

Index

A

Affine systems, 12, 13, 17, 24, 240
Analysis of singularities, 70, 134–142, 284
Anisotropic features, 2, 5, 6, 8, 30, 33,
146–149, 169, 196, 240
Atomic decompositions, 107, 116–121,
125–126, 134

B

Banach frames, 107, 114, 116–119, 121, 125
Band-limited shearlets, 7, 11, 28, 34, 40, 148,
149, 162, 164–166, 169–172, 174, 176,
178–179, 188–189, 191, 193–194, 241,
243–261, 277

C

Cartoon-like images, 8, 9, 14, 15, 25, 30,
58, 98, 147–151, 155–159, 161, 164,
170–172, 175, 176, 188, 192, 195, 196,
239, 240, 286, 297
Compactly supported shearlets, 7, 11, 18, 21,
24, 25, 28–31, 34, 97, 99, 122, 134,
148, 149, 162, 164, 166–172, 174–178,
180–192, 194–196, 228, 231, 241, 243,
261–272, 277, 289
Continuous wavelet transform, 12–14, 17, 22,
50, 69, 70, 75, 199, 310
Coorbit theory, 23, 105–107, 113–121
Curvelets, 5–6, 15, 31, 49, 54, 65, 66, 70, 93,
106, 107, 109, 134, 148, 171, 189, 240,
242, 286, 298, 317

D

Deconvolution, 299–303, 323
Denoising, 35, 148, 212, 243, 284–295, 304,
311, 318, 319
Digital shearlet system, 253, 256–259, 261

E

Edge detection, 23, 33, 70, 309–314, 320
Embeddings, 2, 8, 32, 107, 115, 121, 126,
128–134, 221

F

Fast digital shearlet transform (FDST), 243,
244, 250, 255, 259–261, 272–275,
277–281
Filterbank, 200–212, 214–218, 222–227,
229–231, 236

G

Geometric separation, 315–317

I

Image processing, 34, 35, 70, 98, 283–320

L

Linear and non-linear approximations, 14, 15,
31, 119–121, 147, 151–155, 160, 296

M

Microlocal analysis, 22, 23, 39–66
Multi-dimensional data, 2, 5, 6, 13–15, 35,
146, 284
Multiple multiresolution analysis (MMRA),
199–236
Multiresolution analysis (MRA), 4, 11, 12,
33–35, 199, 213, 216–219, 221–223,
226, 227, 242, 261, 271
Multivariate shearlet transform, 17, 23, 32, 51,
105–142

P

Performance measures, 243
Pseudo-polar Fourier transform, 241, 244–248,
251, 256, 273–274, 288
Pseudo-polar grid, 244–260, 273, 277, 279,
288, 318

R

Radon transform, 23, 35, 42–44, 55, 62, 191, 194, 196–199

Representation formulas, 48–54

S

Shearlab, 170, 243, 250, 253, 259, 273

Shearlet MRA, 199–236, 242

Shearlets, 1–35, 39–66, 69–102, 105–142, 145–196, 199–236, 239–281, 283–320

Singularity analysis, 69–102, 134–142

Smoothness spaces/shearlet coorbit spaces, 32, 105–142

Software package, 242, 243

Sparse approximations, 4–6, 14–16, 25, 30–33, 35, 59, 145–196, 240, 241, 270, 279, 316, 318

