

**DEMETRIO LABATE**  
**CURRICULUM VITAE**

(June 2020)

DEMETRIO LABATE ..... University of Houston  
Department of Mathematics  
651 Phillip G Hoffman  
Houston, TX 77204-3008, USA

**CONTACT INFORMATION**

Office Phone: (713) 743-3492  
Fax Number: (713) 743-3505  
Email Address: [dlabate@math.uh.edu](mailto:dlabate@math.uh.edu)  
Homepage: <http://www.math.uh.edu/~dlabate>

**I. GENERAL**

**EDUCATIONAL BACKGROUND**

2000 Ph.D. in Mathematics, **Georgia Institute of Technology**, Atlanta, GA  
Thesis: *Time–frequency characterization of pseudodifferential operators.*  
Advisor: Christopher Heil  
1995 M.S. in Applied Mathematics, **Georgia Institute of Technology**, Atlanta, GA  
1994 Ph.D. in Electrical Engineering, **Politecnico di Torino**, Torino, Italy  
Thesis: *High-frequency electromagnetic field due to lightning. A fractal model.*  
Advisor: Flavio Canavero.  
1991 B.S. in Electrical Engineering, **Politecnico di Torino**, Torino, Italy

**EMPLOYMENT HISTORY**

2015–present **University of Houston**, Dept. of Mathematics,  
Professor  
2009–2015 **University of Houston**, Dept. of Mathematics,  
Associate Professor  
2003–2009 **North Carolina State University**, Dept. of Mathematics,  
Assistant Professor (Tenured in 2009)  
2000–2003 **Washington University in St.Louis**, Dept. of Mathematics,  
Chauvenet Lecturer of Mathematics  
1994–2000 **Georgia Institute of Technology**, School of Mathematics,  
Graduate assistant

1991–1994     **Politecnico di Torino** Dept. of Electrical Engineering,  
Graduate assistant

## CURRENT FIELDS of INTEREST

- Primary:     Harmonic analysis, especially wavelets and multiscale analysis; sparse approximations; applications to signal and image processing.
- Secondary:   Biomedical imaging; computational neuroscience; inverse problems; integral geometry; machine learning; pseudodifferential operators; Radon transform.

## EXTENDED VISITS to OTHER RESEARCH INSTITUTIONS

- Universidad Autonoma Madrid, Spain, (invited by E. Hernandez), December 2003
- Università di Torino, Italy, (invited by E. Cordero and L. Rodino), June 2006
- Washington University in St. Louis, St. Louis, (invited by G. Weiss), January-February 2007
- Nuhag Center at the University of Vienna, Austria, (invited by H. Feichtinger and K. Gröchenig), April 2007
- University of Genoa, Italy, (invited by F. DeMari and G. Mauceri), June 2007
- University of Houston, (invited by J. Morgan), September 2008 - May 2009
- University of Osnabrueck, Germany, (invited by G. Kutyniok), June 2009
- University of Osnabrueck, Germany, (invited by G. Kutyniok), June 2010
- University of Genoa, Italy, (invited by F. DeMari and G. Mauceri), July 2010
- University of Genoa, Italy, (invited by F. DeMari and E. De Vito), September 2013
- University of Ferrara, Italy, (invited by G. Zanghirati), December 2015
- University of Firenze, Italy, (invited by C. Conti), May 2018

## HONORS and AWARDS

- (1) Fellowship of the Italian National Science Foundation, 1991–1994. This is a fellowship that covered my graduate studies at the Politecnico di Torino.
- (2) Sanpaolo Bank Fellowship, (\$ 44,000), 1994–1995. This fellowship enabled me to attend Georgia Tech as a visiting graduate student.
- (3) Sigma Xi Best Ph. D. Thesis Award, *Time-Frequency Analysis of Pseudodifferential Operators*, Georgia Institute of Technology, 2001.
- (4) NSF Young Investigator Career Award, *Sparse directional multiscale representations: theory, implementation and applications*, 2008.
- (5) IEEE Best Paper Award, 2011.
- (6) Keynote speaker at Workshop on Applied Harmonic Analysis, University of Genova, Italy, September 2013.

- (7) Keynote speaker at Minitutorial of SIAM Conference on Imaging Science, Albuquerque, May 2016.
- (8) Keynote speaker at SMART 2017 Conference, Gaeta, September 2017.

## II. SCHOLARLY ACTIVITY

### INVITED TALKS

1. *High-frequency electromagnetic field due to lightning. A fractal model*, Electromagnetic Seminar, Politecnico di Torino, December 1994.
2. *Fractal modeling of high-frequency electric field due to lightning*, Electromagnetic Seminar, Università' La Sapienza, Roma, November 1995.
3. *Pseudodifferential operators*, Graduate Seminar, Georgia Institute of Technology, Atlanta, GA, May 1997.
4. *Hilbert transform*, Analysis Seminar, Georgia Institute of Technology, Atlanta, GA, February 1998.
5. *Time-frequency analysis of pseudodifferential operators*, YAMS 99, Furman University, Greenville, SC, July 8, 1999.
6. *Composition of pseudodifferential operators*, Analysis Seminar, GaTech, Atlanta, GA, September 28, 1999.
7. *Composition of pseudodifferential operators*, Analysis Seminar, York University, Toronto, October 29, 1999 (invited by M. W. Wong).
8. *Time-frequency analysis of pseudodifferential operators*, Analysis Seminar, Politecnico di Torino, December 1999 (invited by F. Ricci).
9. *Composition of pseudodifferential operators*, 106th Annual Meeting of AMS, Washington DC, January, 2000 (invited by S. Casey and D. Walnut).
10. *Time-frequency analysis of pseudodifferential operators*, SIAM-SEAS 2000, UGA Athens, March 2000.
11. *Time-frequency analysis of pseudodifferential operators*, Analysis Seminar, Washington University, September 2000 (invited by G. Weiss).
12. *Pseudodifferential operators on modulation spaces*, 957th AMS Meeting, University of Toronto, Ontario, Canada, September 2000 (invited by M. W. Wong).
13. *A Unified Characterization of Reproducing Systems Generated by a Finite Family*, Wavelet Seminar, Washington University, September 2001 (invited by G. Weiss).
14. *A Unified Characterization of Reproducing Systems Generated by a Finite Family*, 2001 Gabor Workshop, University of Vienna, December 2001 (invited by H. Feichtinger).
15. *A Unified Characterization of Reproducing Systems Generated by a Finite Family*, Colloquium, Politecnico di Torino, Torino, December 2001 (invited by A. Tabacco).

16. *A Unified Characterization of Reproducing Systems Generated by a Finite Family*, AMS Sectional Meeting, Atlanta, March 2002 (invited by C. Heil and Y. Wang).
17. *Oversampling of Reproducing Systems*, Wavelet Seminar, Washington University, September 2002 (invited by G. Weiss).
18. *A Unified Theory of Reproducing Function Systems*, Colloquium, GaTech, Atlanta, September 2002 (invited by C. Heil).
19. *A Unified Theory of Reproducing Function Systems*, Colloquium, Kansas State University, December 2002 (invited by L. Pigno).
20. *A Unified Theory of Reproducing Function Systems*, AMS Annual Meeting, Baltimore, January 2003 (invited by C. Heil and P. Jorgesen).
21. *A Unified Theory of Reproducing Function Systems*, Colloquium, University of Houston, February 2003 (invited by M. Papadakis).
22. *A Unified Theory of Reproducing Function Systems*, Colloquium, DePaul University, February 2003 (invited by A. Zayed).
23. *A Unified Theory of Reproducing Function Systems*, Colloquium, Saint Louis University, February 2003 (invited by J. Hebda).
24. *A Unified Theory of Reproducing Function Systems*, Colloquium, University of Central Florida, March 2003 (invited by Z. Nashed).
25. *A Unified Theory of Reproducing Function Systems*, Colloquium, North Carolina State University, March 2003 (invited by J.P. Fouque).
25. *Efficient Representations of Multivariable Functions*, Probability Seminar, North Carolina State University, October 2003 (invited by M. Kang).
26. *Efficient Representations of Multivariable Functions*, Wavelet Seminar, Washington University, December 2003 (invited by G. Weiss).
27. *The theory of composite wavelets*, Wavelet Seminar, Washington University, February 2004 (invited by G. Weiss).
28. *An approach to the theory of reproducing systems on lca groups*. Washington University in St.Louis. International Workshop on wavelets. March 2004 (invited by G. Weiss and E. Wilson)
29. *Composite Wavelets. A new tool for efficient multi-dimensional representations*. International Conference in Computational Harmonic Analysis Vanderbilt University, Nashville, May 2004 (invited by A. Aldroubi).
30. *Directional representations in mathematics and signal processing.*, Wavelet Seminar, Washington University, February 2005 (invited by G. Weiss).
31. *Wavelets with Composite Dilations and their MRA Properties*. Vissta Seminar, North Carolina State University, February 2005 (invited by H. Krim).
32. *Wavelets with Composite Dilations and their MRA Properties*. Workshop on Sparse Representation in Redundant Systems, CSCAMM, University of Maryland, College Park, May 2005 (invited by J. Benedetto and E. Tadmor).

