MLKD 2024
The First International Conference on
Machine Learning and Knowledge Discovery
Amirkabir University of Technology, December 18-19, 2024

Climate Forecasting by Bidirectional Recurrent Neural Networks

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Abstract

Regression problems have been extensively studied and addressed using a variety of algorithms and models, including both statistical and machine learning-based approaches. One notable application of regression tasks is in predicting weather conditions, which has significant implications for various sectors. To enhance the accuracy of real-valued predictions in time series or sequential data, memory-based models are particularly effective. Among these, Bidirectional Recurrent Neural Networks stand out because they learn from both past and future data points. Bidirectional learning approach allows for more precise parameter tuning and improved predictive performance. This study focuses on three specific types of Bidirectional Recurrent Neural Networks: Bidirectional Recurrent Neural Network, Bidirectional Long Short-Term Memory, and Bidirectional Gated Recurrent Unit. The primary objective is to investigate and compare their performance in regression tasks. Through a comprehensive analysis, the models are trained on a relevant dataset and evaluated based on their ability to adapt and fit the data and predict unseen values. The findings of this study provide worthwhile intelligence into the efficiency of each model, regarding the advancement of memory-based approaches in regression tasks. The Bidirectional Gated Recurrent Unit model has demonstrated desirable performance, achieving a high R^2 score of 0.93233. This indicates a highly acceptable level of modeling accuracy.

Keywords: Bidirectional RNN, Climate Forecast, and Regression

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