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Acta Medica Iranica

2009;47(4) : 74-84

Original Article

Comparison of Neural Network and Principal Component-Regression Analysis to Predict the Solid Waste Generation in Tehran

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Received: June 10,2008

Accept : December 20,2008

Available online: April 6,2009

Abstract:

Background: Municipal solid waste (MSW) is the natural result of human activities. MSW generation modeling is of prime importance in designing and programming municipal solid waste management system. This study tests the short-term prediction of waste generation by artificial neural network (ANN) and principal component-regression analysis.

Methods: Two forecasting techniques are presented in this paper for prediction of waste generation (WG). One of them, multivariate linear regression (MLR), is based on principal component analysis (PCA). The other technique is ANN model. For ANN, a feed-forward multi-layer perceptron was considered the best choice for this study. However, in this research after removing the problem of multicollinearity of independent variables by PCA, an appropriate model (PCA-MLR) was developed for predicting WG.

Results: Correlation coefficient (R) and average absolute relative error (AARE) in ANN model obtained as equal to 0.837 and 4.4% respectively. In comparison whit PCA-MLR model (R= 0.445, MARE= 6.6%), ANN model has a better results. However, threshold statistic error is done for the both models in the testing stage that the maximum absolute relative error (ARE) for 50% of prediction is 3.7% in ANN model but it is 6.2% for PCA-MLR model. Also we can say that the maximum ARE for 90% of prediction in testing step of ANN model is about 8.6% but it is 10.5% for PCA-MLR model.

Conclusion: The ANN model has better results in comparison with the PCA-MLR model therefore this model is selected for prediction of WG in Tehran.

Keywords:

Prediction of waste generation . Artificial neural network . Multivariable linear regression . Principle component analysis

TUMS ID: 12874

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