33. *Localization of the Wavefront Set using the Continuous Shearlet Transform*, Wavelet Seminar, Washington University in St.Louis, May 2005, (invited by G. Weiss).
34. *Sparse representations using shearlets* SPIE Conference, Wavelet XI, San Diego, August 2005, (invited by M. Papadakis).
35. *Optimally Sparse Representation using Shearlets*, Wavelet Seminar Washington University in St.Louis, January 2006, (invited by G. Weiss).
36. *Optimally Sparse Image Representation using Shearlets*, Vissta Seminar, ECE NCSU, February 2006 (invited by H. Krim).
37. *Optimally Sparse Representation using Shearlets*, International Workshop on Wavelets, Washington University in St.Louis, April 2006, (invited by G. Weiss and E. Wilson).
38. *Optimally Sparse Representation using Shearlets*, Current Trends in Harmonic Analysis and Its Applications: Wavelets and Frames, University of Colorado Boulder, May 2006 (invited by K. Merrill or J. Packer).
39. *Sparse Representation using Shearlets*, Pseudo-Differential Operators, Quantization and Signals, Centro Internazionale Matematico Estivo (CIME), Cetraro, June 2006 (invited by G. Rodino).
40. *Sparse Representation using Shearlets*, Colloquium Talk, University of Genova, July 2006 (invited by F. DeMari).
41. *Shearlet Representation of Fourier Integral Operators*, Wavelet Seminar, Washington University in St.Louis, April 2006, (invited by G. Weiss).
42. *Shearlet Representation of Fourier Integral Operators, II*, Wavelet Seminar, Washington University in St.Louis, October 2006, (invited by G. Weiss).
43. *Wavelets and Iterated Function Systems*, Wavelet Seminar, Washington University in St.Louis, January 2007, (invited by G. Weiss).
44. *Sparse Multidimensional Representation using Shearlets. Theory and Applications*, Colloquium, NuHAG, Faculty of Mathematics, University of Vienna, April 2007, (invited by C. Gröchenig).
45. *Sparse Shearlet Representation of Fourier Integral Operators*, Colloquium, NuHAG, Faculty of Mathematics, University of Vienna, April 2007, (invited by C. Gröchenig).
46. *Sparse Multidimensional Representation using Shearlets. Theory and Applications*, Illinois-Missouri Applied Harmonic Analysis Meeting, Washington University in St.Louis, April 2007, (invited by G. Weiss and E. Wilson).
47. *Sparse Multidimensional Representation using Shearlets. Theory and Applications*, 31-st SIAM-SEAS Meeting University of Memphis, May 2007, (invited by P. Casazza and A. Powell).
48. *Sparse Multidimensional Representations using Shearlets. Theory and Applications*, Colloquium Talk, University of Genova, July 2007 (invited by F. DeMari).
49. *Edge modeling using the continuous shearlet transform*, Wavelet Seminar, Washington University in St.Louis, December 2007, (invited by G. Weiss).

50. *Sparse Multidimensional Representations using Shearlets. Theory and Applications.*, Colloquium Talk, University of Houston, April 2008 (invited by M. Papadakis).
51. *A shearlet-based approach to the analysis and detection of edges*, Mini-symposium on Computational Harmonic Analysis, University of Missouri, St.Louis, November 2008, (invited by C. Chui).
52. *A shearlet-based approach to the analysis and detection of edges*, Applied Analysis and Fast Computation in Phase-Space, University of Vienna, Austria, November 2008, (invited by H. Feichtinger).
53. *Sparse representations in mathematics and engineering*, Graduate Seminar, University of Houston, Texas, November 2008.
54. *Radon Transform Inversion using the Shearlet Representation*, Analysis Seminar, University of Houston, Texas, (invited by V. Paulsen), February 2009.
55. *Radon Transform Inversion using the Shearlet Representation*, AMS Meeting, U.Illinois UC (invited by R. Laugesen), March 2009.
56. *Harmonic Analysis and Geometric Image Representations*, Graduate Seminar, University of Houston, Texas (invited by S. Ji), March 2009.
57. *Analysis of singularities and edge detection using the shearlet transform*, SAMPTA'09, 8th international conference on Sampling Theory and Applications, Marseille, France, May 2009, (invited by G. Kutyniok).
58. *Inversion of the Radon Transform using the Shearlet Decomposition*, Colloquium Talk, U. of Osnabrueck (invited by G. Kutyniok), July 2009.
59. *Characterization of Singularities and Edge Detection using the Continuous Shearlet Transform*, SIAM Conference on Image Processing, Chicago, April 2010 (invited by M. Cheney).
60. *Characterization of Singularities in Multidimensions using the Continuous Shearlet Transform*, New Trends in Harmonic and Complex Analysis, Jacobs University Bremen, June 2010.
61. *Analysis and identification of multidimensional singularities using directional multiscale representations*, Oberseminar in Applied Analysis, U. of Osnabrueck (invited by G. Kutyniok), June 2010.
62. *Analysis and identification of multidimensional singularities using directional multiscale representations*, Analysis Seminar, U. of Genoa (invited by F. De Mari), July 2010.
63. *Optimally Sparse Representations of Multidimensional Data using the Shearlet Transform*, Colloquium, University of Texas PanAmerican (invited by Z. Qiao), November 2010.
64. *Regularized Inversion of the Radon Transform using the Shearlet Representation*, Seminar, University of Texas PanAmerican (invited by Z. Qiao), November 2010.

65. *Analysis and identification of multidimensional singularities using the continuous shearlet transform.*, BANFF Workshop on Sampling and Reconstruction: Applications and Advances (invited by I. Selesnick), December 2010.
66. *3D Discrete Shearlet Transform and Video Denoising* Poster presentation at FFT 2011, Norbert Wiener Center at U Maryland College Park, (invited by R. Balan), February 2011.
67. *Optimally sparse approximations of 3D data*, SPIE, Defense, Security and Sensing, Orlando, (invited by G. Easley), April 2011.
68. *Searchlight CT: A new reconstruction method for collimated X-ray tomography* Workshop on New Computational Method for Inverse Problems, NCMIP 2011, ENS Cachan, May 2011.
69. *3D Discrete Shearlet Transform and Video Denoising* SPIE Conference, Wavelets and Sparsity XIV, San Diego, August 2011, (invited by M. Papadakis), August 2011.
70. *Sparsity. From theory to applications in signal and image processing*, 7th Conference of the Italian Research in the World, Houston, December 3, 2011, (invited by R. Ambrosetti), August 2011.
71. *Computed tomography and the shearlet representation*, Graduate Seminar, University of Houston, Texas, April 2012 (invited by S. Ji).
72. *Optimal Recovery of 3D X-Ray Tomographic Data via Shearlet Decomposition* Harmonic Analysis Conference, U. Genova (invited by F. DeMari), June 2012.
73. *Optimal Recovery of 3D X-Ray Tomographic Data via Shearlet Decomposition*, Workshop in Analysis and Probability, Texas A&M, (invited by E. King), July 2012 .
74. *Hyperbolic Shearlets*, Poster presentation at International Conference on Image Processing (ICIP) 2012, Orlando, FL, October 2012 .
75. *Automated quantitative image analysis of voltage-gated  $Na^+$  channels at the Axonal Initial Segment* Poster presentation at Society for Neuroscience Annual Meeting 2012, New Orleans, LA.
76. *Optimal Recovery of 3D X-Ray Noisy Data using Shearlet Decompositions* Image Analysis Seminar, University of Houston, January 2013.
77. *Optimal Recovery of 3D X-Ray Noisy Data using Shearlet Decompositions* Norbert Wiener Seminar, University of Maryland College Park, MD, (invited by K. Okoudjou), February 2013.
78. *Sparse representations and singularity detection using directional multiscale representations* Applied mathematics Seminar, Yale University, CT, (invited by R. Coifman), February 2013.
79. *Detection of singularities using directional multiscale representations*, 14th International Conference on Approximation Theory, San Antonio, TX, (invited by G. Kutyniok and J. Lemvig) ), April 2013.

