MAURO MAGGIONI

E-mail: mauromaggioniit@icloud.com
Home page: https://mauromaggioni.duckdns.org

RESEARCH INTERESTS

I am interested in a variety of problems in the mathematical foundations of Data Science, motivated by the need to exploit data to advance scientific discovery and build generalizable, interpretable predictive models. These problems require ideas and techniques from a variety of areas, including Harmonic Analysis, Approximation Theory, Probability and Statistics. Scalable algorithms are a requirement, and I often use multiscale techniques to develop near-linear time algorithms to implement efficiently the estimators developed in theory.

I apply these techniques to the study of physical systems, e.g. to the analysis of molecular dynamics data in order to automatically learn reduced models or speed up simulations, or to infer models of complex agent-based systems (e.g. to model cell dynamics), to the study of hyperspectral images (e.g. for unsupervised segmentation or anomaly detection), to reinforcement learning (to learn optimal policies for automated agents).

EMPLOYMENT

2016-	*Bloomberg Distinguished Professor* in the Departments of Mathematics and Applied Mathematics and Statistics, Johns Hopkins University.
2012-2016	*Professor* in Mathematics, Electrical and Computer Engineering, Computer Science, Duke University.
2006-2012	*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 Univ.. Mentor: R.R. Coifman.
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, Universitá di Milano, Italy, M*-band compactly supported biorthogonal wavelets and Burt-Adelson wavelets*, under the supervision of Prof. P. M. Soardi.

HONORS, AWARDS

2020-2021 : Simons Fellowhip.
2013- : Fellow of the American Mathematical Society.
2012-2013: Thomas Langford Lecturship Award, Duke University.
2008-2012: Sloan Fellowship.
2007: Popov prize in approximation theory.
1999-2000: The Albert and Judith Fay Ross Memorial Fellowships, Washington University, St.Louis.

GRANTS (RECENT)

2020-2023: AFOSR *Statistical Learning for Complex Dynamic Data Sets in Metric Spaces* , PI.
2019-2022: NSF *Learning dynamics from data: discovering interaction laws of particle and agent systems*, coPI.
2020: Leon Lowenstein Foundation *Deep Heart Initiative-Precision Cardiology by Digital Twinning and Deep Learning*, senior personnel.
2019-2022: NSF *HDR TRIPODS: Institute for the Foundations of Graph and Deep Learning*, coPI.
2020-2021: Simons Fellowship, Simons Foundation, PI.
2018-2021: NSF BIGDATA *Compositional Learning, Maps and Transfer: Statistical and Machine Learning on Collections of Data Sets*, PI.
2017-2020: NSF ATD *Estimation and Anomaly Detection for high-dimensional Data, Maps and Dynamic Processes*, PI.
2017-2020: AFOSR *Information, Approximation, and Fast Algorithms for Data in High Dimensions*, PI.
2018-2022: ARO STTR, Phase II, lead by I-A-I Inc., *Multiscale Fast and Distributed Data and Statistics Summarization*, PI.
2018-2019: JHU DISCOVERY award: *Novel Methods for Non-Invasive Assessment of Myocardial Fibrosis Complexity and Disorganization to Predict Ventricular Arrhythmias*, Co-PI.
2017-2020: ARO STTR, Phase I, lead by I-A-I Inc., *Multiscale Fast and Distributed Data and Statistics Summarization*, PI.
2017-2018: JHU DISCOVERY award: *Anomaly Detection for Zero Shot Learning with Applications to Rare Myopathic Disease Diagnostics*, PI.
2015-2018: NSF *BIGDATA: Collaborative Research: From Data Geometries to Information Networks*, PI.
2015-2018: NSF *Statistical Learning for High-Dimensional Stochastic Dynamical Systems*, PI.
2014-2016: AFOSR *Information, Approximation, and Fast Algorithms for Data in High Dimensions*, PI.
2013-2016: NSF *Structured Dictionary Models and Learning for High Resolution Images*, PI.
2013-2016: NSF *Collaborative Proposal: SI2-CHE: Extensible tools for advanced sampling and analysis*, PI.
2012-2016: NSF *ATD: Online Multiscale Agorithms for Geometric Density Estimation in High-Dimensions and Persistent Homology of Data for Improved Threat Detection*, PI.

PUBLICATIONS

[1] Rebecca Yu Changxin Lai Julie K. Shade Katherine C. Wu Mauro Maggioni Natalia A. Trayanova Haley G. Abramson Dan M. Popescu. “Anatomically-Informed Deep Learning on Contrast-Enhanced Cardiac MRI for Scar Segmentation and Clinical Feature Extraction”. Oct. 21, 2020. URL: https://arxiv.org/abs/2010.11081. Forthcoming.

