains related to weather: Humidity, Temperature, Wind Speed and Rainfall. Then further we will forecast the future trends of weather on the basis of past meteorological data.

Data can be viewed against four different types of scenarios/conditions. The scenarios are as follows:

1. Single place single point in time weather prediction
2. Multiple places single points in time weather prediction
3. Single place multi points in time weather prediction
4. Multi places multi points in time weather prediction

3.1 Weather Data Forecasting

3.1.1 Short Term Forecasting

We have used Weather API for performing short term display of temporary details about weather of entered location. It shows the daily weather for any entered region, depicting the maximum and minimum temperature of day & night, information like

humid, wind and weather symbol for pictorial representation. The 2 or 3 days for the sites within the areas of a number of purposes of short-range prediction today is to supply numerous users with data on the anticipated weather over forthcoming million sq. kilometres to take necessary precautions beforehand and thus to cut back the harm of adverse weather.

3.1.2 Long Term Forecasting

For long term forecasting we have used linear regression and decision tree regression. Linear regression is a mathematical technique that is used for finding the straight line that best-fits the values of a function that is linear for the axis. It is plotted on scatter graph as different data points of the database. When 'best fit' line of the relation is searched, it is used for the base for estimating and predicting the future values of the function. We do so by extending it without disturbing the slope of axis. It always uses 2 variables to analyse the data. One variable is taken as independent variable and the other is dependent variable.

Independent variable is also taken as explanatory variable and affects the values of dependent variable. To use the linear regression, it is required to look for the relationship between different parameters. In long term forecasting we have predicted the weather trend of next few years on the basis of previous 30 years of data.

For weather trends we have used the twenty four values for every year minimum value for each parameter in every month and maximum value for each parameter in every month. Our parameters are the as it as discussed before, for example: humidity, wind, rainfall and temperature. Each parameter has 3 values within 24 hours at 12pm at 3pm and at 12am. For regression we must have an independent and dependent variable and these parameters should have some relationship between them.

Relationship among different - different parameters that is used in forecasting is as follows: Humidity depends upon rainfall. Temperature depends on average humidity. Rainfall depends on average temperature. Wind speed depends on average temperature. To use linear regression equation, first step is to determine if there is a relationship between the two variables.

The equation has the form as follows:

$$Y = aX + b$$

X represents the independent variable of figure and Y is the dependent variable of model. If X is plotted on X-axis and Y is plotted on Y-axis then b should be the slope of the line and a is the intercept of model. To calculate a and b following equations are used:

$$a = \frac{(\sum Y)(\sum X^2) - (\sum X)(\sum XY)}{n(\sum X^2) - (\sum X)^2}$$

$$b = \frac{n(\sum XY) - (\sum X)(\sum Y)}{n(\sum X^2) - (\sum X)^2}$$

4. RESULT & DISCUSSION

4.1 Prediction System

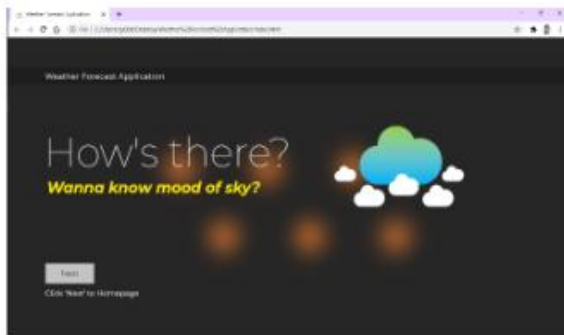


Figure 1: Landing Page of Application

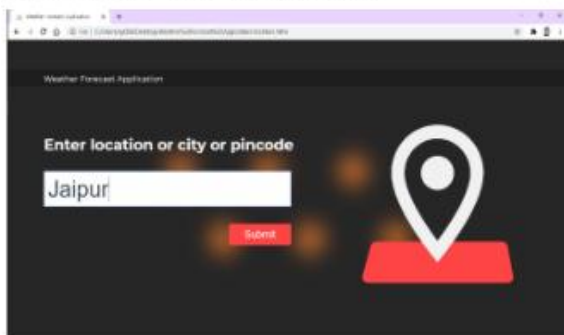


Figure 2: Location Page of Application



Figure 3: Main Application of Weather Forecast App.

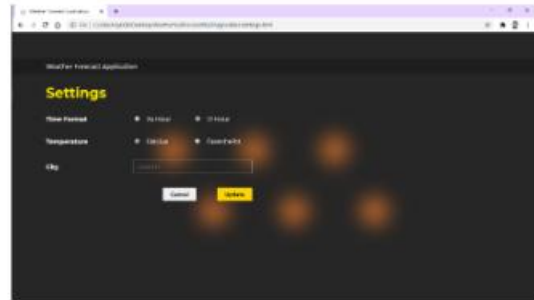


Figure 4: Settings & Configuration Page of Application

5. CONCLUSION

This paper describes a web-based interactive application for prediction and forecasting. All the stages of development of the system are already discussed and well mentioned. The data-set was taken from Meteorological Department which contained multiple parameters such as wind speed, temperature, humidity and rain fall, min-max temperature. After a detailed background study and work on the project, it became clear that weather prediction is a challenging and sensitive problem. Making clear and understandable predictions needs careful contemplation and analysis. The Weather Forecast Application may assist experts and farmers in the process of finding patterns and relationships in weather data and Weather of upcoming days in advance.

REFERENCE

- [1] 1.Nargis BIBI, Zainab KAZMI, Bisma JAVED, Amber SHAMIM, Sadaf ABDUL RAUF/ GU J Sci, 30(4): 152-161 (2017)