80. *Analysis and detection of singularities using the continuous shearlet transform*, Keynote speaker at Workshop on Applied Harmonic Analysis, University of Genova, Genova, Italy, (invited by F. De Mari and E. De Vito), September 2013.
81. *Sparse approximations and singularity detection using directional multiscale representations*, Analysis Seminar, Missouri State University, Springfield, MO, (invited by K. Guo), October 2013.
82. *Shearlet methods for the analysis of singularities*, AMS Fall Central Sectional Meeting Washington University, St. Louis, MO, (invited by M. Bownik and D. Speegle), October 2013.
83. *Shearlet: geometric multiscale analysis for multidimensional data*, Schlumberger-WesternGeco, Houston, TX, (invited by C.E. Yarman ), January 2014.
84. *Shearlet-based analysis of singularities and applications to fluorescent image analysis of neuronal cultures*, 5th International Conference on Computational Harmonic Analysis, Vanderbilt University, (invited by A. Aldroubi and A. Powell), May 2014.
85. *Analysis and detection of edge singularities using the continuous shearlet transform*, Workshop on Harmonic Analysis, PDEs and Vision, Universidad Autonoma de Madrid (invited by D. Barbieri and E Hernandez), September 2014.
86. *Analysis and detection of edge singularities using the continuous shearlet transform*, University of Houston, Image Analysis Seminar (invited by M. Papadakis), September 2014.
87. *The shearlet representation: directional multiscale analysis for multivariate functions*, Colloquium, School of Mathematical Sciences, Beijing Normal University, Beijing, China (invited by D. Yang), December 2014.
88. *Sparse shearlet representations and applications to fluorescent image analysis of neuronal cultures*, Joint Mathematics Meeting 2015, San Antonio, (invited by R. Balan, K. Okoudjou, R. Ward), January 2015.
89. *Directional multiscale representations for phenotypic profiling in neuronal imaging*, February Fourier Talks 2015, Norbert Wiener Center, MD (invited by R. Balan, W. Czaja, K. Okoudjou), February 2015.
90. *Theory and applications of shearlets*, Numerical analysis seminar, University of Ferrara, (invited by G. Zanghirati), December 2015.
91. *The shearlet representation: directional multiscale analysis for multivariate functions*, Colloquium talk, Instituto Tecnológico Autónomo de México, (invited by D. Vera Rea), February 2016.
92. *Geometric multiscale analysis and applications in neuroscience imaging*, Graduate Seminar, University of Houston, Texas (invited by S. Ji), April 2016.
93. *Applied Harmonic Analysis Methods in Imaging Science*, Minitutorial at SIAM Conference on Imaging Science, Albuquerque, May 2016.
94. *Geometric multiscale representations in neuroscience imaging*, Applied Mathematics seminar, Technische Universität Berlin (invited by G. Kutyniok), June 2016.



95. *Geometric multiscale representations in neuroscience imaging*, GCC Translational Pain Research Cross-Consortia Colloquium, Houston (invited by S. Tomlinson), December 2016.
96. *Geometric multiscale representations in biomedical imaging*, MD Anderson, Department of Biostatistics (invited by K. Do), December 2016.
97. *Geometric multiscale algorithms for neuroscience imaging*, Neuroscience seminar, University of Texas Medical Branch, Galveston (invited by Shao-Jun Tang), January 2017.
98. *Detection of singularities by discrete multiscale representations*, Special session on “Bases in Function Spaces: Sampling, Interpolation, Expansions and Approximations” (invited by C. Heil, S. Nitzan and A. Powell), Joint Mathematics Meeting 2017, Atlanta, January 2017.
99. *Detection of singularities by discrete directional multiscale representations*, Aspects of Time-Frequency Analysis 2017 (ATFA17), Torino, (invited by E. Cordero and F. Nicola) June 2017.
100. *The shearlet representation. Directional multiscale analysis of multivariate data*, Keynote speaker at SMART 2017 Conference, Gaeta, September 2017.
101. *Robust and stable region of interest tomographic reconstruction by sparsity inducing convex optimization*, Houston Imaging Sciences Symposium 2017, October 2017.
102. *Sparsity-based computed tomography and region-of-interest tomographic reconstruction* (invited by C. Conti), Seminar at Dipartimento di Ingegneria Industriale, University of Florence, May 2018.
103. *Robust and stable region-of-interest tomographic reconstruction by sparsity inducing convex optimization* (invited by S. Morigi and I. Selesnick), at SIAM Conference on Imaging Science (IS18), Bologna, June 2018.
104. *Geometric multiscale methods for neuroscience imaging* (invited by D. Barbieri), SIAM Conference on Imaging Science (IS18), Bologna, June 2018.
105. *Geometric separation and applications to hyperspectral image analysis* (invited by R. Renaut), IMA Workshop on: Recent advances in machine learning and computational methods for geoscience, UMN, Minneapolis, October 2018.
106. *Automated sorting of neuronal trees in fluorescent images of neuronal networks using NeuroTreeTracer*, Workshop on Imaging-based Single Cell Analytics: Applications for Cancer Cell Biology and Therapeutics, Golf Coast Consortium, Houston, February 2019.
107. *Geometric separation and applications to hyperspectral image analysis*, Aspects of Time-frequency Analysis, Politecnico di Torino, June 2019.
108. *A deep learning framework for robust geospatial image analysis with limited ground truth*, SPIE Conference, Wavelets and Sparsity XVIII, San Diego, August 2019.

109. *Structured Receptive Field Networks and applications to hyperspectral image classification* SPIE Conference, Wavelets and Sparsity XVIII, San Diego, August 2019.
110. *Model and data-driven methods for image-based cell profiling* Texas A&M University, Institute of Biosciences & Technology, Seminar of the Center for Advanced Microscopy and Image Informatics, October 2019.
111. *Structured Receptive Field Networks and applications to hyperspectral classification* Data Science Seminar, University of Houston, October 2019.
112. *A Deep Learning Framework for the Automated Detection and Segmentation of Astrocytes in Fluorescent Images of Brain Tissue* SIAM, MDS20, June 2020.

## ORGANIZATION of MEETINGS

- Special session on *Efficient Multidimensional Representations* at the International Conference in Computational Harmonic Analysis (ICCHA5) Vanderbilt University, Nashville, May 2004 (joint with H.Krim)
- Special session on *Advanced Wavelet Representations*, at the SPIE (Society of Photographic Instrumentation Engineers) Conference, Wavelet XI, San Diego, August 2005 (joint with M.Do)
- Special session on *Directional Multidimensional Data Representations*, at the SPIE Conference, Wavelet XIII, San Diego, August 2009
- Workshop on *Shearlets* at the Oberwolfach Mathematical Institute, Oberwolfach, Germany, October 2010 (joint with G. Kutyniok).
- Special session on *Efficient Representation for Multidimensional Data*, at the SPIE Conference, Wavelet XIV, San Diego, August 2011 (joint with I. Kryshtal).
- Special session on *Advanced Representations for Multidimensional Data*, at the SPIE Conference, Wavelet XV, San Diego, August 2013
- Special session on *Sparse Methods in Medical Imaging*, at the SPIE Conference, Wavelet XVI, San Diego, August 2015
- Minitutorial on *Applied harmonic analysis methods in imaging science*, at the SIAM Imaging Conference, Albuquerque, New Mexico, May 2016
- Special session on *Sparse and multiscale methods for biomedical imaging*, at the SPIE Conference, Wavelet XVII, San Diego, August 2017
- Houston Imaging Sciences Symposium, SIAM TX-LA section meeting, Houston, October 2017
- International Conference in Computational Harmonic Analysis (ICCHA7) Vanderbilt University, Nashville, May 2018 (joint with A. Aldroubi, B. Bodmann, M. Papadakis, A. Powell)
- Minisymposium on *Anisotropic multi scale methods and biomedical imaging*, at SIAM Conference on Imaging Science (IS18), Bologna, 5-8 June, 2018

- Special session on *Sparse and multiscale methods in biomedical imaging*, at the SPIE Conference, Wavelet XVIII, San Diego, August 2019.
- Mini-symposium on *Integration of model- and data-based methods in medical imaging*, at the SIAM Conference on Mathematics of Data Science (MDS20), Cincinnati, May 2020.
- Workshop on *Integration of model- and data-driven methods for medical imaging*, BANFF Casa Matematica, Oaxaca, September 2021.

