

MAURO MAGGIONI

Department of Mathematics, Computer Science
Duke University, 117 Physics Bldg., Box 90320
Durham, NC 27708-0320, +1-(919)-660-2825
Home page: www.math.duke.edu/~mauro

RESEARCH INTERESTS

Applied harmonic analysis; diffusion processes and heat kernels; theory and algorithms for machine learning; spectral graph theory. Applications to imaging and signal processing; geometric methods for the analysis of high-dimensional probability distribution; classification and clustering algorithms, control and reinforcement learning.

My recent work has focused on the construction of multi-resolution structures on discrete data and graphs, connecting aspects of classical harmonic analysis, global analysis on manifolds, spectral graph theory and classical multiscale analysis. These ideas enable multiscale signal processing on graphs and manifolds, with a wide variety of applications to analysis of data, compression and denoising, classification and clustering algorithms for images (e.g.: 2-D, hyper-spectral), EEG data, network traffic, large data sets.

POSITIONS HELD

- 2006- *Assistant Professor* in Mathematics and Computer Science, Duke University.
- 2005-2006 *Research Scientist*, Applied Mathematics, Yale University.
- 2004-2005 *Gibbs Assistant Professor*, Department of Mathematics, Yale University.
- 2004 (Fall) *Fellow*, Institute Pure and Applied Mathematics, UCLA, Program in Multiscale Geometry and Analysis in High Dimensions.
- 2002-2004 *Gibbs Instructor*, Department of Mathematics, Yale University.
- 2002- *Director*, MPIM Consultants Limited, a U.K.-based scientific software company.
- 2001-2002 *Software Engineer* and project team leader, Mettler-Toledo-Myriad, Melbourn, U.K., design of software for robots for automated chemistry.
- 2000-2001 Graduate Teaching Assistantship, Washington University, St.Louis.

EDUCATION

- 2002, May Ph.D. in Mathematics, Washington University, St.Louis, *Discretization of continuous wavelet transforms*, advisor: Prof. G. L. Weiss. Area: harmonic analysis.
- 2000, Dec M.Sc., Washington University, St. Louis.
- 1999, July Laurea (M.Sc.) *cum laude* in Mathematics, Universita' di Milano, Italy, *M-band compactly supported biorthogonal wavelets and Burt-Adelson wavelets*, under the supervision of Prof. P. M. Soardi.

HONORS, AWARDS

- 2008-2012: Sloan Fellowship.
- 2007: Popov prize in approximation theory.
- 1999-2000: The Albert and Judith Fay Ross Memorial Fellowships, School of Art and Sciences, Washington University, St.Louis.

GRANTS

- 2011-2016: NSF-RTG: *Geometric, Topological and Statistical Methods for Analyzing Massive Datasets*, CoPI.
- 2011-2013: DARPA *Knowledge Enhanced Exapixel Photography*, subcontract.
- 2010-2013: ONR *Geometric Multiresolution Analysis for Data Representation, Information Extraction and*

Learning.

2010-2013: DOE *Multiscale geometry for the analysis of high dimensional datasets*, Co-PI, subcontract.

2009-2014: NSF-DMS CAREER *Multiscale methods for high-dimensional data, graphs and dynamical systems*, PI.

2009-2013: NSF-NeTS *NeTS: Small: Collaborative Research: Online Social Networks: Measurement and Characterization Methodologies*, PI.

2008-2011: NSF-IIS *Learning Multiscale Representations Using Harmonic Analysis on Graphs*, PI.

2008-2011: NSF-CHE (CDI program), *A multidisciplinary, multiscale approach to discover organizing principles in macromolecular dynamics and functions*, PI.

2008-2011: NSF-CCF *Mathematical Foundations of Multiscale Graph Representations and Interactive Learning*, PI.

2007-2010: ONR *Geometric Modeling OF and Function Approximation ON High Dimensional, Multi-Modal Data Sets*, PI.

2005-2009: NSF DMS *Multiscale Diffusion Analysis*, PI.

