



PREDICT CLIMATE CHANGES

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Abstract: Weather forecasting helps meteorologists predict future weather. They look at temperature, wind, humidity, and rainfall data. This experiment analyzed only temperature and humidity. A DHT11 sensor collected these values from a certain area. A Raspberry Pi stored the data in the cloud using an Ethernet shield. The cloud data was made into CSV, JSON, and XML files for analysis. Looking at how temperature and humidity change together helps predict future values. Some sentences were long and complex, others short and simple. The ARIMA model best for predicting time data forecasted upcoming values. Our app alerts people weather conditions and upcoming disasters. This lets affected people take steps to safeguard themselves and property. The alerts aid analyzing data helpful many growing areas like health, weather, learning, farming, media, and online buying.

Keywords – DHT11 sensor, ARIMA, CSV, XML files, java program etc.

I. INTRODUCTION

The weather man tries to tell what will happen with the sky. They look at lots of tools and computers. Satellites in space, radar machines, balloons, and things on the ground all give weather info. Meteorologists work hard to make sense of the puzzle of air and clouds. They want to know how hot it will be, if it will rain, and which way the wind will blow. This helps them make the computer models better. Now we can understand storms and such a bit more each day. As society becomes increasingly dependent on timely and precise weather information, the continuous refinement of forecasting techniques remains pivotal in mitigating the impact of extreme weather events and supporting informed decision-making across various sectors. This report delves into the intricate landscape of weather forecasting, examining the methodologies, technologies, and ongoing advancements that underpin our ability to decipher and forecast the ever-changing atmospheric conditions.

Weather predicting is a big part of weather science. It uses new tools, close looks at what's happening now, and hard math models. At its core, this field tries to solve the tricky and changing pieces of our air around Earth. It gives us useful clues about what the weather will do next and how it affects our everyday world. Weather forecasting relies heavily on the integration of data gathered from a multitude of tools. High-flying satellites offer a panoramic perspective, capturing detailed images and information on important variables such as cloud cover, temperature fluctuations, and atmospheric makeup. Radar equipment provides timely updates on precipitation movements. For a more complete understanding, weather balloons traverse different layers of the atmosphere, collecting vital data on temperature, humidity, and pressure. And on the ground, precise instrumentation diligently records a range of meteorological indicators. Incorporating both observation and advanced computational models, weather forecasting wields a formidable influence. Through intricate numerical simulations, meteorologists can accurately mirror the intricate atmospheric processes. These sophisticated models, rooted in principles of fluid dynamics and thermodynamics, provide insights into a range of weather phenomena, from temperature fluctuations to precipitation patterns and the ever-changing dynamics of wind.

The constant drive for precise weather forecasting is driven by a never-ending desire for technological advancement. As our computing capabilities evolve, we are able to construct more intricate models that take into account a wide range of factors. This pursuit becomes increasingly vital as our global communities rely heavily on accurate and timely weather forecasts to guide important decisions in fields such as agriculture, transportation, emergency response, and urban development. As you delve into the following pages, this report immerses you in the complex world of weather forecasting. Discover the various methodologies, technologies, and continuous advancements that enable us to decipher and predict the constantly evolving atmospheric conditions. Through this deep dive, we aim to bring to light the intricacies involved in this scientific pursuit and showcase the significant impact weather forecasting has on our comprehension of the natural world and our ability to adapt to its ever-changing nuances.

2. LITERATURE SURVEY

Weather forecasting is a complex and demanding task that has long intrigued scientists due to its practical importance and relevance in both popular culture and the field of meteorology. The unpredictable and ever-changing nature of weather, coupled with the sheer amount of data involved, makes it a challenging and invigorating pursuit. Meteorological services across the globe are constantly tasked with the responsibility of accurately predicting the weather, a task that requires sophisticated techniques such as time series data manipulation. A variety of techniques, ranging from statistical decomposition models to exponential smoothing models, have been utilized both in India and abroad, such as the seasonal ARIMA and vector ARIMA models, showcasing the continuous quest for improvement in this critical operational field. Numerous trainings have been conducted to analyze the patterns and distribution of rainfall across various regions of the world. Various time series methods have been employed in numerous literature sources to investigate weather data for different purposes. Achieving precise and timely weather forecasts remains a significant challenge in the realm of scientific research. Weather prediction modeling relies on a combination of computer models, observations, and understanding of trends and patterns. By utilizing these methods, highly accurate forecasts can be generated. Regression, a statistical experimental technique, plays a crucial role in various fields such as business, behavioral sciences, social sciences, and climate forecasting, among others.