## PUBLICATIONS

### Refereed journal papers

- [1] D. Labate, F. G. Canavero, A. DeMarchi, *A Comparison of Fractal Dimension and Spectrum Coefficient*, *Metrologia*, **31**, pp. 51-53 (1994).
- [2] G. Vecchi, D. Labate, F. G. Canavero, *Fractal Approach to Lightning Radiation on a Tortuous Channel*, *Radio Sci.*, **29**(4), pp. 691-704 (1994).
- [3] D. Labate, *Time-frequency analysis of pseudodifferential operators*, *Monatsh. Math.*, **133**, pp. 143-156 (2001).
- [4] D. Labate, *Pseudodifferential operators on modulation spaces*, *J. Math. Anal. Appl.*, **262**, pp. 242-255 (2001).
- [5] D. Labate, *A unified characterization of reproducing systems generated by a finite family*, *J. Geom. Anal.*, **12**(3), pp. 469-491 (2002).
- [6] E. Hernandez, D. Labate, G. Weiss, *A unified characterization of reproducing systems generated by a finite family, II*, *J. Geom. Anal.*, **12**(4), pp. 615-662 (2002).
- [7] E. Hernandez, D. Labate, G. Weiss, E. Wilson, *Oversampling, quasi affine frames and wave packets*, *Appl. Comput. Harmon. Anal.*, **16**, pp. 111-147 (2004).
- [8] D. Labate, G. Weiss, E. Wilson *An Approach to the Study of Wave Packet Systems*, *Contemp. Math.*, **345**, Wavelets, Frames and Operator Theory, pp. 215-236 (2004).
- [9] K. Guo, D. Labate, W. Lim, G. Weiss, E. Wilson, *Wavelets with composite dilations*, *Electron. Res. Announc. Math. Sci.*, **10**, pp.78-87 (2004).
- [10] D. Labate, E. Wilson, *Connectivity in the set of Gabor frames*, *Appl. Comput. Harmon. Anal.*, **18**, pp. 113-132 (2005).
- [11] K. Guo, D. Labate, W. Lim, G. Weiss, and E. Wilson, *Wavelets with Composite Dilations and their MRA Properties*, *Appl. Comput. Harmon. Anal.*, **20**, pp. 231-249 (2006).
- [12] G. Kutyniok, and D. Labate, *The Theory of Reproducing Systems on Locally Compact Abelian Groups*, *Colloq. Math.*, **106**, pp. 197-220 (2006).
- [13] K. Guo and D. Labate, *Some Remarks on the Unified Characterization of Reproducing Systems*, *Collect. Math.*, **57**, pp. 279-293 (2006).
- [14] K. Guo and D. Labate *Optimally Sparse Multidimensional Representation using Shearlets*, *SIAM J. Math. Anal.*, **39**, pp. 298-318, (2007).

- [15] G. Kutyniok and D. Labate, *The Construction of Regular and Irregular Shearlet Frames*, J. Wavelet Theory Appl., **1**, pp. 1-10 (2007).
- [16] K. Guo and D. Labate, *Sparse Shearlet Representation of Fourier Integral Operators*, ERA-MS, **14**, pp. 7-19 (2007).
- [17] K. Guo and D. Labate, *Representation of Fourier Integral Operators using Shearlets*, J. Fourier Anal. Appl., **14**, pp. 327–371, (2008).
- [18] G. Easley, D. Labate, and W. Lim, *Sparse Directional Image Representations using the Discrete Shearlet Transform*, Appl. Comput. Harmon. Anal., **25**, pp. 25–46, (2008).
- [19] G. Kutyniok, and D. Labate, *Resolution of the Wavefront Set using the Continuous Shearlet Transform*, Trans. AMS, **361**, pp. 2719–2754 (2009).
- [20] K. Guo, D. Labate and W. Lim, *Edge Analysis and Identification using the Continuous Shearlet Transform*, Appl. Comput. Harmon. Anal., **27**(1), pp. 24–46 (2009).
- [21] G. R. Easley, D. Labate, and F. Colonna, *Shearlet Based Total Variation for Denoising*, IEEE Trans. Image Process, **18**(2), pp. 260–268 (2009).
- [22] S. Yi, D. Labate, G. R. Easley, and H. Krim, *A Shearlet approach to Edge Analysis and Detection*, IEEE Trans. Image Process, **18**(5), pp. 929–941 (2009.) [**SPS IEEE Young Author Best Paper Award, 2011**]
- [23] K. Guo, and D. Labate, *Characterization and analysis of edges using the continuous shearlet transform*, SIAM J. Imaging Sci., **2**, pp. 959–986 (2009).
- [24] F. Colonna, G. Easley, K. Guo, and D. Labate, *Radon Transform Inversion using the Shearlet Representation*, Appl. Comput. Harmon. Anal., **29**(2), pp. 232–250 (2010).
- [25] K. Guo, and D. Labate, *Optimally Sparse 3D Approximations using Shearlet Representations*, Electron. Res. Announc. Math. Sci., **17**, pp. 126–138, (2010).
- [26] K. Guo, and D. Labate, *Analysis and Detection of Surface Discontinuities using the 3D Continuous Shearlet Transform*, Appl. Comput. Harmon. Anal., **30**, pp. 231–242, (2011).
- [27] K. Guo, and D. Labate, *Optimally Sparse Representations of 3D Data with  $C^2$  Surface Singularities using Parseval Frames of Shearlets*, SIAM J Math. Anal., **44**, pp. 851–886 (2012).
- [28] G. R. Easley, and D. Labate, *Critically Sampled Wavelets with Composite Dilations*, IEEE Trans. Image Process., **21**(2), pp. 550–561 (2012).
- [29] P. S. Negi and D. Labate, *3D Discrete Shearlet Transform and Video Processing*, IEEE Trans. Image Process. **21**(6), pp. 2944-2954 (2012).
- [30] K. Guo, and D. Labate, *Characterization of Piecewise Smooth Surfaces using the 3D Continuous Shearlet Transform*, J. Fourier Anal. Appl. **18**, pp. 488-516 (2012).
- [31] K. Guo, and D. Labate, *The Construction of Smooth Parseval Frames of Shearlets*, Math. Model. Nat. Phenom., **8**(1), pp. 82–105 (2013).

- [32] D. Labate, G. Weiss, and E. Wilson, *Wavelets*, Notices AMS **60**(1) pp. 66-76 (2013).
- [33] D. Labate, L. Mantovani and P. S. Negi, *Shearlet Smoothness Spaces*, J. Fourier Anal. Appl., **19**(3) pp. 577–611 (2013).
- [34] K. Guo, and D. Labate, *Optimal Recovery of 3D X-Ray Tomographic Data using the Shearlet Representation*, Advances Comput. Math., **39**(2) pp. 227–255 (2013).
- [35] G. Easley, D. Labate, and P. S. Negi, *3D data denoising using combined sparse dictionaries*, Math. Model. Nat. Phenom., **8**(1), pp. 60–74 (2013).
- [36] G. R. Easley, D. Labate and V. Patel, *Directional multiscale processing of images using wavelets with composite dilations*, J. Math. Imag. Vision, **48**(1), pp. 13-34 (2014).
- [37] D. Labate, F. Laezza, B. Ozcan, P. Negi, M. Papadakis, *Efficient processing of fluorescence images using directional multiscale representations*, Math. Model. Nat. Phenom., **9**(5), pp. 177–193 (2014).
- [38] X. G. Serra, V. M. Patel, D. Labate, and R. Chellappa, *Discrete Shearlet Transform on GPU with applications in anomaly detection and denoising*, EURASIP J. Adv. Sig. Proc., **2014**: **64**, (2014).
- [39] M. A. Borgi, D. Labate, M. El Arbi, C. Ben Amar, *Sparse Multi-Stage Regularized Feature Learning for robust Face Recognition*, Expert Syst. Appl., **42**(1), pp. 269–279 (2015).
- [40] M. A. Borgi, D. Labate, M. El Arbi, C. Ben Amar, *A Regularized Directional Features Learning For Face Recognition*, Multimed. Tools Appl., **74**(24) pp. 11281-11295 (2015) [DOI 10.1007/s11042-014-2228-3].
- [41] K. Guo, and D. Labate, *Geometric Separation of Singularities using Combined Multiscale Dictionaries*, J. Fourier Anal. Appl. **21**(4) pp. 667–693 (2015).
- [42] D. Jimenez, D. Labate, I. A. Kakadiaris and M. Papadakis, *Improved automatic centerline tracing for dendritic and axonal structures*, Neuroinformatics, **13**(2), pp. 227-244 (2015).
- [43] T.F. James, M.N. Nenov, N.C. Wildburger; C. Litchi, J. Luisi, F. Vergara, N. Panova-Electronova, C. L. Nilsson; J. Rudra, T. A. Green, D. Labate and F. Laezza, *The Nav1.2 channel is regulated by glycogen synthase kinase 3 (GSK3)*, Biochim Biophys Acta, **1850**(4), pp. 832–44 (2015).
- [44] R. Houska, and D. Labate, *Detection of boundary curves on the piecewise smooth boundary surface of three dimensional solids*, Appl. Comput. Harmon. Anal. **40**(1), pp. 137–171 [doi:10.1016/j.acha.2015.01.004] (2015).
- [45] B. Ozcan, P. Negi, F. Laezza, M. Papadakis, and D. Labate, *Automated detection of soma location and morphology in neural network cultures*, PLoS One **10**(4), April 8, (2015).
- [46] G. Gao, Y. Liu, and D. Labate, *An image inpainting approach for the removal of Random-Valued Impulse Noise in images*, J. Vis. Commun. Image Represent. **32** pp. 83–94 (2015).

