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Analysis of the interrelationship between weather parameters in Colombo area

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Colombo serves as the administrative, legal, and primary urban hub of Sri Lanka in terms of population. Its metropolitan vicinity houses around 5.6 million residents, with 752,993 within the Municipality. The city of Colombo is renowned for its tropical climate, characterized by consistently high average temperatures, substantial annual rainfall, and other meteorological factors. This study attempted to investigate the variations in the weather parameters and to model the interdependencies among those variables. The correlations of five weather parameters between January 2007 and May 2022 were analysed based on the monthly data collected from the Department of Meteorology in Colombo area. Rainfall, Minimum Relative Humidity, Maximum Relative Humidity, Wind Speed, and Temperature were considered in this study. Investigation of the correlation among various weather parameters holds paramount importance in understanding the intricate dynamics of Colombo's climate. A seasonal pattern was found in Minimum Relative Humidity, and high fluctuations were observed in Wind Speed and Rainfall out of the five weather parameters under study. Further, the study concluded that there is a moderate positive correlation ($r = 0.5$) between Rainfall and Minimum Relative Humidity and as well as between Rainfall and Maximum Relative Humidity ($r = 0.7$). A moderate negative relationship ($r = -0.5$) between Wind Speed and Maximum Relative Humidity is also found in this case study. In this research, vector autoregressive (VAR) models were employed to capture the relationships among weather parameters which indicated the presence of Granger Causality. According to the Granger Causality test it was found that Minimum Relative Humidity can be used in predicting the other four parameters i.e., Rainfall, Maximum Relative Humidity, Wind Speed, and Temperature. Maximum Relative Humidity can be used in predicting the Minimum Relative Humidity, Wind Speed, and Temperature. Also, Wind Speed can be used in predicting all other four weather parameters concerned in this study. It has been found that monthly average Temperature has the potential to serve as a predictive factor for all three of the weather parameters except Wind Speed under consideration in this investigation.

Keywords: Correlation, Cross Correlation, Granger Causality, VAR Model