Chiew and colleagues (1993) compared six different modeling techniques for simulating daily, monthly, and yearly streamflow in eight diverse catchment areas. After thorough analysis, the team found that time-series methods yielded satisfactory results for approximating monthly and annual water supply in these catchments.[1]

Seyed, Shamsnia, Naeem, and Ali (2011) delved into the weather parameter through the use of various random methods, specifically the ARIMA model. They focused on Abadeh station in Iran as a case study to illustrate their findings.[2]

Langu (1993) implemented a unique method that utilized statistical analysis to identify shifts in weather and runoff trends, in order to investigate key changes within a multitude of weather indicators.[3]

During the 1970s, **Box and Jenkins (1994)** were innovators in creating statistical methodologies for representing data in a single variable, which is now commonly known as Univariate Box-Jenkins (UBJ) ARIMA modeling. [4]

Kuo and Sun (1993) proposed an intervention model to address the unusual events caused by typhoons and other weather anomalies in the Tanushi region of Taiwan. Through their investigation and synthesis, they aimed to provide a reliable 10-day stream flow forecast.[5]

3. PROPOSED SYSTEM

Experience accurate and convenient weather updates with our web-based application. Simply enter your desired location and our system, using your browser and server settings, will automatically generate complete weather forecasts. From temperature and wind direction to humidity levels, our geographical locator has got you covered. Our innovative software also includes wind speed, cloud cover, and precipitation data, catering to the needs of individuals worldwide.

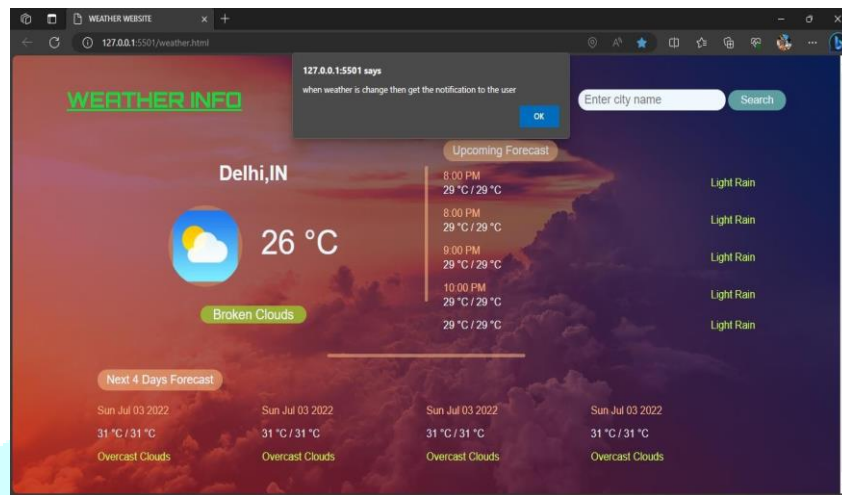


Figure 3.1 Home Page of Weather Forecast (Delhi, INDIA)



Figure 3.2 Home Page of Weather Forecast (Basic)

When a user inputs the current temperature, humidity, and wind, the system will use this information to predict the weather by referencing previous data in the database. The administrator's responsibility is to input previous weather data into the database to aid in the system's forecasting. By considering factors such as temperature, humidity, and wind from past records, the weather forecasting system is able to make reliable predictions.

4. METHODOLOGY

Our mission is to create state-of-the-art software that accurately predicts weather patterns, including wind speed, cloud cover, and precipitation, to serve the global community. This is especially crucial in developing countries like India, where the agricultural sector is a major contributor to the economy. Therefore, it is imperative that our weather forecasting technology is not only precise, but also easily accessible to the general public. To ensure the highest level of accuracy, we gather data from reliable open sources spanning from 2013 to 2019. Our team used JavaScript as the programming language of choice to bring this vision to life.

Machine Learning: Linear regression is a commonly utilized and fundamental predictive tool in data analysis. Its estimations allow us to gain insight into the relationships among multiple independent and dependent variables. Visually, the best-fit line of the regression model precisely captures the collective data points. This line is commonly referred to as the regression line.

