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# Comparison of different wavelet transforms for urban water demand forecasting using machine learning techniques

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Wavelet transforms (WT) are suitable tools for unraveling the time-frequency nature of urban water demand (UWD) signals since they are able to localize periodic and/or trend components within a given time series. In this study, we use WT to uncover periodic and trend components in real-world UWD time series and use these components to forecast UWD into the future at daily and monthly lead times using machine learning methods. We demonstrate the gains in forecast accuracy when one uses the WT as a pre-processing technique prior to inputting the data into the machine learning models. Comparisons between different wavelet families (e.g. Daubechies, Coiflets, Symlets, Splines, etc.) are undertaken to identify the most suitable WT for our case studies considering UWD data from Montreal (Quebec), Toronto (Ontario), and Victoria (British Columbia). The results of our study indicate that particular wavelets are better suited at extracting certain UWD characteristics – we demonstrate suitable methods that may be used to combine the forecasts produced from multiple wavelets to create an improved (ensemble) forecast with superior performance.