PUBLICATIONS

Applied Mathematics, Multiscale and Computational Harmonic Analysis

A.V. Little, M. Maggioni and L. Rosasco, *Multiscale Geometric Methods for Data Sets I: multiscale covariances of noisy samples and intrinsic dimension*, under revision, 2011

W. Zheng, M. A. Rohrdanz, M. Maggioni and C. Clementi, *Polymer reversal rate calculated via locally scaled diffusion map* in Journ. Chem. Phys., 134 2011: 144108.

M. A. Rohrdanz, W. Zheng, M. Maggioni and C. Clementi, *Determination of reaction coordinates via locally scaled diffusion map* in Journ. Chem. Phys., 134 2011: 124116.

W.K. Allard, G. Chen and M. Maggioni, *Multiscale Geometric Methods for Data Sets II: Geometric wavelets*, in press, Appl. Comp. Harm. Anal., 2011

G. Chen, A.V. Little, M. Maggioni and L. Rosasco, *Some recent advances in multiscale geometric analysis of point clouds*, in Wavelets and Multiscale Analysis: Theory and Applications, Springer Verlag, 2011

E.E. Monson, G. Chen, R. Brady and M. Maggioni, *Data representation and exploration with Geometric Wavelets*, Visual Analytics Science and Technology (VAST), 2010 IEEE Symposium, 243–244, 2010,

G. Chen and M. Maggioni, *Multiscale Geometric Dictionaries for Point-Cloud Data*, Proc. SampTA, 2011

J. Lee and M. Maggioni, *Multiscale Analysis of Time Series of Graphs*, Proc. SampTA, 2011

A.V. Little, M. Maggioni and L. Rosasco, *Multiscale Geometric Methods for Estimating Intrinsic Dimension*, Proc. SampTA, 2011

J Guinney, P Febbo, M. Maggioni, S Mukherjee *Multiscale factor models for molecular networks*, Proc. JSM, 2010.

E Monson, R Brady, G Chen, M. Maggioni *Exploration & Representation of Data with Geometric Wavelets*, Poster & short paper at Visweek, 2010.

G. Chen, M. Maggioni *Multiscale Geometric Wavelets for the Analysis of Point Clouds*, Proc. C.I.S.S., 2010.

A V Little, J Lee, YM Jung, M. Maggioni *Multiscale Estimation of Intrinsic Dimensionality of Data Sets*, Proc. A.A.A.I., Nov. 2009.

R R Coifman, M. Maggioni *Geometry analysis and signal processing on digital data, emergent structures, and knowledge building*, SIAM news, Dec. 2008.

P W Jones, M. Maggioni, R Schul. *Universal local manifold parametrizations via heat kernels and eigenfunctions of the Laplacian*, Ann. Acad. Scient. Fen., Vol. 35:1–44, 2010. <http://arxiv.org/abs/0709.1975>.

W. Willinger, R. Rejaie, M. Torkjazi, M. Valafar, and M. Maggioni. *Research on Online Social Networks: Time to Face the Real Challenges*, Proc. HotMetrics'09, 2009.

P W Jones, M. Maggioni, R Schul. *Manifold parametrizations by eigenfunctions of the Laplacian and heat kernels*, P.N.A.S., Vol. 105, 6, Feb 2008.

R R Coifman, I G Kevrekidis, S Lafon, M. Maggioni, B. Nadler. *Diffusion Maps, reduction coordinates and low dimensional representation of stochastic systems*, SIAM J.M.M.S., 7(2): 842–864, 2008.

E E Monson, M. Maggioni, A L Lin. *Markov Modeling of experimental, constrained geometry neuron network dynamics*, submitted, 2007.

M Mahoney, M. Maggioni, and P Drineas. *Tensor-CUR Decompositions for Tensor-Based Data*. to appear in SIAM Jour. on Mat. Anal. and Appl., 2007.

R R Coifman, S Lafon, M. Maggioni, Y Keller, A D Szlam, F J Warner, S W Zucker. *Geometries of sensor outputs, inference and information processing*, Proc. SPIE, Vol. 6232, 623204, May 2006.

R R Coifman, M. Maggioni, S W Zucker, and I G Kevrekidis. *Geometric diffusions for the analysis of data from sensor networks*, Curr. Opin. Neurobiol., 15(5):576–84, Oct 2005.

