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PREDICTING AIR POLLUTANTS IN URBAN ENVIRONMENTS USING ARTIFICIAL NEURAL NETWORK MODELS

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Abstract

Air quality monitoring is crucial for human health and environmental sustainability, particularly in large cities where daily human activities contribute significantly to air pollution. This study evaluates the concentrations of air pollutants, specifically PM_{10}, CO_2, and SO_2, under varying environmental and social conditions using Artificial Neural Networks (ANN). Data were collected from three major cities in Jordan, considering variables like wind speed, temperature, humidity, population, and the number of vehicles. The ANN model was developed to predict pollutant concentrations based on these parameters. The results showed that CO concentration had the highest correlation with environmental parameters, yielding a mean squared error (mse) of $7.2x10^{-3}$ and a correlation coefficient (R^2) close to 1. The ANN-derived equation for CO demonstrated the model's strong predictive capability. Other pollutants, such as NO_2, O_3, and PM_{10}, showed varying degrees of accuracy, with PM_{10} having the weakest correlation. This study highlights the potential of ANN models for cost-effective air quality prediction in urban environments lacking extensive monitoring infrastructure. Future research should focus on refining the models for pollutants with lower correlations and integrating more diverse data sources to enhance predictive accuracy across different urban settings.

Key words: air pollution monitoring, ANN, CO_2 concentration, environmental parameters, PM_{10}, urban air quality prediction

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