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Wavelet and Fourier Methods for Nonparametric Regression

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Abstract

Fourier series and transforms have proved useful in many applications to statistics like Fourier regression and frequency domain analysis among others. One inherit limitation of them is their loss of localization. Wavelet transforms do not have this limitation and can give us information in both the time and frequency domain. We present the theory behind Fourier series- and transforms as well as for wavelets and wavelet transforms, as described in among others [11, 10]. This theory is used to cover two approaches to nonparametric regression, Fourier smoothing as proposed in [2], and wavelet thresholding using one method of global thresholding and two methods for level-dependent thresholding. We conclude by applying the theory in a simulation study of a selection of test functions. We found that both methods show promising results, but also that Fourier smoothing was overall outperformed by the wavelet thresholding method.

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