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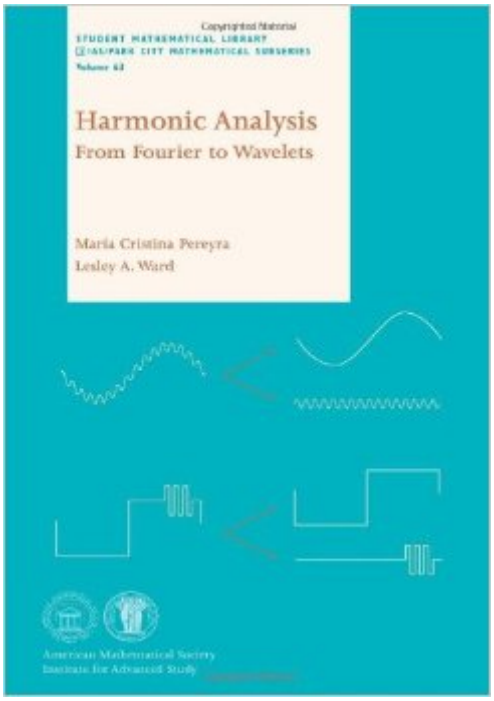
Harmonic Analysis: From Fourier To Wavelets (Student Mathematical Library)



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Synopsis

In the last 200 years, harmonic analysis has been one of the most influential bodies of mathematical ideas, having been exceptionally significant both in its theoretical implications and in its enormous range of applicability throughout mathematics, science, and engineering. In this book, the authors convey the remarkable beauty and applicability of the ideas that have grown from Fourier theory. They present for an advanced undergraduate and beginning graduate student audience the basics of harmonic analysis, from Fourier's study of the heat equation, and the decomposition of functions into sums of cosines and sines (frequency analysis), to dyadic harmonic analysis, and the decomposition of functions into a Haar basis (time localization). While concentrating on the Fourier and Haar cases, the book touches on aspects of the world that lies between these two different ways of decomposing functions: time-frequency analysis (wavelets). Both finite and continuous perspectives are presented, allowing for the introduction of discrete Fourier and Haar transforms and fast algorithms, such as the Fast Fourier Transform (FFT) and its wavelet analogues. The approach combines rigorous proof, inviting motivation, and numerous applications. Over 250 exercises are included in the text. Each chapter ends with ideas for projects in harmonic analysis that students can work on independently. This book is published in cooperation with IAS/Park City Mathematics Institute.

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Customer Reviews

I have worked with HA for decades in array processing and MR Imaging. I always enjoy authors

who take a "specialty" area, then go really deep and broad to explore both the body and frontiers. The problem with handling HA this way is that the field, and Fourier transforms in general, has become SO broad and diverse that the math itself is all over the board in complexity, from "relatively" simple partial differential equations for continuous signal processing waveforms, to extremely difficult Hilbert space translations between pure and general functional analysis and HA, including rotational invariance of the Fourier tools and decompositions.Far from just thermodynamics and Newtonian physics, the dynamical systems and advanced Fourier applications have broadened HA to Neurology, Electronics, Quantum Physics, sound and musical eigenvalue applications, and many others. These don't even begin to scratch the surface of the REALLY advanced research in pure math such as topology, duality and other very abstract research areas. Note also that this book is about the Fourier aspects of non-musical applications (though they are covered and mentioned as examples), NOT the strictly "other" form of HA in music. I'm sure you know this, but I have many music oriented buddies who frown at my (and this book's) broad view of HA!The bottom line is that, even though the problems are very well presented and the book is brilliantly written, I'd take exception to the publisher's "undergraduate" statement.

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