A deep learning approach for prediction of SARS-CoV-2 cases using the weather factors in India

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Abstract

Advanced and accurate forecasting of COVID-19 cases play a crucial role in management of hospital facility, policy decision, logistic support, and economy of the country. Artificial Intelligence (AI) techniques have proved its capability in time series forecasting of the non-linear problems. The present study assessed the relationship between weather parameters and COVID-19 cases and found the specific humidity have strong positive association, maximum temperature have negative and minimum temperature have positive association in most of the states in India. Further, we have developed a weather integrated LSTM (long short term memory) models for advanced (1-14 days) forecasting of the COVID-19 cases over different states in India. To achieve the goal we have utilized the humidity and temperature time series data along with the COVID-19 confirmed cases data (1st April-30th June 2020) to optimise the LSTM model in univariate and multivariate modes. The optimised models are utilized to forecast the COVID-19 cases for the period 1st July, 2020 to 31st July 2020 with 1 to 14days lead time. The results shows that the univariate LSTM model (past COVID-19 input) have reasonably good skill (Relative Error $< 20\%$) in short range forecast (1day lead) for most of the selected states, whereas the skill is degraded with the medium and long range forecast. The major finding of the current study is that the medium range (1-7days) forecasting skill is enhanced in some of the states with the weather integrated multivariate LSTM models. The states (Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, Haryana, and Punjab) located in West and North West India region, humidity play a key role in enhancement of medium range forecasting skill of the LSTM model. It is also observed that the states located in high humid regions (Kerala, Tamil Nadu, and West Bengal) temperature plays a key role in model enhancement.

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