M. Maggioni, J C Bremer Jr, R R Coifman, and A D Szlam. *Biorthogonal diffusion wavelets for multiscale representations on manifolds and graphs*, Proc. SPIE Wavelet XI, Vol 5914, 59141M, Sep 2005.

M. Maggioni, A D Szlam, R R Coifman, and J C Bremer Jr. *Diffusion-driven multiscale analysis on manifolds and graphs: top-down and bottom-up constructions*. Proc. SPIE Wavelet XI, Vol 5914, 59141D, Sep 2005.

J C Bremer, R R Coifman, M. Maggioni, and A D Szlam. *Diffusion wavelet packets*. Appl. Comp. Harm. Anal., 15(1): 95–112.

R R Coifman and M. Maggioni. *Diffusion wavelets for multiscale analysis on graphs and manifolds*. Proc. Conf. Interactions Splines and Wavelets, Oct. 2005.

R R Coifman and M. Maggioni. *Diffusion wavelets*. Appl. Comp. Harm. Anal., 21(1):53–94, July 2006.

R R Coifman, S Lafon, A Lee, M. Maggioni, B Nadler, F J Warner, and S W Zucker. *Geometric diffusions as a tool for harmonic analysis and structure definition of data. part i: Diffusion maps*. Proc. of Nat. Acad. Sci., 102:7426–7431, May 2005.

R R Coifman, S Lafon, A Lee, M. Maggioni, B Nadler, F J Warner, and S W Zucker. *Geometric diffusions as a tool for harmonic analysis and structure definition of data. part ii: Multiscale methods*. Proc. of Nat. Acad. Sci., 102:7432–7438, May 2005.

Pure Mathematics

M. Maggioni *Quantitative bounds on the perturbation of the eigenvalues and eigenfunctions of the Laplacian on graphs and manifolds under rough isometries*, in preparation.

M. Maggioni, H N Mhaskar *Diffusion polynomial frames on metric measure spaces*, Appl. Comp. Harm. Anal., 24(3): 329–353, 2007.

M. Maggioni. *Wavelet frames on groups and hypergroups via discretization of Calderón formulas*, Monats. Mat., (143):299–331, 2004.

N H Katz, E Krop, and M. Maggioni. *On the box problem*, Math. Research Letters, 4:515–519, 2002.

M. Maggioni. *M-band Burt-Adelson wavelets*, Appl. Comput. Harm. Anal., 3:286–311, 2000.

C K Chui, W Czaja, M. Maggioni, and G L Weiss. *Characterization of tight wavelet frames with arbitrary matrix dilations and tightness preserving oversampling*, J Four Anal App, 8(2):173–200, 2002.

M. Maggioni. *Critical exponent of short even filters and biorthogonal Burt-Adelson wavelets*, Monats. Math., 131(1):49–70, 2000.

Hyperspectral Imaging, Pathology & Medical Applications

M. Maggioni, F J Warner, G L Davis, R R Coifman, F B Geshwind, A C Coppi, and R A DeVerse. *Hyperspectral Microscopic Analysis of Normal, Adenoma and Carcinoma Microarray Tissue Sections*, SPIE Optical Biopsy, 2006, Vol. 6091, 60910I

E Causevic, R R Coifman, R Isenhardt, A Jacquin, E R John, M. Maggioni, L S Pritchep, F J Warner, *QEEG-based classification with wavelet packets and microstate features for triage applications in the ER*, submitted, Oct 2005.

M. Maggioni, F J Warner, G L Davis, R R Coifman, F B Geshwind, A C Coppi, and R A DeVerse. *Algorithms from signal and data processing applied to hyperspectral analysis: Application to discriminating normal and malignant microarray colon tissue sections*, submitted, 2004.

M. Maggioni, F J Warner, G L Davis, R R Coifman, Frank B Geshwind, Andreas C Coppi, and Richard A DeVerse. *Algorithms from signal and data processing applied to hyperspectral analysis: Application to discriminating normal and malignant microarray colon tissue sections*, Technical Report 1311, Yale University, Dept. Comp. Sci., Feb 2004.

