

Shearlets: Multiscale Analysis for Multivariate Data (Applied and Numerical Harmonic Analysis)

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Over the last 20 years, multiscale methods and wavelets have revolutionized the field of applied mathematics by providing an efficient means of encoding isotropic phenomena. Directional multiscale systems, particularly shearlets, are now having the same dramatic impact on the encoding of multidimensional signals. Since its introduction about five years ago, the theory of shearlets has rapidly developed and gained wide recognition as the superior way of achieving a truly unified treatment in both a continuous and a digital setting. By now, it has reached maturity as a research field, with rich mathematics, efficient numerical methods, and various important applications.

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Editorial Review

From the Back Cover

Over the last 20 years, multiscale methods and wavelets have revolutionized the field of applied mathematics by providing efficient means for encoding isotropic phenomena. Directional multiscale systems, particularly shearlets, are currently having the same dramatic impact on the encoding of multivariate signals, which are usually dominated by anisotropic features. Since its introduction about six years ago, the theory of shearlets has rapidly developed and gained wide recognition as the superior approach for multiscale analysis of multivariate signals, providing a truly unified treatment of both the continuum and the digital setting. By now, this research field has reached full maturity, with deep mathematical results, efficient numerical methods, and a variety of high-impact applications.

Edited by the topic's two main pioneers, this volume systematically surveys the theory and applications of shearlets. Following a general survey of the subject, carefully selected contributions explore the current state of the field in greater detail. Specific areas covered include:

* analysis of anisotropic features;

- * sparse approximations of multivariate data;
- * shearlet smoothness spaces;
- * numerical implementations;
- * applications to image processing.

Shearlets is aimed at graduate students and researchers in the areas of applied mathematics, computer science, engineering, and any other field dealing with the development and applications of highly efficient methodologies for processing multivariate data. As the first monograph in the literature to survey shearlets, this volume offers both a unique state-of-the-art resource for scientists dealing with advanced multiscale methods and a supplemental textbook for graduate courses in applied harmonic analysis.

About the Author

With a broad range of experience as a scholar and a professor over the past 15 years, Gitta Kutyniok has received numerous awards for her teaching and research, including the Weierstrass Prize for outstanding teaching at the Universität Paderborn in 1998, the Research Prize of the University Gießen in 2006, and the prestigious von Kaven Prize in 2007. More recently, she has served as an Associate Editor for the Journal of Wavelet Theory and Applications; as a Corresponding Editor for Acta Applicandae Mathematicae; and as an Advisory Board member for Birkhäuser's Applied and Numerical Harmonic Analysis series. She was a panelist for the NSF in 2008 and serves as a reviewer for the European Commission, the DFG-German Research Foundation, the Israel Science Foundation, the NSF, and the French National Research Agency, among others. She has published one book and over 75 peer-reviewed journal and conference publications. Demetrio Labate received his Ph.D. in Electrical Engineering from the Politecnico di Torino, Italy, and his M.S. in Applied Mathematics and his Ph.D. in Mathematics from the Georgia Institute of Technology, Atlanta, GA, where he received the Sigma Xi Best Ph.D. Thesis Award in 2000. In 2008, he was awarded the NSF Career Award for young investigators for his research on shearlets. His research is currently funded by the National Science Foundation, the Army Research Office, and the Norman Hackerman Advance Research Program. He is an Associate Editor for the Journal of Wavelet Theory and Applications, and he is author or coauthor of over 60 publications in both mathematical and engineering journals.

Users Review

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Marcus Leiva:

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