[2] Ming Zhong Mauro Maggioni Jason Miller Sui Tang. *Learning Theory for Inferring Interaction Kernels in Second-Order Interacting Agent Systems*. Oct. 8, 2020. URL: https://arxiv.org/abs/2010.03729. Forthcoming.

[3] Alessandro Lanteri, Mauro Maggioni, and Stefano Vigogna. *Conditional regression for single-index models*. 2020. arXiv: 2002.10008 [math.ST].

[4] Fei Lu, Mauro Maggioni, and Sui Tang. “Learning interaction kernels in stochastic systems of interacting particles from multiple trajectories”. In: *arXiv* (July 30, 2020). URL: https://arxiv.org/abs/2007.15174. Forthcoming.

[5] Fei Lu et al. “On the identifiability of interaction functions in systems of interacting particles”. In: *to appear in Stochastic Processes and their Applications* (Oct. 9, 2020). URL: https://arxiv.org/abs/1912.11965.

[6] David Jason Miller; Jonathan Chrispin; Adityo Prakosa; Natalia Trayanova; Steven Jones; Mauro Maggioni; Katherine Wu R ; C David R. Okada. “Substrate Spatial Complexity Analysis for the Prediction of Ventricular Arrhythmias in Patients with Ischemic Cardiomyopathy”. In: *Circulation: Arrhythmia and Electrophysiology* (Jan. 1, 2020). URL: https://www.ahajournals.org/doi/epub/10.1161/CIRCEP.119.007975. published.

[7] Tyler M Tomita et al. “Sparse Projection Oblique Randomer Forests”. In: *Journal of Machine Learning Research* 21.104 (Jan. 1, 2020), pp. 1–39. URL: http://jmlr.org/papers/v21/18-664.html. published.

[8] A. Lanteri, Mauro Maggioni, and S. Vigogna. “Conditional Regression for Single-index models”. In: *in preparation* (2019).

[9] Wenjing Liao and Mauro Maggioni. “Adaptive Geometric Multiscale Approximations for Intrinsically Low-dimensional Data”. In: *Journal of machine learning Research* 20.98 (2019), pp. 1–63. URL: http://jmlr.org/papers/v20/17-252.html.

[10] Wenjing Liao, Mauro Maggioni, and S. Vigogna. “Multiscale regression on intrinsically low-dimensional sets”. In: *in preparation* (2019).

[11] Anna V Little, Mauro Maggioni, and James M Murphy. “Path-Based Spectral Clustering: Guarantees, Robustness to Outliers, and Fast Algorithms”. In: *Journ. Mach. Learn. Res.* 21 (Jan. 1, 2019), pp. 1–66. URL: http://jmlr.csail.mit.edu/papers/volume21/18-085/18-085.pdf. published.

[12] Fei Lu, Mauro Maggioni, and Sui Tang. “Learning interaction kernels in heterogeneous systems of agents from multiple trajectories”. In: *to appear in Journ. Mach. Learn. Res.* (Jan. 1, 2019). URL: https://arxiv.org/abs/1910.04832. published.

[13] Fei Lu et al. “Nonparametric inference of interaction laws in systems of agents from trajectory data”. In: *Proceedings of the National Academy of Sciences* 116.29 (2019), pp. 14424–14433. ISSN: 0027-8424. DOI: 10.1073/pnas.1822012116. eprint: http://arxiv.org/abs/1812.06003. URL: https://www.pnas.org/content/116/29/14424.

[14] Mauro Maggioni, Jason Miller, and Ming Zhong. “Data-driven Discovery of Emergent Behaviors in Collective Dynamics”. In: *Physica D: Nonlinear Phenomena* (Jan. 1, 2019). DOI: https://doi.org/10.1016/j.physd.2020.132542. URL: https://arxiv.org/abs/1912.11123. published.

[15] Mauro Maggioni and James M. Murphy. “Learning by active nonlinear diffusion”. In: *Foundations of Data Science* 1."2639-8001-2019-3-271" (2019), p. 271. ISSN: A0000-0002. DOI: 10.3934/fods.2019012. URL: http://aimsciences.org//article/id/6f8fefb2-e464-48ea-b2de-f37686725966.

