

Wavelets Made Easy

By Yves Nievergelt

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This book explains the nature and computation of mathematical wavelets, which provide a framework and methods for the analysis and the synthesis of signals, images, and other arrays of data. The material presented here addresses the au dience of engineers, financiers, scientists, and students looking for explanations of wavelets at the undergraduate level. It requires only a working knowledge or memories of a first course in linear algebra and calculus. The first part of the book answers the following two questions: What are wavelets? Wavelets extend Fourier analysis. How are wavelets computed? Fast transforms compute them. To show the practical significance of wavelets, the book also provides transitions into several applications: analysis (detection of crashes, edges, or other events), compression (reduction of storage), smoothing (attenuation of noise), and syn thesis (reconstruction after compression or other modification). Such applications include one-dimensional signals (sounds or other time-series), two-dimensional arrays (pictures or maps), and three-dimensional data (spatial diffusion). The ap plications demonstrated here do not constitute recipes for real implementations, but aim only at clarifying and strengthening the understanding of the mathematics of wavelets.

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Editorial Review

Review

"The book explains in a nice way the nature and computation of mathematical wavelets, which provide a framework and methods for the analysis and synthesis of signals, images, and other arrays of data. A useful text for engineers, financiers, scientists, and students looking for explanation of wavelets."

?Journal of Information and Optimization Sciences

"Giving practice first and theory later, the author avoids discouraging readers whose main subject is not mathematics. The book is written in a very comprehensible and lively style. The text is essentially self-contained since many of the facts employed from analysis, linear algebra and functional analysis are stated and partially proved in the book."

?ZAA

From the Back Cover

This book, written at the level of a first course in calculus and linear algebra, offers a lucid and concise explanation of mathematical wavelets. Evolving from ten years of classroom use, its accessible presentation is designed for undergraduates in a variety of disciplines (computer science, engineering, mathematics, mathematical sciences) as well as for practising professionals in these areas.

This unique text starts the first chapter with a description of the key features and applications of wavelets, focusing on Haar's wavelets but using only high school mathematics. The next two chapters introduce one-, two-, and three-dimensional wavelets, with only the occasional use of matrix algebra.

The second part of this book provides the foundations of least squares approximation, the discrete Fourier transform, and Fourier series. The third part explains the Fourier transform and then demonstrates how to apply basic Fourier analysis to designing and analyzing mathematical wavelets. Particular attention is paid to Daubechies wavelets.

Numerous exercises, a bibliography, and a comprehensive index
combine to make this book an excellent text for the classroom as well as a valuable resource for self-study.

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