Sparsity, 4, 35, 148, 156, 174, 176, 178, 179, 188, 191, 193, 195, 196, 284, 285

Subdivision, 34, 36, 200, 203, 204, 209, 210, 212–236, 242

T

Tight frames, 24, 25, 30, 153, 154, 165, 166, 227, 252, 270

Traces, 2, 16, 107, 121, 126–131, 134, 312

V

Video denoising, 35, 318, 319

W

Wavefront set, 8, 13, 22, 23, 40–51, 55–66, 70

Wavelets, 2, 39, 69, 113, 148, 199, 240, 285

Applied and Numerical Harmonic Analysis

- A.I. Saichev and W.A. Woyczyński: *Distributions in the Physical and Engineering Sciences* (ISBN 978-0-8176-3924-2)
- R. Tolimieri and M. An: *Time-Frequency Representations* (ISBN 978-0-8176-3918-1)
- G.T. Herman: *Geometry of Digital Spaces* (ISBN 978-0-8176-3897-9)
- A. Procházka, J. Uhlíř, P.J.W. Rayner, and N.G. Kingsbury: *Signal Analysis and Prediction* (ISBN 978-0-8176-4042-2)
- J. Ramanathan: *Methods of Applied Fourier Analysis* (ISBN 978-0-8176-3963-1)
- A. Teolis: *Computational Signal Processing with Wavelets* (ISBN 978-0-8176-3909-9)
- W.O. Bray and C.V. Stanojević: *Analysis of Divergence* (ISBN 978-0-8176-4058-3)
- G.T. Herman and A. Kuba: *Discrete Tomography* (ISBN 978-0-8176-4101-6)
- J.J. Benedetto and P.J.S.G. Ferreira: *Modern Sampling Theory* (ISBN 978-0-8176-4023-1)
- A. Abbate, C.M. DeCusatis, and P.K. Das: *Wavelets and Subbands* (ISBN 978-0-8176-4136-8)
- L. Debnath: *Wavelet Transforms and Time-Frequency Signal Analysis* (ISBN 978-0-8176-4104-7)
- K. Gröchenig: *Foundations of Time-Frequency Analysis* (ISBN 978-0-8176-4022-4)
- D.F. Walnut: *An Introduction to Wavelet Analysis* (ISBN 978-0-8176-3962-4)
- O. Bratteli and P. Jorgensen: *Wavelets through a Looking Glass* (ISBN 978-0-8176-4280-8)
- H.G. Feichtinger and T. Strohmer: *Advances in Gabor Analysis* (ISBN 978-0-8176-4239-6)
- O. Christensen: *An Introduction to Frames and Riesz Bases* (ISBN 978-0-8176-4295-2)
- L. Debnath: *Wavelets and Signal Processing* (ISBN 978-0-8176-4235-8)
- J. Davis: *Methods of Applied Mathematics with a MATLAB Overview* (ISBN 978-0-8176-4331-7)
- G. Bi and Y. Zeng: *Transforms and Fast Algorithms for Signal Analysis and Representations* (ISBN 978-0-8176-4279-2)
- J.J. Benedetto and A. Zayed: *Sampling, Wavelets, and Tomography* (ISBN 978-0-8176-4304-1)
- E. Prestini: *The Evolution of Applied Harmonic Analysis* (ISBN 978-0-8176-4125-2)
- O. Christensen and K.L. Christensen: *Approximation Theory* (ISBN 978-0-8176-3600-5)
- L. Brandolini, L. Colzani, A. Iosevich, and G. Travaglini: *Fourier Analysis and Convexity* (ISBN 978-0-8176-3263-2)
- W. Freeden and V. Michel: *Multiscale Potential Theory* (ISBN 978-0-8176-4105-4)
- O. Calin and D.-C. Chang: *Geometric Mechanics on Riemannian Manifolds* (ISBN 978-0-8176-4354-6)
- J.A. Hogan and J.D. Lakey: *Time-Frequency and Time-Scale Methods* (ISBN 978-0-8176-4276-1)
- C. Heil: *Harmonic Analysis and Applications* (ISBN 978-0-8176-3778-1)
- K. Borre, D.M. Akos, N. Bertelsen, P. Rinder, and S.H. Jensen: *A Software-Defined GPS and Galileo Receiver* (ISBN 978-0-8176-4390-4)

Applied and Numerical Harmonic Analysis (Cont'd)

T. Qian, V. Mang I, and Y. Xu: *Wavelet Analysis and Applications* (ISBN 978-3-7643-7777-9)

G.T. Herman and A. Kuba: *Advances in Discrete Tomography and Its Applications* (ISBN 978-0-8176-3614-2)

M.C. Fu, R.A. Jarrow, J.-Y. J. Yen, and R.J. Elliott: *Advances in Mathematical Finance* (ISBN 978-0-8176-4544-1)

O. Christensen: *Frames and Bases* (ISBN 978-0-8176-4677-6)

P.E.T. Jorgensen, K.D. Merrill, and J.A. Packer: *Representations, Wavelets, and Frames* (ISBN 978-0-8176-4682-0)

M. An, A.K. Brodzik, and R. Tolimieri: *Ideal Sequence Design in Time-Frequency Space* (ISBN 978-0-8176-4737-7)

B. Luong: *Fourier Analysis on Finite Abelian Groups* (ISBN 978-0-8176-4915-9)

S.G. Krantz: *Explorations in Harmonic Analysis* (ISBN 978-0-8176-4668-4)

G.S. Chirikjian: *Stochastic Models, Information Theory, and Lie Groups, Volume 1* (ISBN 978-0-8176-4802-2)

C. Cabrelli and J.L. Torrea: *Recent Developments in Real and Harmonic Analysis* (ISBN 978-0-8176-4531-1)

M.V. Wickerhauser: *Mathematics for Multimedia* (ISBN 978-0-8176-4879-4)

P. Massopust and B. Forster: *Four Short Courses on Harmonic Analysis* (ISBN 978-0-8176-4890-9)

O. Christensen: *Functions, Spaces, and Expansions* (ISBN 978-0-8176-4979-1)

J. Barral and S. Seuret: *Recent Developments in Fractals and Related Fields* (ISBN 978-0-8176-4887-9)

O. Calin, D. Chang, K. Furutani, and C. Iwasaki: *Heat Kernels for Elliptic and Sub-elliptic Operators* (ISBN 978-0-8176-4994-4)

C. Heil: *A Basis Theory Primer* (ISBN 978-0-8176-4686-8)

J.R. Klauder: *A Modern Approach to Functional Integration* (ISBN 978-0-8176-4790-2)

J. Cohen and A. Zayed: *Wavelets and Multiscale Analysis* (ISBN 978-0-8176-8094-7)

D. Joyner and J.-L. Kim: *Selected Unsolved Problems in Coding Theory* (ISBN 978-0-8176-8255-2)

J.A. Hogan and J.D. Lakey: *Duration and Bandwidth Limiting* (ISBN 978-0-8176-8306-1)

G. Chirikjian: *Stochastic Models, Information Theory, and Lie Groups, Volume 2* (ISBN 978-0-8176-4943-2)

G. Kutyniok and D. Labate: *Shearlets* (ISBN 978-0-8176-8315-3)

For a fully up-to-date list of ANHA titles, visit <http://www.springer.com/series/4968?detailsPage=titles> or <http://www.springerlink.com/content/t7k8lm/>.