

Short-term spatio-temporal forecasting of air temperatures using deep graph convolutional neural networks

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Abstract-

Time series forecasting of meteorological variables, such as the hourly air temperature, has multiple benefits for industry, agriculture, and the environment. Due to the high accuracy required for the associated short-term predictions, traditional methods cannot satisfy the requirements and generally ignore spatial dependencies. This paper proposes a deep Graph Convolutional Long Short Term Memory Neural Network (GCN-LSTM) technique to tackle the time series prediction problem in air temperature forecasting. In the proposed methodology, temporal and spatial-based imputation approaches have been employed to recover the weather variables missing values. The proposed approach is validated using real, open weather data from 37 meteorological stations in Spain. Performed analysis indicates that GCN-LSTM showed superior performance when compared with various state-of-the-art Deep Learning based models found in the literature, resulting in a more robust and computationally efficient model for forecasting air temperature in many meteorological stations simultaneously.

Index Terms- Air temperature forecasting; Short-term forecasting; Deep learning; Deep graph convolutional neural networks; Missing values imputation

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