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Comparative analysis on the application of artificial intelligence techniques to forecast solid waste generation in the city of Bogotá

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In the design of medium and long-term management alternatives for urban waste generated in cities, precisely forecasting urban solid waste generation rates in order to minimize its resulting environmental impacts is of the utmost importance. This paper presents a comparative analysis of three artificial intelligence modeling tools to forecast solid waste generation in the city of Bogotá, for which significant increases in the quantities of waste produced are expected in the coming years.

The first model used to analyze data was the decision tree through machine learning, which is a non-parametric algorithm that models data separation limitations based on learning decision rules on the input characteristics of the model. Support vector machines were the second method implemented as a forecasting model, which are based on local separation functions of information, called "KERMES." These functions interpose a plane separation between a set of nearby data (local) and its separation flexibility depends on the type of function. Lastly, recurrent neural network models to forecast data were implemented, which have yielded positive results. The design of their architecture is useful in exploring temporal correlations among the same.

Python was used to carry out the data analysis and implement the forecasting models. Notebooks technology was employed to visualize and display the data, which codes interactive digital files that envelop both the models' code and description, while visualizing the results obtained, which facilitates the analysis and manipulation of the information contained therein. Information in these types of tools may be analyzed separately and correlated among the same. This comparative behavioral analysis of models led to the determination that, for this type of forecasting with a limited amount of data, support vector machines are more efficient given the type and quantity of available information.