- [47] D. Jimenez, D. Labate, and M. Papadakis, *A directional representation for 3D tubular structures resulting from isotropic well-localized atoms*, Appl. Comput. Harmon. Anal. **40**(3), pp. 588–599 [doi:10.1016/j.acha.2015.08.011] (2016).
- [48] K. Guo, and D. Labate, *Characterization and analysis of edges in piecewise smooth functions*, Appl. Comput. Harmon. Anal. **41**(1) pp. 139–163 (doi:10.1016/j.acha.2015.10.007]) (2016).
- [49] T. K. Alshammari, M. A. Alshammari, M. N. Nenov, E. Hoxha, M. Cambiaghi, A. Marcinno, T. F. James, P. Singh, D. Labate, J. Li, H. Y. Meltzer, B. Sacchetti, F. Tempia and F. Laezza, *Genetic deletion of fibroblast growth factor 14 recapitulates phenotypic alterations underlying cognitive impairment associated with schizophrenia*, Translational Psychiatry **6**, Nature Publishing Group (doi:10.1038/tp.2016.66) (2016).
- [50] P. Singh, P. Negi, F. Laezza, M. Papadakis, D. Labate *Multiscale analysis of neurite orientation and spatial organization in neuronal images*, Neuroinformatics **14**(4) pp. 465–77 (doi: 10.1007/s12021-016-9306-9) (2016).
- [51] C. B. Kayasandik, D. Labate, *Improved detection of soma location and morphology in fluorescence microscopy images of neurons*, Journal of Neuroscience Methods **274** pp. 61–70 (doi:10.1016/j.jneumeth.2016.09.007) (2016).
- [52] K. Guo, and D. Labate, *Microlocal analysis of edge flatness through directional multiscale representations*, Advances in Computational Mathematics **43**(2), pp. 295–318 (doi: 10.1007/s10444-016-9486-8)(2017).
- [53] S. Dahlke, F. De Mari, E. De Vito, D. Labate, G. Steidl, G. Teschke, and S. Vigogna, *Coorbit spaces with voice in a Fréchet space*, J. Fourier Anal. Appl. **23**(1), pp. 141–206 (doi: 10.1007/s00041-016-9466-x) (2017).
- [54] A. Borgi, T. P. Nguyen, D. Labate, C. Ben Amar, *Statistical binary pattern and post-competitive representation for pattern recognition*, International Journal of Machine Learning and Cybernetics (doi:10.1007/s13042-016-0625-9) (2017).
- [55] S. Prasad, D. Labate, M. Cui, Y. Zhang, *Morphologically Decoupled multi-Scale sparse representation for hyperspectral image analysis*, IEEE Transactions on Geoscience and Remote Sensing **55**(8), pp. 4355–4366 (doi: 10.1109/TGRS.2017.2691607) (2017).
- [56] P. Singh, P. Hernandez-Herrera, D. Labate and M. Papadakis, *Automated 3-D detection of dendritic spines from in vivo two-photon image stacks*, Neuroinformatics **15**(4) pp. 303–319 (doi: 10.1007/s12021-017-9332-2) (2017).
- [57] K. Guo, and D. Labate, *Detection of singularities by discrete multiscale transforms*, The Journal of Geometric Analysis **28**(3) pp 2102–2128 (doi: 10.1007/s12220-017-9897-x) (2018).
- [58] R. Azencott, B. Bodmann, D. Labate, A. Sen, and D. Vera, *Region-of-interest reconstructions from truncated 3D x-ray projections*, Inverse Problems and Imaging **12**(1), pp. 29–57 ( doi: 10.3934/ipi.2018002) (2018).

- [59] T. Bubba, D. Labate, G. Zanghirati, S. Bonettini, *Numerical assessment of shearlet-based regularization in ROI tomography*, Math. Model. Nat. Phenom. **12**(1), pp. 29–57 ( doi: 10.3934/ipi.2018002) (2018).
- [60] C. Kayasandik, P. Negi, F. Laezza, M. Papadakis, and D. Labate, *Automated sorting of neuronal trees in fluorescent images of neuronal networks*, Scientific Reports **8**, Article number 6450 (doi: 10.1038/s41598-018-24753-w)(2018).
- [61] K. Guo, and D. Labate, *Geometric separation in  $R^3$* , J. Fourier Anal. Appl. **25**(1) pp 108–130 (doi:10.1007/s00041-017-9569-z)(2019).
- [62] K. Guo, C. Kayasandik, and D. Labate, *Directional multiscale representations and applications in neuron profiling*, Journal of Computational and Applied Mathematics **349**(15) pp. 482-493 (<https://doi.org/10.1016/j.cam.2018.09.003>) (2019).
- [63] J. Di Re, C. Kayasandik, G. Botello-Lins, D. Labate, F. Laezza, *Imaging of the Axon Initiation Segment*, Current Protocols in Neuroscience **89**(1), e78 (doi: 10.1002/cpns.78) (2019).
- [64] B. G. Bodmann, D. Labate, B. R. Pahari, *Smooth projections and the construction of smooth Parseval frames of shearlets*, Advances in Computational Mathematics **45** pp. 32413264 (doi: 10.1007/s10444-019-09736-3) (2019).
- [65] B. Goossens, D. Labate and B. G. Bodmann, *Robust and stable region-of-interest tomographic reconstruction using a robust width prior*, Inverse Problems and Imaging **14**(2) pp. 291–316 (doi: 10.3934/ipi.2020013)(2020).
- [66] K. Safari, S. Prasad, D. Labate, *A multiscale deep learning approach for high-resolution hyperspectral image classification*, IEEE Geoscience and Remote Sensing Letters (doi: 10.1109/LGRS.2020.2966987)(2020).
- [67] C. B. Kayasandik, W. Ru, D. Labate, *A multistep deep learning framework for the automated detection and segmentation of astrocytes in fluorescent images of brain tissue*, Scientific Reports **10**, Article number: 5137 (doi: 10.1038/s41598-020-61953-9)(2020).
- [68] K. Guo, D. Labate, J. P. Rodriguez Ayllon, *Image inpainting using sparse multi-scale representations: exact recovery performance guarantees*, to appear in Appl. Comput. Harmon. Anal. (doi.org/10.1016/j.acha.2020.05.001)(2020).
- [69] G. Easley, K. Guo, D. Labate, B. R. Pahari, *Sparse representations of cartoon-like cylindrical data*, to appear in Journal of Geometric Analysis (doi:10.1007/s12220-020-00493-0)(2020).
- (manuscripts below submitted or under review)**
- [70] W. J. Hsu, C. Kayasandik, P. Negi, J. Di Re, M. N. Nenov, T. F. James, F. Scala, A. Singh, P. Wadsworth, S. Prasad, D. Labate, F. Laezza, *Disrupted interactions of proteins at the axonal initial segment induced by Akt signaling*, submitted to PLOS Biology (2020).
- [71] C. Conti, M. Cotronei, D. Labate, W. Molina, *Stable recovery of planar regions with algebraic boundaries in Bernstein form*, submitted Advances in Computational Mathematics (2020).

- [72] J. Schmalfuss, N. Karantzas, D. Labate, *A geometric separating convolutional neural network for blind image inpainting*, submitted to Sig Proc Let (2020).

## Refereed conference papers

- [1] G. Vecchi, D. Labate, F. G. Canavero, *Fractal Determination of Parameters in Lightning and ESD model*, in: Proceedings of the 1992 International Aerospace and Ground Conference on Lightning and Static Electricity, Atlantic City, N.J., USA, October 6-8, (1992).
- [2] G. Vecchi, F. G. Canavero, D. Labate, *Fractal modeling of high-frequency noise due to lightning*, in: Proceedings X RiNEm, Cesena, Italy, September 21-23, (1994).
- [3] B. Dilecce, L. Isnardi, D. Labate, F. G. Canavero, *Exact Spice model of field coupling to multiconductor transmission lines*, in: Proceedings Int. Symp. EMC 1994, Sendai, Japan, May 16-20, pp. 12-15 (1994).
- [4] D. Labate, W. Lim, G. Kutyniok and G. Weiss, *Sparse Multidimensional Representation using Shearlets*, Wavelets XI (San Diego, CA, 2005), pp. 254-262, SPIE Proc. **5914**, SPIE, Bellingham, WA, 2005.
- [5] K. Guo, G. Kutyniok, and D. Labate *Sparse Multidimensional Representations using Anisotropic Dilation and Shear Operators* in: Wavelets and Splines: Athens 2005 (Proceedings of the International Conference on the Interactions between Wavelets and Splines. Athens, GA, May 16-19, 2005), G. Chen and M. Lai (eds.).
- [6] G. Easley, W. Lim, and D. Labate, *Optimally Sparse Image Representations using Shearlets*, Proc. 40th Asilomar Conference on Signals, Systems and Computers, Oct 29 - Nov 01, 2006, Vols 1-5, pp. 974-978, (2006).
- [7] S. Yi, D. Labate, G. R. Easley, and H. Krim, *Edge Detection and Processing using Shearlets*, 15th IEEE Int. Conf. on Image Processing (ICIP), San Diego, October 12-15, 2008, Vol. 1-5, pp. 1148-1151, 2008.
- [8] G. Easley, K. Guo, and D. Labate, *Analysis of Singularities and Edge Detection using the Shearlet Transform*, Proceedings Sampta 2009.
- [9] G. Easley, F. Colonna, and D. Labate, *Improved Radon Based Imaging using the Shearlet Transform*, Independent Component Analyses, Wavelets, Neural Networks, Biosystems, and Nanoengineering VII (Orlando, FL, 2009), SPIE Proc. **7343** (2009).
- [10] G. Easley, and D. Labate, *Critically Sampled Composite Wavelets*, Proc. 43rd Asilomar Conf. on Signals, Systems and Computers, Monterey, November 2009 (2009).
- [11] G. Kutyniok, and D. Labate, *Shearlets. The First Five Year*, Oberwolfach Report No. 44/2010 (2010).
- [12] K. Guo, and D. Labate, *Optimally sparse shearlet approximations of 3D data*, Independent Component Analyses, Wavelets, Neural Networks, Biosystems, and Nanoengineering IX (Orlando, FL, 2011), SPIE Proc. **8058** (2011).