G L Davis, M. Maggioni, F J Warner, F B Geshwind, A C Coppi, R A DeVerse, and R R Coifman. *Spectral analysis of normal and malignant microarray tissue sections using a novel micro-optoelectromechanical system*, Mod. Pathol., 17(1:358A), 2004.

G L Davis, M. Maggioni, F J Warner, F B Geshwind, A C Coppi, R A DeVerse, and R R Coifman. *Hyper-spectral analysis of normal and malignant colon tissue microarray sections using a novel dmd system*, Poster, Optical Imaging NIH workshop, to appear in Proc., Sep 2004.

G L Davis, M. Maggioni, R R Coifman, R Levinson, and D Rimm. *Spatial-spectral analysis of colon carcinoma*, Mod. Path., 2004. In print.

Machine Learning, Statistics

G. Chen and M. Maggioni, *Multiscale Geometric and Spectral Analysis of Plane Arrangements*, Proc. CVPR, 2011

Q. Wu, J. Guinney, M. Maggioni, S. Mukherjee, *Learning Gradients: Predictive Models that Infer Geometry and Statistical Dependence*, Jour. Mach. Learn. Res. 11: 2175-2198, 2010

A D Szlam, M. Maggioni, R R Coifman, *Regularization on graphs with function adapted diffusion processes*. Journ. Mach. Learn. 9(Aug):1711-1739, 2008

S Mahadevan, M. Maggioni. *Proto-value Functions: A Laplacian Framework for Learning Representation and Control in Markov Decision Processes*. Journ. Mach. Learn. (8): 2169-2231, 2007

S Mahadevan, K Ferguson, S Osentoski and M. Maggioni. *Simultaneous Learning of Representation and Control In Continuous Domains* Proc. AAAI 2006.

S Mahadevan and M. Maggioni. *Value function approximation with diffusion wavelets and Laplacian eigenfunctions*, Univ. of Massachusetts, Dept. of Computer Science TR-2005-38, and NIPS, accepted, 2005.

M. Maggioni and S Mahadevan. *Fast direct policy evaluation using multiscale analysis of Markov diffusion processes*, Univ. of Massachusetts, Dept. of Computer Science TR-2005-39, and ICML 2005.

Miscellanea

R J Cassidy, J Berger, M. Maggioni, and R R Coifman. *Auditory display of hyperspectral colon tissue images using vocal synthesis models*, Proc. 2004 Intern. Conf. Auditory Display, 2004.

S Ferrari, M. Maggioni, and N A Borghese. *Multi-scale approximation with hierarchical radial basis functions networks*, IEEE Trans. on Neural Networks, 15(1):178-188, January 2004.

Non-refereed publications

A V Little, J Lee, YM Jung, M. Maggioni *Estimation of intrinsic dimensionality of samples from noisy low-dimensional manifolds in high dimensions with multiscale SVD* Proc. S.S.P., Sep. 2009.

PROFESSIONAL ACTIVITIES

Mathematical Biology Institute Semester-long program for Spring 2014, organizer.

Workshop on Large Graphs: Modeling, Algorithms and Applications, in the program on Mathematics of Information, Institute for Mathematics and its Applications, Oct. 2011, organizer.

Duke workshop on *Sensing and Analysis of High-Dimensional Data* on July 26-28th, 2011, organizer.

ICIAM Minisymposium on Harmonic Analysis on Graphs and Networks on July 22, 2011, organizer.

Workshop on *Optimization, Search and Graph-Theoretical Algorithms for Chemical Compound Space*, Inst. Pure and Appl. Math., Apr. 2011, organizer.

The Mathematics of Information and Knowledge, AMS national meeting, Jan. 2010, organizer.

Geometric and Spectral Techniques for Analysis of Graphs, SAMSI working group, Fall 2010.

Duke workshop on *Large Data Sets: Computation and Structure*, CTMS, Nov. 2010, organizer.

Symposium on manifold learning, AAAI, Nov. 2009, organizer.

Internet Multiresolution program, Inst. Pure and Appl. Math., U.C.L.A., Sep-Dec. 2008, organizer.

