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Air quality management in Agua Santa, Puebla

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Abstract

The main objective of this research is to investigate the phenomenon of climate change in the southern region of the Metropolitan Puebla Valley in Mexico, providing information and generating knowledge that supports the development of effective strategies. The state of Puebla is the fourth largest in Mexico, and the Puebla Valley is an important industrial zone with a population over 5 million of people. Using a raw dataset from Agua Santa, one of the most populated and polluted areas of the Puebla Valley (years 2000-2009) located in the southern area, we built a Relational Object Oriented Design framework able to perform a multidimensional information process with Online Analytical Processing using Extraction, Transformation and Load to manage the relational data stores.

Data were analyzed to identify a pattern and found that air quality in the area and average temperature were determined primarily by the concentrations of PM10 and Ozone. In general, variables that determine air quality are related to climatic variables. It was found that the strongest relationship between variables correspond to PM10, Ozone, IMECAS and temperature. The next strong correlation was between relative humidity and CO_2, followed by the correlation between SO_2 and NO_2 and finally wind.

Besides, we generated a set of training data and another set of tests, and executed the algorithms for time series predictions for every climate variable in the model.

It is worth mentioning that the contribution arising from this research is not only the knowledge gained from the data, but also a set of tools and processes that will allow further investigation of the phenomenon of climate change in any area or region.

Biography

Maria Osorio obtained her bachelor's degree in Chemical Engineering at the University of the Americas in Puebla, Mexico, master's degree in Systems at the Iberoamerican University in Mexico, master's degree and a Ph.D. in Operations Research at the National University of Mexico. She worked on her dissertation with John Hooker at Carnegie Mellon, had a Postdoctoral position at the University of Colorado at Boulder working with Manuel Laguna and Fred Glover. She was also a Research Associate at the Imperial College and has been working for the Universidad Autonoma de Puebla since 1983. Currently, she is the Director of the Chemical Engineering Department at the Universidad Autonoma de Puebla, is the Vice President of the Mexican Society of Operations Research, is in the Editorial board of the Cuban Journal of Operational Research and belongs to the National System of Research in Mexico, publishing more than 50 papers in first level journals.