ABSTRACT

The number of subway passengers is an important indicator for transportation planning and operational management in large metropolitan cities such as New York. Accurate prediction of passenger volume helps operators assess capacity requirements, optimize scheduling, and respond effectively to changes in demand. This study implements a Feedforward Neural Network (FNN) optimized using a Genetic Algorithm to predict the daily number of passengers using public transportation in New York. The Feedforward Neural Network is selected for its ability to model complex nonlinear relationships in time-series data, while the Genetic Algorithm is employed to perform a global search in optimizing network weights, thereby reducing the risk of convergence to local optima. Historical daily data from January 1, 2021 to January 9, 2025 are utilized and divided into training data (80%) and testing data (20%). The optimization process evaluates various configurations of network architecture, population size, mutation rate, and crossover operators. Experimental results indicate that the best-performing architecture uses lags of 1, 2, 3, 5, 6, and 7 with three hidden layers consisting of 11, 13, and 11 neurons, respectively, yielding the most optimal performance. The model demonstrates higher accuracy compared to a non-optimized approach, which tends to produce more fluctuative predictions with higher error rates. Evaluation results show a MAPE value of 10.22% on the training data and 16.82% on the testing data, indicating good predictive capability. The best model is then used to forecast the next six periods, producing passenger volume estimates that realistically reflect demand patterns. This approach highlights the potential of an FNN optimized with a Genetic Algorithm as a reliable decision-support tool for transportation planning in the context of dynamic urban mobility.

Keywords: Passenger Prediction, Feedforward Neural Network (FNN), Genetic Algorithm, Optimization, Public Transportation