Document Space workshop, Inst. Pure and Appl. Math., U.C.L.A., Jan. 2006, organizer.

Constructive Approximation, editor; Applied Computational Harmonic Analysis, associate editor; Information & Inference, associate editor.

NSF, ONR, AFOSR, DOE, Australian Research Council, Israel Science Foundation: reviewer/panelist.

Reviewer for Appl. Comp. Harm. Anal., Jour. Math. Anal. and Appl., Jour. Comp. Phys., N.I.P.S. 2005, I.E.E.E. Trans. Neur. Net., I.E.E.E. Trans. Image Proc., Jour. Funct. Anal., Journ. A.M.S.

3 U.S. patents pending, one for hyper-spectral imaging, two for data analysis, organization and visualization. High-D Systems, U.K., Director.

TEACHING EXPERIENCE

Fall 2011: Topics in Probability; Scientific Computing I
Fall 2010: Real Analysis
Spring 2009: Scientific Computing II
Spring 2008: Topics of current research in Analysis: Introduction to Spectral Graph Theory and Applications
Fall 2007: Scientific Computing I
Spring 2007: Topics of current research in Analysis: Harmonic Analysis and Applications
Spring 2005: Topics in Harmonic Analysis and Applications, graduate course, Yale University
Spring 2004: Basic Functional Analysis, Dept. of Mathematics, Yale University
Summer 2003: Instructor, Calculus I part 2, Summer Programs, Yale University
Fall 2002: Instructor, Applied Mathematics and Engineering I, Yale University
Summer 2000: Instructor, Introduction to Calculus, Inroads Program, Washington University
Fall 2000: Teaching Assistant for Calculus I

TRAINING OF STUDENTS

Miles Crosskey, Ph.D. student, 09-12
Prakash Balachandran, Ph.D. on *Dimensionality Reduction and Learning on Networks*, 7/11
Anna V. Little, Ph.D. on *Estimating the Intrinsic Dimension of High-Dimensional Data Sets: A Multiscale, Geometric Approach*, 5/11
Arthur D. Szlam, co-advisor, Ph.D. on *Non-Stationary Analysis on Datasets and Applications*, Yale, 5/06.

TRAINING OF POSTDOC'S

Mark Iwen, Visiting Asst. Prof., 10-12
Guangliang Chen, Visiting Asst. Prof., 09-12
Jake Bouvrie, Visiting Asst. Prof., 09-12
Yoon-Mo Jung, postdoc, 08-10, currently in Comp. Sci. & Eng. at Yonsei Univ.

INVITED TALKS

Multiscale geometric methods for noisy point clouds in high dimensions, FOCM, Budapest, 7/4/11
Multiscale Geometric Dictionaries for Point-cloud Data, SPARS, Edinburgh, 6/28/11
Graphs, High-dimensional Data Sets, and Multiscale Analysis, IPAM, 6/15/11
Multiscale geometric methods for noisy point clouds in high dimensions, International Conference on Computational Harmonic Analysis, City U., Hong Kong, 5/23/11
Geometric Multi-Resolution Analysis and Dictionary Learning, Shanks conference, Vanderbilt, 5/17/11; SampTA, Singapore, 5/5/11
Multiscale geometric methods for noisy point clouds: intrinsic dimension estimation, SampTA, Singapore, 5/5/11
Multiscale Analysis of Dynamic Graphs, SampTA, Singapore, 4/5/11
Multiscale geometric methods for noisy low-dimensional point clouds in high dimensions, I.I.S.A., N.C.S.U., 4/28/11
Geometric analysis of molecular dynamics data, diffusion geometry and reaction coordinates, I.P.A.M., 4/12/11
Multiscale geometric methods for noisy point clouds in high dimensions, Applied Math Colloquium, Caltech, 4/11/11; Applied math Colloquium, Yale, 4/4/11; Statistics colloquium, University of Chicago, 3/29/11; N.C.S.U., 3/18/11; Imaging workshop, Columbia, SC, 2/19/11
Geometric MultiResolution Analysis, FFT 2011, University of Maryland, 2/18/11
Multiscale geometric methods for noisy point clouds in high dimensions, Applied Math Colloquium, Boulder, 1/14/11; E.P.F.L., 12/20/10; Yale, 11/30/10
Novel Multiscale Representations of Data Sets for Interactive Learning, Georgia Tech, 12/09/10
Multiscale Methods for Analysis on Graphs, Duke Network Center, 11/11/10
Novel Multiscale Representations of Data Sets for Interactive Learning, Visweek, 10/24/10
Graphs, High-Dimensional Data, Dynamic Graphs, SAMSI undergraduate workshop, 10/31/10
Geometry and Analysis of point sets in high dimensions, Vanderbilt, colloquium, 9/10/10
Multiscale Methods for Analysis on Graphs, SAMSI Complex Networks workshop, 8/1/10
Multiscale Geometric Methods for the Analysis of Points Clouds, Université Marie-Curie, 6/21/10; IPAM Machine Reasoning Workshop, 9/23/10