- [13] R. Azencott, B. Bodmann, D. Labate, A. Sen, K. Li, X. Zhou, *Searchlight CT: A new reconstruction method for collimated X-ray tomography*, Proceedings of NCMIP 2011.
- [14] D. Labate and P. S. Negi, *3D Discrete Shearlet Transform and Video Denoising*, Wavelets XIV (San Diego, CA, 2011), SPIE Proc. **8138** (2011).
- [15] G. Easley, D. Labate and V. Patel, *Multi-Composite Wavelet Estimations*, Wavelets XIV (San Diego, CA, 2011), SPIE Proc. **8138** (2011).
- [16] G. Easley, D. Labate and V. Patel, *Hyperbolic Shearlets*, 19th IEEE International Conference on Image Processing (ICIP), 2012, pp. 2449–2452 (2012).
- [17] D. Jimenez, E. Papadakis, D. Labate and I. Kakadiaris, *Improved Automatic Centerline Tracing for Dendritic Structures*, 9th IEEE International Symposium on Biomedical Imaging (ISBI), (2013).
- [18] M.A. Borgi, D. Labate, M. ElArbi, C. Ben Amar, *Shearlet-Network-based Sparse Coding Augmented by Facial Texture Features for Face Recognition*, The 17th International Conference on Image Analysis and Processing (ICIAP) (2013).
- [19] D. Labate, G. Easley, and K. Guo, *Optimal restoration of noisy 3D X-ray data via shearlet decompositions*, Wavelets XV (San Diego, CA, 2013), SPIE Proc. **8858** (2013).
- [20] B. Ozcan, D. Labate, D. Jimenez, and M. Papadakis, *Directional and non-directional representations for the characterization of neuronal morphology*, Wavelets XV (San Diego, CA, 2013), SPIE Proc. **8858** (2013).
- [21] M. A. Borgi, D. Labate, M. El'Arbi, C. Ben Amar, *Regularized shearlet network for face recognition using single sample person*, IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), (2014).
- [22] K. Guo, R. Houska, and D. Labate, *Microlocal analysis of singularities from directional multiscale representations*, Approximation Theory XIV, April 7-10, 2013, San Antonio, Texas. Springer Proceedings in Mathematics & Statistics, Volume 83, pp 173-196 (2014).
- [23] M. A. Borgi, D. Labate, M. El'Arbi, C. Ben Amar, *Sparse multi-regularized shearlet-network using convex relaxation for face recognition*, International Conference on Pattern Recognition (ICPR), (2014).
- [24] M. A. Borgi, D. Labate, M. El'Arbi, C. Ben Amar, *ShearFace: Efficient extraction of anisotropic features for face recognition*, International Conference on Pattern Recognition (ICPR), (2014).
- [25] M. A. Borgi, D. Labate, M. El'Arbi, C. Ben Amar, *Face, gender and race classification using multi-regularized features learning*, International Conference on Image Processing (ICIP), (2014).
- [26] T.A. Bubba, D. Labate, G. Zanghirati, S. Bonettini and B. Goossens, *Shearlet-based regularized ROI reconstruction in fan beam computed tomography*, Wavelets and Sparsity XVI (San Diego, CA, 2015), SPIE Proc. (2015).
- [27] G. R. Easley, M. Barbu-McInnis, D. Labate, *Image registration using the shearlet transform*, Wavelets and Sparsity XVI (San Diego, CA, 2015), SPIE Proc. (2015).

- [28] D. Labate, P. Negi, B. Ozcan, M. Papadakis, *Directional ratio based on parabolic molecules and its application to the analysis of tubular structures*, Wavelets and Sparsity XVI (San Diego, CA, 2015), SPIE Proc. (2015).
- [29] T. K. Alshammari, M. A. Alshammari, M. N. Nenov, E. Hoxha, M. Cambiaghi, A. Marcinno, T. F. James, P. Singh, D. Labate, J. Li, H. Y. Meltzer, B. Sacchetti, F. Tempia, F. Laezza, *Fibroblast Growth Factor 14 is an Essential Element of the Inhibitory Circuit that Controls Cognitive Function Associated with Schizophrenia*, ACNP 54th Annual Meeting (Hollywood, FL, Dec 6-10, 2015), Neuropsychopharmacology (2015) vol. 40, S540. [doi:10.1038/npp.2015.327]
- [30] S. Prasad, D. Labate, M. Cui, Y. Zhang, *Rotation invariance through structured sparsity for robust hyperspectral image classification*, Proceedings ICASSP (2017).
- [31] J. Hsu, P. Negi, M. Nenov, F. Thomas, C. Kayasandik, A. Limon, B.E. Hjelm, M.O. Vawter, S. Prasad, D. Labate, F. Laezza, *Akt Dysfunction Leads to Structure-Function Changes in the Voltage-Gated Na<sup>+</sup> Channel Complex at Axonal Initial Segment That Mimic Endophenotypes Associated With Schizophrenia*, ACNP 56th Annual Meeting (2017) Neuropsychopharmacology 2017.
- [32] D. Labate, K. Safari, N. Karantzas S. Prasad, F. Foroozandeh Shahraki, *Structured Receptive Field Networks and applications to hyperspectral image classification*, Proc. SPIE 11138, Wavelets and Sparsity XVIII, 111380O (9 September 2019) (<https://doi.org/10.1117/12.2527712>)

### Other publications (books, book chapters, etc.)

- [1] P. Gressman, D. Labate, G. Weiss, E. Wilson, *Affine, quasi-affine and co-affine wavelets*, in: Beyond Wavelets, G. Welland (Ed.), Studies in Computational Mathematics, Elsevier, 2003.
- [2] D. Labate, and G. Weiss, *Wavelets associated with Composite Dilations*, in: Matemáticas: investigación y educación. Un homenaje a Miguel de Guzmán. Universidad Complutense de Madrid, Ed.Anaya, Madrid, 2005.
- [3] K. Guo, D. Labate, W. Lim, G. Weiss and E. Wilson, *The theory of wavelets with composite dilations*, in: Harmonic Analysis and applications, in: Harmonic Analysis and Applications, C. Heil (ed.), pp. 231-249, Birkhäuser, 2006.
- [4] D. Labate, and G. Weiss, *Continuous and discrete reproducing systems that arise from translations. Theory and applications of composite wavelets.*, pp. 45, in: Four Short Courses on Harmonic Analysis, Birkhäuser (2009).
- [5] G. Kutyniok and D. Labate, *Shearlets: Multiscale Analysis for Multivariate Data*, Birkhäuser, Boston (2012).
- [6] G. Kutyniok and D. Labate, *Introduction to Shearlets*, in: Shearlets: Multiscale Analysis for Multivariate Data, Birkhäuser, Boston (2012).
- [7] K. Guo and D. Labate, *Analysis and Identification of Multidimensional Singularities using the Continuous Shearlet Transform*, in: Shearlets: Multiscale Analysis for Multivariate Data, Birkhäuser, Boston (2012).

