


Chapter 4

Analysis of Arima Model for Weather Forecasting in the Assam District

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ABSTRACT

Weather forecasting is a scientific method that involves the prediction of atmospheric conditions at a specific geographic location. The increased volatility over the last decade is owing to an enormous rise in water used for irrigation application throughout agricultural area, much of which evaporates, necessitating accurate forecasting in order to take essential safeguards. In this chapter, an attempt is made to predict the average temperature and maximum temperature through machine learning models. The daily temperature data from 1970 to 2022 were collected from the National Centre of Environmental Information (NCEI). The ARIMA model is used to predict the weather data sets of Tezpur, Assam. Previous conventional models are insufficient to predict forecasting precisely. So statistical models and auto-regressive models are programmed and compared.

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1. INTRODUCTION

Forecasting weather is the technique of estimating the present condition of the climate for a certain location using an array of meteorological factors. From individual decision-making to large-scale industrial planning, weather forecasting is a vital instrument that supports many aspects of human existence and societal processes. Accurate forecasting has a major impact that extends to the energy industry. It helps in the improvement of power generation and distribution by effectively controlling demand changes. Tezpur is located very near to the Himalayan foothills. The Himalayan range of mountains has the potential to affect local weather patterns (Sharma, et al., 2009). MAPPLS View of Tezpur city and nearby areas affecting the weather formation is shown in Figure 1. Apart from Himalayan influence, the Brahmaputra rivers have the ability to impact humidity levels and play a role in the development of regional weather patterns. Tezpur is located at a modest altitude, and altitude can influence temperature and air conditions.

(Zaw & Naing, 2009) introduced a model for rainfall prediction that utilized multi-variable polynomial regression and then compared the model performance to that of multiple linear regression. Short-term weather forecasting can be conducted using statistical models, which are linear. Weather prediction is possible using statistical forecasting by using historical weather data. (Anusha, et al., 2019) suggested that statistical model called linear regression is used to determine whether dependent and independent variables have a linear relationship. The best-fit line is what the linear regression seeks to identify. A line that covers the greatest number of points with the least amount of error is considered the best-fit line. The algorithm of gradient descent is employed to minimize the error to the greatest extent feasible. Since multiple linear regression involves more than one independent argument, it differs from simple linear regression. (Obeidat, et al., 2020) investigated that there will not be much temperature shift and quantified the error that results from defining a naive prediction that assumes every change will be zero. Similarly for predicting wind speed in the short term, (Yang & Yang, 2020) suggested hybrid Bayesian Ridge Regression (BRR) - an ensemble empirical mode decomposition (EEMD) approach was presented. Several other methods for weather forecasting have been applied by various researcher to obtain a low forecasting error.

1.1 Research Motivation and Application

Data obtained from global navigation satellite system are uncomplicated and economical methods preferable for low power low tech networks (Guerra, et.al., 2024). In this chapter, an attempt has been made to examine the forecasting techniques used to anticipate seasonal and short-term weather variations in Tezpur, India

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