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PREDICTION OF WIND ENERGY POTENTIAL USING DIFFERENT ARTIFICIAL INTELLIGENCE TECHNIQUES FOR ISPARTA PROVINCE (TÜRKIYE)

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Abstract

In this paper, artificial neural network (ANN) and adaptive neuro-fuzzy inference system (ANFIS) are applied to forecast the wind energy potential of Isparta province (Türkiye). Wind speed data between 2007 and 2019 taken from eight stations of the Turkish State Meteorological Service in Isparta province (Türkiye) were used for training and test set in ANN and ANFIS methodologies. Eight stations are Uluborlu, Eğirdir, Yalvaç, Aksu, Isparta Center, SDU airport, Senirkent, and Şarkikaraağaç. The wind speed values were analyzed using ANN and ANFIS methodologies. The results of the ANN and ANFIS have been compared for the same data sets. Besides, an empirical formula has been created to estimate the wind speed of Isparta for the future years. The coefficient of multiple determination (R^2) values are 0.995697 for ANN and 0.998818 for ANFIS. Both models achieved very high R² values and it was seen that the estimated wind speed values were largely consistent with the actual values. Root mean square error (RMSE) values were calculated as 0.081358 for ANN and 0.03196 for ANFIS. The ANFIS model has a significantly lower error rate than ANN in terms of RMSE. This shows that ANFIS makes fewer errors in its predictions and its predictions are more accurate. The coefficient of variation (cov) is used to evaluate the variability in the forecast results. The cov value for ANN was found to be 0.115433 and for ANFIS it was found to be 0.045346. The results of paper can help researchers and investors in the wind energy works.

Key words: adaptive neuro-fuzzy inference system, artificial neural network, energy potential, renewable energy, wind energy