- [8] G. Easley and D. Labate, *Image Processing using Shearlets*, in: Shearlets: Multi-scale Analysis for Multivariate Data, Birkhäuser, Boston (2012).
- [9] P. Hernandez-Herrera, D. Jimenez, I. A. Kakadiaris, A. Koutsogiannis, D. Labate, F. Laezza and E. Papadakis, *A harmonic analysis view on neuroscience imaging*, in: Excursions in Harmonic Analysis: February Fourier Talks at the Norbert Wiener Center for Harmonic Analysis and Applications. Editors: J. Benedetto, T. Andrews, R. Balan, W. Czaja, K. Okoudjou. Birkhäuser, 2012.
- [10] K. Guo, and D. Labate, *Characterization and analysis of edges in piecewise smooth functions*, in *Harmonic and applied analysis. From groups to signals*, Birkhäuser, Boston, 2015.
- [11] S. Dahlke, F. De Mari, P. Grohs and D. Labate, *Harmonic and applied analysis. From groups to signals*, Birkhäuser, Boston, 2015.
- [12] D. Labate, B. R. Pahari, S. Hoteit, M. Mecati, "Quantitative methods in ocular fundus imaging: Analysis of retinal microvasculature, to appear in Landscapes of Time-Frequency Analysis II Editors: Boggiatto, P., Cordero, E., de Gosson, M., Feichtinger, H.G., Nicola, F., Oliaro, A., Tabacco, A. (Eds.) (2020).

## SOFTWARE DEVELOPMENT

(Codes available at <http://www.math.uh.edu/~dlabate/software.html>)

- [1] *2D Shearlet Toolbox*, developed in collaboration with G. Easley and W. Lim (2011).
- [2] *3D Shearlet Toolbox*, developed in collaboration with P. Negi (2013).
- [3] *Segmentation Toolbox*, developed in collaboration with D. Jimenez and M. Papadakis (2013).
- [4] *Directional ratio code*, developed in collaboration with B. Ozcan and M. Papadakis (2015).
- [5] *Automated soma detection code*, developed in collaboration with C. Kayasandik (2015).
- [6] *Neuronal tracing and arborization sorting code*, developed in collaboration with P. Negi and C. Kayasandik (2017).

## GRANTS

### Grants (completed):

- (1) Faculty Research and Professional Development (FR&PD) Award, *Wavelet-Galerkin Solutions of Multidimensional Hyperbolic Problems*, (Amount: \$4,000), 07/01/04-06/30/05, **Principal Investigator**. COMPLETED
- (2) NSF-DMS, Applied Mathematics, *Sparse Shearlet Representation: Analysis, Implementation and Applications*, (Amount: \$ 179,708), 07/01/2006-06/30/2009, **Principal Investigator** with P. Gremaud as Co-Investigator. COMPLETED

- (3) NSF-DMS (Career Award), Applied Mathematics, *Sparse directional multiscale representations: theory, implementation and applications*, (Amount: \$ 422,025), 07/01/2008-06/30/2014, **Principal Investigator**. COMPLETED
- (4) ARO (Army Research Office) STIR Award, *A Human-Goal-Based Approach for the Analysis and Processing of Visibility Data*, (Amount: \$ 20,765), 10/01/2009–06/30/2010, **Principal Investigator**. COMPLETED
- (5) NHARP (Norman Hackerman Advanced Research Program), *Morphological feature extraction for fluorescent confocal 3D-images of neurons*, (Amount : \$ 149,860), 07/01/2010 - 06/30/2012, **Co-Investigator** (50%) (PI: M. Papadakis). COMPLETED
- (6) NSF-DMS, Applied Mathematics, *Analysis and processing of multidimensional data using sparse directional multiscale representations*, (\$ 337,404), 09/01/2010-08/30/2014, **Principal Investigator** with K. Guo as Co-Investigator. COMPLETED
- (7) GEAR, Mathematics, *A targeted computational platform for the modeling of axonal plasticity in neurons*, (\$ 29,976), 06/01/2012-05/31/2013, **Principal Investigator** (coPI: B. Roysam). COMPLETED
- (8) Faculty research development (mini-grant for postdoc), UH, *A multiscale framework for the automated analysis of dendritic spine morphology*, (Amount : \$ 90,000), 09/01/2013-08/31/2015, **Principal Investigator**, (joint with M. Papadakis). COMPLETED
- (9) GEAR, Mathematics, *Quantitative geometric measures of alteration in local brain circuits*, (\$ 29,982), 06/01/2015-05/31/2016, **co-PI** (PI: M. Papadakis). COMPLETED
- (10) U.S. Air Force Office of Scientific Research; Title: *Hyperspectral and Acoustic Sensing for Robust Scene Understanding*; PI: S. Prasad (UH), **Co-Investigator** D. Labate (30%), Co-Investigator S. Shah (UH); Amount: \$ 294,918. Performance dates: 07/01/2014–07/31/2016. COMPLETED
- (11) NSF-DMS, Computational Mathematics, *Sparse 3D-Data Representations from Compactly Supported Atoms for Rigid Motion Invariant Classification with Applications to Neuroscience Imaging*, (\$ 229,993), 08/01/2013-07/31/2017, **Co-Investigator** (32%) (PI: M. Papadakis). COMPLETED
- (12) The Simons Foundation; Title: *Sparse multiscale representations and applications to multidimensional data*, **Principal Investigator** : D. Labate, \$ 35,000; Performance dates: 09/01/2016–08/30/2020. COMPLETED
- (13) GEAR, Mathematics, *Phenotypic profiling of signaling pathways in fluorescent images of neuronal cultures*, (\$ 23,976), 08/01/2017-07/31/2018, **Principal Investigator**. COMPLETED

**Grants (active):**

- (14) NSF-DMS, Computational Mathematics; Title: *Multiscale algorithms for the geometric analysis of hyperspectral data*, **Principal Investigator:** D. Labate, coPI: B. Bodmann (UH), coPI: S. Prasad (UH), \$ 270,284; Performance dates: 10/01/2017–09/30/2020. ACTIVE
- (15) NSF-DMS, Computational Mathematics; Title: *Fine Scale Singularity Detection in Multi-D Imaging with Regular, Orientable, Symmetric, Frame Atoms with Small Support* PI: E. Papadakis, **Co-Investigator:** D. Labate, (UH), \$ 249,999; Performance dates: 08/01/2017–07/30/2020. ACTIVE
- (16) Research and Innovation Staff Exchange (RISE) EU proposal 777822; Title: *GHAIA: Geometric and Harmonic Analysis with Interdisciplinary Applications*, Amount requested: Euros 2,092,500.00 (\$ 10,000 to UH for travel). Coordinator Organization: U of Bologna; UH contact: Demetrio Labate; dates: 01/01/2018–12/31/2022. ACTIVE

## REFeree EXPERIENCE

- Referee for the mathematical journals: Advances in Computational Mathematics; AMS Contemporary Mathematics; Applied and Computational Harmonic Analysis; Applied Numerical Mathematics; Bollettino dell'Unione Matematica Italiana; Bulletin of the Belgian Mathematical Society; Collectanea Mathematica Contemporary Mathematics; Constructive Approximations; Electronic Research Announcements AMS; Foundations of Computational Mathematics; International Journal of Mathematics and Mathematical Sciences; International Journal of Wavelets, Multiresolution and Information Processing; Journal of Approximation Theory; Journal of Computational and Applied Mathematics; Journal of Fourier Analysis and Applications; Journal of Geometric Analysis; Journal of Mathematical Analysis and Applications; Journal of Mathematical Imaging and Vision; Journal of Sampling Theory in Signal and Image Processing; Mathematical Modeling of Natural Phenomena; Mathematics of Computation; Monatshefte für Mathematik; Positivity; Proceedings AMS; Sampta Proceedings; Science China Mathematics; SIAM Journal of Mathematical Analysis; Zentralblatt MATH.
- Referee for the non-math journals: Applied Surface Science; Computer and Electrical Engineering; Expert Systems With Applications; Frontiers Neuroscience; Geoscience and Remote Sensing Letters; IEEE Transactions on Biomedical Engineering; IEEE Transactions on Image Processing; IEEE Transactions on Signal Processing; IEEE Transactions on Information Theory; IEEE Transactions on Geoscience and Remote Sensing; Journal of Electronic Imaging; Neuroinformatics; Journal of Visual Communication and Image Representation; Neuroinformatics; Optical Engineering; Pattern Recognition; Signal Processing; Signal Processing Letters.
- Panelist or Reviewer for the National Science Foundations, 2008,2009,2011,2012,2013,2015,2018;
- Panelist for the Oak Ridge Institute for Science and Education, 2010;
- Panelist or Reviewer for the Department of Energy, 2014;
- Panelist or Reviewer for FWO, Research Foundation Flanders, 2016,2017;

## **EDITORIAL WORK**

- Editorial Board of JP Journal of Wavelets. 2007-2010
- Associate Editor IEEE Signal Processing Letters 2018-present

### III. TEACHING AND MENTORING

#### TEACHING ACTIVITIES

University of Houston (2008-17: 17 undergraduate, 9 graduate classes):

