INTRODUCTION TO WAVELET METHODS FOR NUMERICAL PDES

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Wavelets are sparse multiscale representation systems, which are built from refinable functions. They have been widely used with success in many applications such as data science, image/signal processing, and numerical analysis. In this tutorial, we shall introduce the basic concepts of wavelets and focus on their applications to numerical PDEs. In particular, we shall highlight some key properties that make wavelets attractive in the context of numerical PDEs. Several wavelet methods and their recent developments will be discussed. A few examples of wavelets and their performance in solving some model problems will be presented. Finally, we shall conclude this tutorial by outlining several open research problems in the intersection of wavelet analysis and numerical PDEs.