[16] James M Murphy and Mauro Maggioni. “Unsupervised Clustering and Active Learning of Hyperspectral Images With Nonlinear Diffusion”. In: *IEEE Transactions on Geoscience and Remote Sensing* 57.3 (Mar. 1, 2019), pp. 1829–1845. ISSN: 1558-0644. DOI: 10.1109/TGRS.2018.2869723. published.

[17] Joshua T. Vogelstein et al. “Discovering and deciphering relationships across disparate data modalities”. In: *eLife* (2019), 8:e41690. DOI: 10.7554/eLife.41690. URL: https://elifesciences.org/articles/41690.

[18] Paul Escande and Mauro Maggioni. “Multiscale Approximations of Transformations”. In: *in preparation* (2018).

[19] James M. Murphy and Mauro Maggioni. “Diffusion geometric methods for fusion of remotely sensed data”. In: *Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XXIV*. Ed. by Miguel Velez-Reyes and David W. Messinger. Vol. 10644. International Society for Optics and Photonics. SPIE, 2018, pp. 137 –147. DOI: 10.1117/12.2305274. URL: https://doi.org/10.1117/12.2305274.

[20] James M. Murphy and Mauro Maggioni. “Iterative Active Learning with Diffusion Geometry for Hyperspectral Images”. In: *Proc. of WHISPERS*. 2018. URL: https://ieeexplore.ieee.org/abstract/document/8747033.

[21] Miles C. Crosskey and Mauro Maggioni. “ATLAS: A geometric approach to learning high-dimensional stochastic systems near manifolds”. In: *Journal of Multiscale Modeling and Simulation* 15.1 (2017). arxiv: 1404.0667, pp. 110–156.

[22] Sam Gerber and Mauro Maggioni. “Multiscale Strategies for Discrete Optimal Transport”. In: *Journ. Mach. Learn. Res.* 72 (2017), pp. 1–32.

[23] Anna V. Little, Mauro Maggioni, and Lorenzo Rosasco. “Multiscale geometric methods for data sets I: Multiscale SVD, noise and curvature”. In: *Applied and Computational Harmonic Analysis* 43.3 (2017). Submitted: 2012, MIT-CSAIL-TR-2012-029/CBCL-310, pp. 504 –567.

[24] Mauro Maggioni. “Geometric Measure Estimation”. In: *in preparation* (2017).

[25] Tyler Tomita, Mauro Maggioni, and Joshua T. Vogelstein. “ROFLMAO: Robust Oblique Forests with Linear MAtrix Operations”. In: 2017.

[26] Tyler M. Tomita, Mauro Maggioni, and Joshua T. Vogelstein. “ROFLMAO: Robust Oblique Forests with Linear MAtrix Operations”. In: *SIAM Data Mining*. 2017.

[27] Mattia Bongini et al. *Inferring Interaction Rules From Observations of Evolutive Systems I: The Variational Approach*. 2016. DOI: https://doi.org/10.1142/S0218202517500208. URL: https://arxiv.org/pdf/1602.00342.pdf.

[28] Wenjing Liao, Mauro Maggioni, and S. Vigogna. “Learning adaptive multiscale approximations to data and functions near low-dimensional sets”. In: *Proceedings of the IEEE Information Theory Workshop*. Cambridge, UK. 2016.

[29] Mauro Maggioni, Stanislav Minsker, and Nate Strawn. “Multiscale Dictionary Learning: Non-asymptotic Bounds and Robustness”. In: *J. Mach. Learn. Res.* 17.1 (Jan. 2016), pp. 43–93. ISSN: 1532-4435. URL: http://dl.acm.org/citation.cfm?id=2946645.2946647.

[30] Cencheng Shen et al. “Dependence Discovery from Multimodal Data via Multiscale Generalized Correlation”. In: *Submitted* (2016).

[31] Yang Wang, Guangliang Chen, and Mauro Maggioni. *High Dimensional Data Modeling Techniques for Detection of Chemical Plumes and Anomalies in Hyperspectral Images and Movies*. 2016.

[32] Rachel Yin et al. “Object recognition in art drawings: Transfer of a neural network”. In: *Proc. IEEE ICASSP*. 2016.

[33] Tyler M Tomita, Mauro Maggioni, and Joshua T. Vogelstein. “Randomer Forests”. In: *arXiv preprint arXiv:1506.03410* (2015). URL: https://arxiv.org/abs/1506.03410.

[34] Mauro Y. Wang Maggioni and Guangliang Chen. “Enhanced Detection of Chemical Plumes in Hyperspectral Images and Movies through Improved Background Modeling”. In: *Proceedings of the 7th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*. 2015.