Spring 2020	Math 6397	Mathematics of machine learning	24 students
Spring 2020	Math 3333	Intermediate Analysis	39 students
Fall 2019	Math 4310	Biostatistics	26 students
Spring 2019	Math 6398	Spec Prob: Math. of machine learning	9 students
Spring 2019	Math 3333	Intermediate Analysis	31 students
Spring 2019	Math 3339	Statistics for the Sciences	42 students
Fall 2018	Math 3339	Statistics for the Sciences	42 students
Spring 2018	Math 3339	Statistics for the Sciences	18 students
Spring 2018	Math 3333	Intermediate Analysis	26 students
Fall 2017	Math 6397	Multiscale anal. and sparse repr.	9 students
Spring 2017	Math 4355	Math. for signal representations	25 students
Spring 2017	Math 4332/6313	Introduction to Real Analysis II	19 students
Fall 2016	Math 4331/6312	Introduction to Real Analysis I	29 students
Spring 2016	Math 3363	Introduction to PDEs	66 students
Spring 2016	Math 3339	Statistics for the Sciences	34 students
Fall 2015	Math 3339	Statistics for the Sciences	55 students
Spring 2015	Math 6397	Mathematics of Medical Imaging	13 students
Spring 2015	Math 4355	Math. for signal representations	15 students
Fall 2014	Math 3339	Statistics for the Sciences	30 students
Spring 2014	Math 3339	Statistics for the Sciences	45 students
Spring 2014	Math 4355	Math. for signal representations	34 students
Fall 2013	Math 3339	Statistics for the Sciences	49 students
Spring 2013	Math 6321	Theory of functions of real var. II	21 students
Fall 2012	Math 6320	Theory of functions of real var. I	28 students
Fall 2012	Math 3339	Statistics for the Sciences	61 students
Spring 2012	Math 4355	Math. for signal representations	33 students
Fall 2011	Math 3333	Intermediate Analysis	23 students
Spring 2011	Math 7321	Functional Analysis	7 students
Fall 2010	Math 7320	Functional Analysis	7 students
Spring 2010	Math 4355	Math. for signal representations	25 students
Fall 2009	Math 6397	Introduction to Wavelets	6 students
Spring 2009	Math 3338	Introduction to Probability	53 students
Spring 2009	Math 3333	Intermediate Analysis	42 students
Fall 2008	Math 3333	Intermediate Analysis	21 students

NC State University (2003-08: 9 undergraduate, 5 graduate classes):

Spring 2008	Math 515	Real Analysis I	16 students
-------------	----------	-----------------	-------------

Fall 2007	Math 425	Mathematical Analysis	20 students
Fall 2007	Math 242	Calculus III	50 students
Fall 2006	Math 797	Introduction to Wavelets	7 students
Fall 2006	Math 242	Calculus III	47 students
Fall 2006	Math 425	Mathematical Analysis	20 students
Spring 2006	Math 515	Real Analysis I	17 students
Fall 2005	Math 242	Calculus III (2 sections)	99 students
Spring 2005	Math 715	Real Analysis II	7 students
Fall 2004	Math 515	Real Analysis I	20 students
Fall 2004	Math 242	Calculus III	30 students
Spring 2004	Math 242	Calculus III	38 students
Fall 2003	Math 242	Calculus III	50 students

**Washington University** (2000-03: 8 undergraduate, 1 graduate classes):

Spring 2003	Math 233	Calculus III	73 students
Fall 2002	Math 217	Differential Equations	58 students
Fall 2002	Math 519	Harmonic Analysis	7 students
Spring 2002	Math 404	Numerical Methods	7 students
Fall 2001	Math 141	Accelerated Calculus I	35 students
Fall 2001	Math 217	Differential Equations	61 students
Spring 2001	Math 142	Accelerated Calculus II	18 students
Fall 2000	Math 320	Intr. to Probability and Statistics	63 students
Fall 2000	Math 141	Accelerated Calculus I	28 students

**Georgia Tech** (1995-99: 16 undergraduate classes):

Summer 1999	Math 2508	Calculus V	49 students
Winter 1999	Math 2502	Finite diff. and differential eq.	13 students
Fall 1998	Math 2502	Finite diff. and differential eq.	37 students
Summer 1998	Math 2502	Finite diff. and differential eq.	18 students
Spring 1998	Math 2502	Finite diff. and differential eq.	31 students
Winter 1998	Math 1508	Calculus II	39 students
Fall 1997	Math 1508	Calculus II	45 students
Summer 1997	Math 2508	Calculus V	27 students
Spring 1997	Math 1711	Math. for management I	54 students
Winter 1997	Math 1713	Math. for management III	43 students
Fall 1996	Math 1713	Math. for management III	37 students
Summer 1996	Math 2502	Finite diff. and differential eq.	31 students
Spring 1996	Math 1713	Math. for management II	46 students
Winter 1996	Math 1713	Math. for management III	46 students
Fall 1995	Math 1509	Calculus III	35 students
Spring 1995	Math 2508	Calculus V	35 students



## OTHER EDUCATIONAL ACTIVITIES

Summer 2007: Research Experience for Undergraduates (REU), *Edge detection using multidimensional wavelets*

## ADVISING: GRADUATE STUDENTS

1. Vishal Patel (MS), *Wavelets and approximation theory*, NCSU, 2006 (currently Assistant Professor, Department of Electrical and Computer Engineering, Johns Hopkins University)
2. Chris Brasfield (MS), *Numerical homogenization using Complex Wavelets*, NCSU, 2008 (supported by my NSF grant)
3. Sheng Ying (Ph.D., co-advisor, advisor: H Krim), *Edge analysis and detection using shearlets*, NCSU 2010 (currently Research Scientist at GE Global Research)
4. Pooran Negi (Ph.D.), *Directional multiscale analysis using shearlets. Theory and applications*, UH 2012 (supported by my NSF grant; currently Postdoc at University of Denver)
5. Anando Sen (Ph.D., jointly with R. Azencot), *Searchlight CT: A new regularized reconstruction method for highly collimated X-ray tomography*, UH 2012 (supported by my NSF grant; currently Postdoc at MD Anderson, Houston)
6. Cihan Kayasandik (Ph.D.), *Geometric Multiscale Analysis and Applications to Neuroscience Imaging*, UH 2017 (supported by my NSF grant; currently Associate Professor at Medipol University Istanbul)
7. Sabrine Hoteit (Ph.D.), *Quantitative methods in retinal fundus imaging*, UH, May 2020
8. Kazem Safaripoorfatide, (Ph.D.), *Receptive Field Convolutional Neural Networks and Applications in Image Classification*, UH, August 2020
9. Basanta Pahari (Ph.D.), *Smooth Projections and Optimally Sparse Representation of Cartoon-like Cylindrical Solids*, UH, August 2020
10. Jose Pedro Rodriguez Ayllon (Ph.D.), *Shearlet-based Analysis of Image Inpainting and Convolutional Framelets*, UH, August 2020
11. Wilfredo Molina (Ph.D.), *Improving the Stability of the Recovery of Algebraic Curves via Bernstein Basis Polynomials and Neural Networks* UH, August 2020.
12. An Vu (Ph.D.), UH, started in 2019, expected 2022.
13. Nick Fularczyk (Ph.D.), UH, started in 2019, expected 2022.
14. Qianfan Bai (Ph.D.), UH, started in 2019, expected 2022.
15. Yewen Huang (Ph.D.), UH, started in 2020, expected 2022.
16. Heng Zhao (Ph.D.), UH, started in 2020, expected 2022.
17. Michela Marini (Ph.D.), UH, started in 2020, expected 2023.

## ADVISING: UNDERGRADUATE STUDENTS

Huy Dinh (2012), Caroline Hodges (2012), Mark Vaugham, (2012-13), Adyta Sen (2014).

## **MENTORING: POSTDOCTORAL FELLOWS**

1. David Jimenez, supported by NHARP grant (jointly with E Papadakis), Jan 2011 - Feb 2013 (currently Professor at the Escuela de Matematica of the Universidad de Costa Rica)
2. Robert Houska, supported by NSF grant, 2011-2015
3. Pooran Negi, supported by GEAR and NSF grants, 2013-2015 (Postdoc at the University of Denver)
4. Pankaj Kumar Singh, supported by NSF and UH grant, 2013-2016 (Postdoc at the University of Texas MD Anderson Cancer Center)
5. Sergio Daniel Vera Rea, supported by NSF and UH grant, 2013-2014 (currently Assistant Professor at the Instituto Tecnologico Autonomo de Mexico).
6. Cihan Kayasandik, supported by Gear and NSF, 2017-2018 (currently Associate Professor at Medipol University Istanbul).

## **ADVISING: INTERNATIONAL SCHOLARS**

Lucia Mantovani (U. Genova, Italy, 2012), Bart Goossens (Gent U., Belgium, 2013), Guorong Gao, (Northwest A&F U., Shaanxi, China, 2014), Tatiana Bubba (U. Ferrara, Italy, 2014), Jenny Schmalfuss (U. Stuttgart, Germany, 2019), Mariachiara Mecari (Politecnico Torino, Italy, 2019), Michela Marini (U. Bologna, 2019).