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Long term temperature prediction model based on a long short-term memory neural network in missing data condition

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Nowadays, global warming not only intimidates humankind but also threatens the ecosystem due to its unpredictability. The ecosystem has warned about its vulnerability, and the need for long-term climate prediction has become indispensable. To build a long-term prediction model, a huge number of training data need without any flawlessness. However, there is a limitation of climate data that once it passed, we could not measure. Thus, the data are apt to be defective. This paper proposes a new long-term temperature prediction model based on a deep neural network, where some defective weather data obtained from a location are calibrated by using those from other locations. Since temperature is seasonal, we use a long short-term memory (LSTM) neural network which is a kind of recurrent neural network (RNN) known as suitable for a very long period of data. In order to predict weather data in advance up to two weeks, the proposed model is trained using actual weather data that are collected in an hourly basis for 36 years (from 1981 to 2016) of 11 different locations of South Korea, including hourly-based measurements for temperature, relative humidity, wind speed, wind direction, precipitation, and accumulated prediction. In particular, when some data are missing, they are filled with those estimated from the refining model. After that, the model is trained again using the refined data. The performance of the proposed LSTM-based model is measured in terms of the root-mean-squared error (RMSE) between actual temperatures and their predicted ones. Consequently, it is achieved that the RMSE averaged over 11 locations is about 2.29 degrees for two weeks prediction. Although the proposed model is applied to refining weather data here, this approach can also be applied to other weather data. Furthermore, the proposed model can be extended to an air pollution prediction model against global warming.

Biography

Inyoung Park is pursuing her PhD in School of Electrical Engineering and Computer Science, Gwangju Institute of Science and Technology, South Korea. She has received her BS degree in Computer Application from the Bangalore University in 2015. Her current research focuses on speech signal processing and climate change modeling based on deep neural networks.

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