

Optimizing water treatment systems using artificial intelligence based tools

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Abstract

Predictive modelling is a process used in predictive analytics to create a statistical model of future behaviour. Predictive analytics is the area of data mining concerned with forecasting probabilities and trends. On the other hand, Artificial Intelligence (AI) concerns itself with intelligent behaviour, i.e. the things that make us seem intelligent. Following this process of thinking, in this work the main goal is the assessment of the impact of using AI based tools for the development of intelligent predictive models, in particular those that may be used to establish the conditions in which the levels of manganese and turbidity in water supply are high. Indeed, one of the main problems that the water treatment plant at Monte Novo (in Évora, Portugal) uncovers is the appearance of high levels of manganese and turbidity in treated water, which sometimes exceed the parametric values established in Portuguese Law, respectively $50 \mu\text{g dm}^{-3}$ and 4 NTU. In this study we tried to find answers to the above problem by building predictive models. The models we developed shall enable the prediction of manganese and turbidity levels in treated water, in order to ensure that the water supply does not affect public health in a negative way and obeys the current legislation. The software used in this study was the Clementine 11.1. The C5.0 Algorithm was also used as a means of introducing Decision Trees and the K-Means Algorithm was used to construct clustering models. The data in the database was collected from 2005 to 2006 and includes reservoir water quality data, treated water data and volumes of water stored in the reservoir.

Keywords: knowledge discovery from databases, data mining, decision trees, water quality, manganese, turbidity.