[35] Nicolas Altemose et al. “Genomic Characterization of Large Heterochromatic Gaps in the Human Genome Assembly”. In: *PLoS Comput Biol* 10.5 (May 2014), e1003628. DOI: 10.1371/journal.pcbi.1003628. URL: http://dx.doi.org/10.1371%2Fjournal.pcbi.1003628.

[36] Miles C. Crosskey and Mauro Maggioni. *Learning of intrinsically low-dimensional stochastic systems in high-dimensions, I*. Tech. rep. in preparation. 2013.

[37] S. Gerber and Mauro Maggioni. “Multiscale dictionaries, transforms, and learning in high-dimensions”. In: *Proc. SPIE conference Optics and Photonics*. 2013.

[38] Mark A. Iwen and Mauro Maggioni. “Approximation of points on low-dimensional manifolds via random linear projections”. In: *Inference and Information* 2.1 (2013). arXiv:1204.3337v1, 2012, pp. 1–31.

[39] Mauro Maggioni. “Geometric Estimation of Probability Measures in High Dimensions”. In: *IEEE Asilomar Conference on Signals, Systems and Computers*. 2013.

[40] William K. Allard, Guangliang Chen, and Mauro Maggioni. “Multi-scale geometric methods for data sets II: Geometric Multi-Resolution Analysis”. In: *Applied and Computational Harmonic Analysis* 32.3 (2012), pp. 435–462.

[41] Jake Bouvrie and Mauro Maggioni. “Efficient Solution of Markov Decision Problems with Multiscale Representations”. In: *Proc. 50th Annual Allerton Conference on Communication, Control, and Computing*. 2012.

[42] Jake Bouvrie and Mauro Maggioni. “Geometric Multiscale Reduction for Autonomous and Controlled Nonlinear Systems”. In: *IEEE Conference on Decision and Control (CDC)*. 2012.

[43] Jake Bouvrie and Mauro Maggioni. “Multiscale Markov Decision Problems: Compression, Solution, and Transfer Learning”. In: (2012). URL: http://arxiv.org/abs/1212.1143.

[44] Guangliang Chen et al. “A fast multiscale framework for data in high-dimensions: Measure estimation, anomaly detection, and compressive measurements”. In: *Visual Communications and Image Processing (VCIP), 2012 IEEE*. 2012, pp. 1–6.

[45] Guangliang Chen et al. “A Fast Multiscale Framework for Data in High Dimensions: Measure Estimation, Anomaly Detection, and Compressive Measurements”. In: *Visual Communications and Image Processing (VCIP), 2012 IEEE*. 2012, pp. 1–6. DOI: 10.1109/VCIP.2012.6410789.

[46] Guangliang Chen, Anna V. Little, and Mauro Maggioni. “Multi-Resolution Geometric Analysis for data in high dimensions”. In: *Proc. FFT 2011* (2011).

[47] Guangliang Chen and Mauro Maggioni. “Multiscale Geometric and Spectral Analysis of Plane Arrangements”. In: *Conference on Computer Vision and Pattern Recognition*. 2011.

[48] Guangliang Chen and Mauro Maggioni. “Multiscale Geometric Dictionaries for Point-Cloud Data”. In: *Proc. SampTA*. 2011.

[49] Guangliang Chen et al. *Wavelets and Multiscale Analysis: Theory and Applications*. submitted March 12th, 2010. Springer Verlag, 2011. Chap. Some recent advances in multiscale geometric analysis of point clouds.

[50] J. Lee and Mauro Maggioni. “Multiscale Analysis of Time Series of Graphs”. In: *Proc. SampTA*. 2011.

[51] Mauro Maggioni. “Multiscale Geometric Dictionaries for Point-Cloud Data, Presented at SPARS 11, http://www.math.duke.edu/ mauro/research.html#Talks”. In: (2011). Presented at SPARS 11. URL: http://www.math.duke.edu/~mauro/research.html#Talks.

[52] M. A. Rohrdanz et al. “Determination of reaction coordinates via locally scaled diffusion map”. In: *J. Chem. Phys.* 134 (2011), p. 124116.

[53] W. Zheng et al. “Polymer reversal rate calculated via locally scaled diffusion map”. In: *J. Chem. Phys.* 134 (2011), p. 144108.

[54] Guangliang Chen and Mauro Maggioni. “Multiscale Geometric Methods for Data Sets III: multiple planes”. In: *in preparation* (2010).

