Forecasting urban water supply system signals: application of nonlinear data driven tools based on machine learning and information theoretic measures

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Urban water supply system signals contain information regarding human behaviour, land use changes, environmental factors, and economic momentum. Despite the wide array of factors influencing changes in urban water demand (UWD), accurate forecasts may be developed using data driven time series methods considering only previous UWD measurements. In this study, we develop a new data driven approach based on a new machine learning technique, Extreme Learning Machines (ELM), and use this tool alongside summary statistics derived from information theoretic measures to forecast urban water demand (UWD) signals (time series) into the future relying on only past observations of the variable. We demonstrate the efficiency of our new method by taking on a real-world urban water demand (UWD) forecasting case study in Toronto, Canada, and compare the new method to (linear and nonlinear based) alternatives. The results of our study indicate the accuracy and usefulness of our new UWD forecasting approach for predicting future demand in urban water supply systems.