A Novel Deep Learning Approach for Capturing Time Series Dependencies and Improving Short-term Weather Forecasting

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Weather forecasting is a critical and challenging task that requires accurate predictions based on historical data and intricate dependencies between time series. Traditi... **View more**

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Abstract:
Weather forecasting is a critical and challenging task that requires accurate predictions based on historical data and intricate dependencies between time series. Traditional neural networks, such as Back Propagation through Time (BPTT) trained RNNs, struggle to effectively capture these dependencies, leading to suboptimal performance in weather forecasting. In this study, we suggest a novel Integrated_Stack based Bi-LSTM Model, which associations the strengths of LSTM and Bi-LSTM networks, to address these limitations and enhance the accuracy of short-term weather predictions. The primary objective of this research is to develop a versatile deep learning model capable of maintaining long-term dependances and reading any length of sequence, while simultaneously providing real-time short-term weather forecasts. To achieve this, the Integrated_Stack based Bi-LSTM Model is designed to exploit the versatility and non-linear adaptive processing ability of neural networks. The proposed model's architecture involves the integration of LSTM and Bi-LSTM layers. By incorporating both forward and reverse direction processing, the model gains a comprehensive understanding of complex patterns present in time-series data. This bidirectional approach enables the model to capture dependencies effectively, which is essential for accurate weather predictions. To estimate the presentation of the Integrated_Stack based Bi-LSTM Model, we conducted experiments using real-world weather data. We compared the model's predictive capabilities against traditional LSTM models and other state-of-the-art

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weather forecasting methods. The assessment metrics included accuracy, root mean square error (RMSE), and mean absolute error (MAE).

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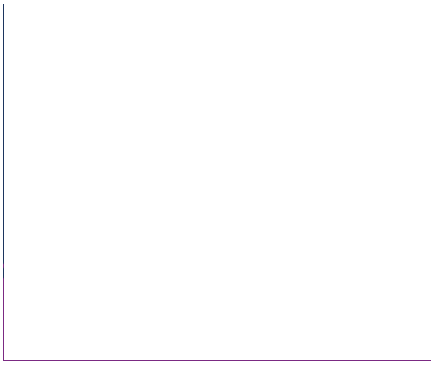

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