[55] Guangliang Chen and Mauro Maggioni. “Multiscale Geometric Wavelets for the Analysis of Point Clouds”. In: *Proc. CISS 2010* (2010).

[56] J. Guinney et al. “Multiscale factor models for molecular networks”. In: *Proc. JSM* (2010).

[57] Peter W. Jones, Mauro Maggioni, and Raanan Schul. “Universal local manifold parametrizations via heat kernels and eigenfunctions of the Laplacian”. In: *Ann. Acad. Scient. Fen.* 35 (2010). http://arxiv.org/abs/0709.1975, pp. 1–44.

[58] Eric Monson et al. “Data Representation and Exploration with Geometric Wavelets”. In: *Proceedings of the IEEE Symposium on Visual Analytics Science and Technology (VAST)*. 2010.

[59] Eric Monson et al. “Data representation and exploration with Geometric Wavelets”. In: *Visual Analytics Science and Technology (VAST), 2010 IEEE Symposium*. 2010, pp. 243–244. DOI: 10.1109/VAST.2010.5653822.

[60] Anna V. Little, Y.-M. Jung, and Mauro Maggioni. “Multiscale Estimation of Intrinsic Dimensionality of Data Sets”. In: *Proc. A.A.A.I.* 2009.

[61] Anna V. Little et al. “Estimation of intrinsic dimensionality of samples from noisy low-dimensional manifolds in high dimensions with multiscale SVD”. In: *Proc. S.S.P.* 2009.
[62] Walter Willinger et al. “Research on Online Social Networks: Time to Face the Real Challenges”. In: *Proc. 2nd Workshop on Hot Topics in Measurement and Modeling of Computer Systems (HotMetrics'09)*. 2009.
[63] Ronald R. Coifman and Mauro Maggioni. *Geometry Analysis and Signal Processing on Digital Data, Emergent Structures, and Knowledge Building*. SIAM News. 2008.
[64] Ronald R. Coifman et al. “Diffusion Maps, reduction coordinates and low dimensional representation of stochastic systems”. In: *SIAM J.M.M.S.* 7.2 (2008), pp. 842–864.
[65] Peter W. Jones, Mauro Maggioni, and Raanan Schul. “Manifold parametrizations by eigenfunctions of the Laplacian and heat kernels”. In: *Proc. Nat. Acad. Sci.* 105.6 (2008), pp. 1803–1808.
[66] Mauro Maggioni and Hrushikesh Mhaskar. “Diffusion polynomial frames on metric measure spaces”. In: *ACHA* 3 (2008), pp. 329–353.
[67] Arthur D. Szlam, Mauro Maggioni, and Ronald R. Coifman. “Regularization on Graphs with Function-adapted Diffusion Processes”. In: *Jour. Mach. Learn. Res.* 9 (2008). (YALE/DCS/TR1365, Yale Univ, July 2006), pp. 1711–1739.
[68] Ronald R. Coifman and Mauro Maggioni. “Multiscale Data Analysis with Diffusion Wavelets”. In: *Proc. SIAM Bioinf. Workshop, Minneapolis* (2007).
[69] Sridhar Mahadevan and Mauro Maggioni. “Proto-value Functions: A Spectral Framework for Solving Markov Decision Processes”. In: *JMLR* 8 (2007), pp. 2169–2231.
[70] James C. Jr. Bremer et al. “Diffusion Wavelet Packets”. In: *Appl. Comp. Harm. Anal.* 21.1 (2006). (Tech. Rep. YALE/DCS/TR-1304, 2004), pp. 95–112.
[71] E. Causevic et al. “QEEG-based classification with wavelet packets and microstate features for triage applications in the ER”. In: vol. 3. 10.1109/ICASSP.2006.1660859. ICASSP Proc., 2006.
[72] Ronald R. Coifman and Mauro Maggioni. “Diffusion Wavelets”. In: *Appl. Comp. Harm. Anal.* 21.1 (2006). (Tech. Rep. YALE/DCS/TR-1303, Yale Univ., Sep. 2004), pp. 53–94.
[73] Ronald R. Coifman and Mauro Maggioni. “Multiscale Analysis of Document Corpora”. Technical Report. 2006.
[74] Ronald R. Coifman et al. “Geometries of sensor outputs, inference, and information processing”. In: *Proc. SPIE*. Ed. by John C. Zolper; Eds. Intelligent Integrated Microsystems; Ravindra A. Athale. Vol. 6232. 2006, p. 623209.
[75] Mauro Maggioni and Sridhar Mahadevan. “Fast Direct Policy Evaluation using Multiscale Analysis of Markov Diffusion Processes”. In: *ICML 2006*. 2006, pp. 601–608.
[76] Mauro Maggioni et al. “Hyperspectral microscopic analysis of normal, benign and carcinoma microarray tissue sections”. In: ed. by Robert R. Alfano and Alvin Katz. Vol. 6091. 1. San Jose, CA, USA: SPIE, 2006, p. 60910I.
[77] Sridhar Mahadevan et al. “Simultaneous Learning of Representation and Control In Continuous Domains”. In: *AAAI*. AAAI Press, 2006.
[78] Michael W. Mahoney, Mauro Maggioni, and Petros Drineas. “Tensor-CUR Decompositions For Tensor-Based Data”. In: *Proc 12-th Annual SIGKDD*. 2006.
[79] Ronald R. Coifman et al. “Geometric diffusions as a tool for harmonic analysis and structure definition of data: Diffusion maps”. In: *Proceedings of the National Academy of Sciences of the United States of America* 102.21 (2005), pp. 7426–7431.
[80] Ronald R. Coifman et al. “Geometric diffusions as a tool for harmonic analysis and structure definition of data: Multiscale methods”. In: *Proceedings of the National Academy of Sciences of the United States of America* 102.21 (2005), pp. 7432–7438.
[81] Ronald R. Coifman et al. “Geometric diffusions for the analysis of data from sensor networks”. In: *Curr Opin Neurobiol* 15.5 (2005), pp. 576–84.
[82] Mauro Maggioni et al. “Biorthogonal diffusion wavelets for multiscale representations on manifolds and graphs”. In: ed. by Manos Papadakis, Andrew F. Laine, and Michael A. Unser. Vol. 5914. 1.

