A review of recent applications of neurocomputing methods in urban hydraulics and hydrology

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Neurocomputing methods represent nowadays an attractive alternative to physically based hydro-numerical models, mainly due, on the one hand, to their cheaper computational costs and high performance, and, on the other hand, to their lower requirement of physical and topographical data. Besides, in comparison with the traditional statistical models, stochastic methods, and empirical formulations, such techniques have a larger potential in providing accurate and reliable predictions (Zounemat-Kermani et al., 2020), fostered by the growing availability of sensor data and current straightforward open-source technology available. In our contribution, we will present some recent hydrological and hydraulic applications of neurocomputing methods, with a particular focus on applications in urban contexts. In detail, we will review some recent works dealing with the prediction of water level and rainfall-runoff, flood and risk assessment, sediment transport, odours in sewage systems, and water demands in the urban surface waters. In fact, most neurocomputing applications in urban water environment available in the literature deal with modelling and/or prediction of rainfall-runoff, streamflow, and flood risk assessments (e.g., Mosavi et al., 2018; Kim and Han, 2020). For instance, identifying the risk of extreme rain events in real-time plays an enormous role in hydraulic engineering and water management, especially in the urban environment. Furthermore, the prediction of surface water levels in urban waterways supports the logistics of navigation and monitors climate change effects. Also, the prediction of sediment transport is of great importance to avoid high amounts of deposition/erosion, obstructions in the canals and for water quality control. Finally, recent works deal with challenges related to the prediction of odours and corrosion in urban sewage systems, as well as of water demands, to inform the design and optimal management of water distribution systems through the deployment of smart meter technologies (e.g., Cominola et al., 2015). As an outlook for future research, further testing of neurocomputing methods with optimization approaches (e.g., Salomons et al., 2007) is needed to assess their usability in integrated models and account for the effect of their uncertainties.

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