Intrinsic dimensionality estimation and multiscale geometry of data sets, M.M.D.S., Stanford, 6/16/10; High dimensional data workshop, Bonn, 6/8/10

Towards Multiscale Methods for the Analysis of Dynamic Graphs, Newton Institute, Statistics of Networks Workshop, 6/25/10

Intrinsic dimensionality estimation and multiscale geometry of data sets, M.I.T., Boston, 5/5/10

Multiscale estimation of dimension of point clouds, Siam Imaging, Chicago, 4/28/10

Estimation of Intrinsic Dimension of Point Clouds, B.A.M.C., Edinburgh, 4/9/10; C.I.S.S., Princeton, 3/17/10

Geometry and Analysis of point sets in high dimensions, Vanderbilt, 2/25/10

Multiscale geometric methods for data sets I: intrinsic dimensionality, Yale, 2/16/10

Geometry and Analysis of point sets in high dimensions, Princeton, P.A.C.M. colloquium, 11/9/09

On estimating the intrinsic dimensionality of noisy data sets in high dimensions, A.A.A.I. Workshop on manifold learning, 11/5/09

Harmonic and Multiscale Analysis of, and on, Data Sets, Luminy, Samp.T.A., plenary talk, 5/18/09

Harmonic and Multiscale Analysis on low-dimensional data sets in high-dimensions, 20 years of wavelets, DePaul, 5/15/09

Parametrizations of manifolds via Laplacian eigenfunctions and heat kernels, I.P.A.M. Laplacian eigenvalues and eigenfunctions, 2/9/09

Harmonic and geometric multiscale analysis of data sets in high dimensions, T.T.I. Chicago, Machine Learning summer school, 2/6/09

Harmonic and geometric analysis of data sets in high-dimensions, Washington, A.F.O.S.R. Math. Foundations of Machine Learning workshop, 1/26/09

Harmonic and Multiscale Analysis on low-dimensional data sets in high-dimensions, A.M.S. nat. meeting, 1/5/09

Multiscale analysis on graphs, I.P.A.M., Workshop on Multiscale Internet, 11/17/08

Harmonic and Multiscale Analysis on low-dimensional data sets in high dimensions, I.M.A., Workshop on Multi-Manifold Learning, 10/27/08

Multiscale harmonic analysis on graphs and data sets, I.P.A.M., Workshop on Multiscale Internet, September 23, 2008

Math Foundations of Multiscale Graph Representations and Interactive Learning, Georgia Tech, FODAVA program kick-off meeting, 9/16/08

Tutorial - Random Walks on Graphs Large-time Behavior and Applications to Analysis of Large Data Sets, Tutorial II: Random Walks on Graphs Multiscale Aspects, I.P.A.M., Workshop on Multiscale Internet, 9/10/08

Harmonic and multiscale analysis of and on data sets in high dimensions, 6/12/08, I.M.S. at N.U.S. in Singapore.

Multiscale Analysis on graphs via diffusion, 5/14/08, DIMACS.

Analysis on and analysis of data sets with diffusion operators, 4/14/08, CAAM, Rice Univ, 4/24/08, Univ. of Maryland College Park.

Geometry of data sets in high dimensions and learning, 4/8/08, O.N.R. workshop, Naval Postgraduate School, Monterey, CA.

