Modelling of public water supply quality in the district of Évora using artificial neural networks

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The Health Surveillance Program was established by the Health Authority to control the quality of public water supply. This authority divides the water quality parameters into three distinct groups (P_1, P_2 and P_3) for which the sampling frequency is different. Thus, the development of models is important to predict the chemical parameters included in group P_2 (nitrates and manganese) and included in group P_3 (sodium and potassium), for which the sampling frequency is lower, based on the chemical parameters included in group P_1 (pH and conductivity). In the present work, Artificial Neural Networks (ANNs) were used to predict the concentration of nitrates, 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 neural network 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 training set and 0.9993-0.9952 for test set.