Prediction of the quality of public water supply using artificial neural networks

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ABSTRACT

The Health Surveillance Program was established by the Regional Health Authority of Alentejo to control the quality of public water supply. This authority divides the water quality parameters into three distinct groups, namely P_1 (pH and conductivity), P_2 (nitrate and manganese) and P_3 (sodium and potassium), for which the sampling frequency is dissimilar. Thus, the development of formal models is essential to predict the chemical parameters included in group P_2 and included in group P_3, for which the sampling frequency is lower, based on the chemical parameters included in group P_1. In the present work, artificial neural networks (ANNs) were used to predict the concentration of nitrate, manganese, sodium and potassium from pH and conductivity. Different network structures have been elaborated and evaluated using the mean absolute deviation and the mean squared error. The ANN selected to predict the concentration of nitrate, sodium and potassium from pH and conductivity has a 2-18-14-3 topology while the network selected to predict the concentration of nitrate and manganese has a 2-19-10-2 topology. A good match between the observed and predicted values was observed with the R^2 values varying in the range 0.9960–0.9989 for the training set and 0.9993–0.9952 for the test set.

Key words | artificial neural networks, monitoring of public water supply, prediction of water quality parameters

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