## Contents

1 An Introduction to Wavelets and Multiscale Analysis: Theory and Applications ..................................................... 1  
   Ahmed I. Zayed

### Part I The Mathematical Theory of Wavelets

2 The Construction of Wavelet Sets ........................................... 17  
   John J. Benedetto and Robert L. Benedetto

3 The Measure of the Closure of a Wavelet Set May Be $> 2\pi$ ............. 57  
   Zhihua Zhang

4 Quincunx Wavelets on $\mathbb{T}^2$ ........................................... 65  
   Kenneth R. Hoover and Brody Dylan Johnson

5 Crystallographic Haar-Type Composite Dilation Wavelets ............... 83  
   Jeffrey D. Blanchard and Kyle R. Steffen

6 From Full Rank Subdivision Schemes to Multichannel Wavelets: A Constructive Approach ........................................109  
   Costanza Conti and Mariantonia Cotronei

7 Unitary Systems and Bessel Generator Multipliers ..........................131  
   Deguang Han and David R. Larson

8 The Zak Transform(s) ........................................................151  
   Eugenio Hernández, Hrvoje Šikić, Guido L. Weiss, and Edward N. Wilson

### Part II The Geometry of Large Data Sets

9 Harmonic Analysis of Digital Data Bases ..................................161  
   Ronald R. Coifman and Matan Gavish
10 Some Recent Advances in Multiscale Geometric Analysis of Point Clouds ..............................................................199
   Guangliang Chen, Anna V. Little, Mauro Maggioni, and Lorenzo Rosasco

11 Signal Ensemble Classification Using Low-Dimensional Embeddings and Earth Mover’s Distance ..................227
   Linh Lieu and Naoki Saito

Part III Applications of Wavelets

12 Wavelets on Manifolds and Statistical Applications to Cosmology .................................................................259
   Daryl Geller and Azita Mayeli

13 Wavelets, a Numerical Tool for Atmospheric Data Analysis ..........279
   Parick Fischer and Ka-Kit Tung

14 Denoising Speech Signals for Digital Hearing Aids: A Wavelet Based Approach .................................................299
   Nathaniel Whitmal, Janet Rutledge, and Jonathan Cohen

Index ...........................................................................................................333