Air temperature forecasting using machine learning techniques: a review

J. Cifuentes Quintero; G. Marulanda García; A. Bello Morales; J. Reneses Guillén

Abstract-

Efforts to understand the influence of historical climate change, at global and regional levels, have been increasing over the past decade. In particular, the estimates of air temperatures have been considered as a key factor in climate impact studies on agricultural, ecological, environmental, and industrial sectors. Accurate temperature prediction helps to safeguard life and property, playing an important role in planning activities for the government, industry, and the public. The primary aim of this study is to review the different machine learning strategies for temperature forecasting, available in the literature, presenting their advantages and disadvantages and identifying research gaps. This survey shows that Machine Learning techniques can help to accurately predict temperatures based on a set of input features, which can include the previous values of temperature, relative humidity, solar radiation, rain and wind speed measurements, among others. The review reveals that Deep Learning strategies report smaller errors (Mean Square Error = 0.0017 °K) compared with traditional Artificial Neural Networks architectures, for 1 step-ahead at regional scale. At the global scale, Support Vector Machines are preferred based on their good compromise between simplicity and accuracy. In addition, the accuracy of the methods described in this work is found to be dependent on inputs combination, architecture, and learning algorithms. Finally, further research areas in temperature forecasting are outlined.

Index Terms- air temperature forecasting; artificial intelligence; machine learning; neural networks; support vector machines

Citation:
Cifuentes, J.; Marulanda, G.; Bello, A.; Reneses, J. "Air temperature forecasting using

machine learning techniques: a review", Energies, vol.13, no.16, pp.4215-1-4215-28, August, 2020.