Universiti Teknologi MARA

Weather Prediction System Using ANN Algorithm

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ABSTRACT

Agriculture, transportation, and disaster management are just a few industries that heavily rely on weather forecasting. The complexity and non-linearity of atmospheric processes make traditional weather forecast approaches, which rely on numerical models and observational data, particularly difficult to use. Artificial neural network (ANN) algorithms have made significant progress in recent years in terms of increasing the accuracy of weather forecasts. This research gives a thorough investigation into ANN-based weather prediction. The objective of the project is to develop a weather prediction system using artificial neural network (ANN) algorithms and to evaluate its performance and accuracy. The dataset used for this project consists of historical weather data collected from the Kaggle website. The dataset contains 1461 rows and six columns, representing the date, precipitation, maximum and minimum temperatures, wind speed, and weather category of each observation. The weather category has five types: drizzle, rain, sun, snow, and fog. However, since drizzle, snow, and fog have too few observations compared to rain and sun, they are combined into one group. The dataset covers the period from 2010 to 2016 and provides essential information for weather analysis and prediction. The data is preprocessed, labeled, and split into training and testing sets which are 80% for training and 20% for testing. The ANN model consists of three layers with ReLU and softmax activations and is trained using the backpropagation algorithm. The performance of the model is evaluated using metrics such as mean squared error (MSE), root mean squared error (RMSE), mean absolute error (MAE), precision, recall, F1-score, and accuracy. The results show that the model can accurately predict the weather category with an accuracy of 87.37%, a precision of 85.24%, a recall of 87.37%, and an F1-score of 85.10%. The model also has low values of MSE (0.0603), RMSE (0.2455), and MAE (0.1302), indicating a good fit between the predicted and actual values. Overall, this study advances the science of weather forecasting by showing how well ANN algorithms can capture intricate weather patterns.

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