Harmonic Analysis on data sets in high-dimensional space, Parametrizations of manifolds with heat kernels, multiscale analysis on graphs, and applications to analysis of data sets, 3/3 and 3/5/08, SC/IMI, Columbia, SC.

Diffusion analysis of and on data sets through diffusion operators, 1/07/08, AMS, San Diego.

Harmonic and multiscale analysis of and on data in high-dimensions, 12/13/07, Bad Honnef.

Super fast tour on the basics of compressive sensing, 11/27/07, SAMSI, RTP.

Diffusion analysis of and on data sets through diffusion operators, 11/02/07, UNC.

CDI NSF program panelist short presentation, 10/29/07, IPAM in UCLA.

Diffusion analysis of and on graphs, and high-dimensional data, talk given at the minisymposium on Eigenfunctions of the Laplacian, held at ICIAM 2007; conference on Trends in Applied Harmonic Analysis, 9/27/07, Banff International Research Station in Banff; conference on Dynamic Searches and Knowledge Building, 10/03/07, IPAM in UCLA; workshop on Wavelet Analysis, AMS conference, Chicago, 10/06/07; conference on Geometric and Topological Approaches to Data Analysis, 10/08/07, TTI-Chicago.

Diffusion processes on graphs and multiscale analysis of high dimensional data, 3/6/07, San Antonio, Texas.

Multiscale analysis of diffusion processes on graphs and analysis of high-dimensional data, 1/26/07, N.C.S.U., Raleigh; 2/14/07, M.I.T., Boston.

Analisi armonica multiscala applicata all'analisi di dati digitali in alte dimensioni e su grafi, Dipt. Mat. e Appl., Milano, Dic. 2006.

Multiscale Analysis of Diffusion Processes on Graphs and Analysis of High-dimensional Data, Dipt. Mat. e Appl., Genova, May 2006; JHU, Applied Math. Dept., Oct. 2006.

Multiscale analysis on manifolds and graphs: constructions and applications, UCLA, Jan. 2006, U.Minnesota, Jan. 2006, Brown U., Feb. 2006, Duke, Feb. 2006, Georgia Tech., Feb. 2006, Stanford U., Feb. 2006.

Diffusion Wavelets for multiscale analysis on manifolds and graphs: constructions and applications, Penn State U., Sep. 2005, Cornell U., Oct. 2005, Duke U., Nov. 2005, EPFL - Lausanne, Dec. 2005.

Biorthogonal Diffusion Wavelets for Multiscale Representation on Manifolds and Graphs, SPIE Wavelet XI Conference, San Diego, July 2005.

Diffusion-driven Multiscale Analysis on Manifolds and Graphs: top-down and bottom-up constructions, SPIE Wavelet XI Conference, San Diego, July 2005.

Diffusion Geometries, Diffusion Wavelets and Harmonic Analysis of large Data Sets, Summer School on Intelligent Extraction of Information from large graphs, IPAM, UCLA, July 2005.

Diffusion Wavelets on Graphs and Manifolds, Princeton University, Brown Bag Seminar, March 2005.

Diffusion Geometries, Diffusion Wavelets and Harmonic Analysis of large Data Sets, MGA workshop at IPAM, UCLA, Sep. 2004, 2hrs talk.

Diffusion Geometries, diffusion wavelets, and Harmonic Analysis of large data sets, short talk at Conference a l'Escorial, June 2004.

Data analysis and applications of wavelet packet algorithms to hyper-spectral imaging and pathology, Washington University, St.Louis, February 2004.

Wavelets and clustering techniques for hyperspectral imaging, Washington University, June 2003; University of Maryland College Park, June 2003.

Coherent frames and wavelets via discretization of Calderón reproducing formulas, National Conference in Harmonic Analysis, Piano di Sorrento, May 2001.

Characterization of tight frame wavelets with arbitrary matrix dilation and oversampling, National Conference in Harmonic Analysis, Como, June 2000.

Critical Exponent of short even filters and biorthogonal Burt-Adelson wavelets, National Conference in Harmonic Analysis, Aosta, May 1999.