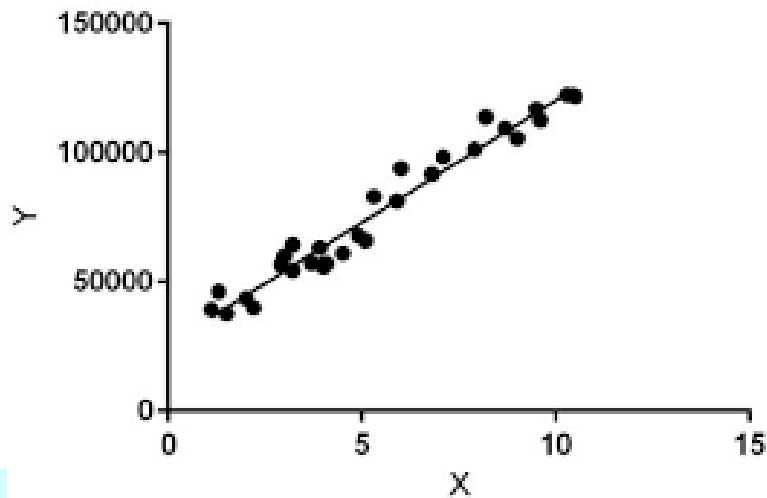


Figure 4.1 Example of Linear Regression Line

JavaScript: JavaScript is a highly versatile, interpreted programming language that excels at creating network-centric applications. It's designed to work seamlessly with Java, making it an indispensable tool for web development. One of its most attractive features is its seamless integration with HTML, making implementation a breeze. Not only is it open and cross-platform, but mastering JavaScript opens up endless possibilities for developing cutting-edge front-end and back-end software using various JavaScript-based frameworks like jQuery and Node.JS. This makes it the go-to language for building interactive websites.

HTML: HTML is commonly used to create web pages that can be viewed in a web browser. With the help of Cascading Style Sheets (CSS) and scripting languages like JavaScript, HTML ensures a smooth browsing experience. Web browsers retrieve HTML documents from a web server or local storage, and then use them to generate multimedia pages. HTML not only dictates the structure of a webpage, but it also provides instructions for its appearance.

CSS: When it comes to web content, CSS (Cascading Style Sheets) takes the main stage in defining its visual presentation and layout. Despite not directly providing weather forecasting data, CSS is essential in showcasing and organizing weather forecast information on a webpage.

Weather API: Weather APIs serve as powerful tools, providing access to vast databases filled with current and historical weather data. With this wealth of information, you can easily obtain basic weather updates such as current conditions, forecasts, UV index reports, and even historical data. Simply input the city's name or geographical coordinates, and the weather API will provide you with accurate location-specific information.

5. RESULTS & DISCUSSIONS

By seamlessly integrating with browser settings and server configurations, the location identification mechanism has demonstrated exceptional effectiveness. Users can now enjoy the convenience and accuracy of having their geographical location automatically identified. This powerful feature greatly enhances their overall experience by providing personalized weather reports tailored to their specific location of interest.

This application excels in weather data collection, showcasing its impressive strength and dependability. Through seamless integration with esteemed meteorological data sources, the system equips users with timely and precise weather updates. The consistent stream of updates further solidifies the trustworthiness of this forecasting system, empowering users to make well-informed choices based on the most up-to-date weather readings. The forecasting feature in the app is highly notable for its precision and complexity. By

incorporating numerical weather prediction models, it delivers accurate forecasts for essential variables like wind speed, cloud cover, and precipitation. Users can confidently rely on the app for both current weather updates and dependable predictions, empowering them to organize their schedule and adapt to unpredictable weather changes with ease.

The user interface was skillfully designed with a keen emphasis on both ease of use and practicality. By implementing a dynamic display of weather data and interactive maps, users are able to actively engage with the app. Furthermore, the inclusion of personalized user profiles and alerts for severe weather situations truly puts the needs and satisfaction of each individual user at the forefront, resulting in a positively customized experience overall.

The Web-Based Weather Forecasting Application boasts a powerful and adaptable stack of HTML, CSS, JavaScript, Node.js, Express.js, and MongoDB. Thanks to its cloud-based infrastructure, it maintains optimal efficiency and seamlessly manages user requests, even during periods of heavy usage. Moving forward, our focus will be on elevating the accuracy of our forecasting models, broadening the spectrum of available weather parameters, and incorporating valuable user input to drive ongoing enhancement. Globally, this application continues to be a trusted and indispensable resource, delivering precise, up-to-the-minute weather data tailored to meet the unique needs of users.

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