San Diego, CA, USA: SPIE, 2005, p. 59141M. URL: http://link.aip.org/link/?PSI/5914/59141M/1.

[83] Sridhar Mahadevan and Mauro Maggioni. "Value Function Approximation with Diffusion Wavelets and Laplacian Eigenfunctions". In: *University of Massachusetts, Department of Computer Science Technical Report TR-2005-38; Proc. NIPS 2005*. 2005.

[84] Arthur D. Szlam et al. "Diffusion-driven multiscale analysis on manifolds and graphs: top-down and bottom-up constructions". In: ed. by Manos Papadakis, Andrew F. Laine, and Michael A. Unser. Vol. 5914-1. San Diego, CA, USA: SPIE, 2005, p. 59141D. URL: http://link.aip.org/link/?PSI/5914/59141D/1.

[85] Ryan J. Cassidy et al. "Auditory display of hyperspectral colon tissue images using vocal synthesis models". In: *Proc. 2004 Intern. Con. Auditory Display* (2004).

[86] Ronald R. Coifman and Mauro Maggioni. *Multiresolution Analysis associated to diffusion semigroups: construction and fast algorithms*. Tech. Rep. YALE/DCS/TR-1289. Dept. Comp. Sci., Yale University, 2004.

[87] Gus L. Davis et al. *Hyper-spectral Analysis of normal and malignant colon tissue microarray sections using a novel DMD system*. Poster, Optical Imaging NIH workshop, to app. in proc. 2004.

[88] Gus L. Davis et al. "Spatial-Spectral Analysis of Colon Carcinoma". In: *Mod. Path.* (2004). In print.

[89] Gus L. Davis et al. "Spectral Analysis of normal and Malignant Microarray Tissue Sections using a novel micro-optoelectrialmechanical system". In: *Mod Pathol* 17.1:358A (2004).

[90] S. Ferrari, Mauro Maggioni, and N. A. Borghese. "Multi-Scale Approximation with Hierarchical Radial Basis Functions Networks," in: *IEEE Trans. on Neural Networks* 15.1 (2004), pp. 178–188.

[91] William Goetzmann et al. "Beauty is in the eye of the beholder". In: *submitted* (2004).

[92] Mauro Maggioni. "Wavelet frames on groups and hypergroups via discretization of Calderón formulas". In: *Monats. Mat.* 143 (2004), pp. 299–331.

[93] Mauro Maggioni et al. "Algorithms from Signal and Data Processing Applied to Hyperspectral Analysis: Application to Discriminating Normal and Malignant Microarray Colon Tissue Sections". In: *submitted* (2004).

[94] Mauro Maggioni et al. *Algorithms from Signal and Data Processing Applied to Hyperspectral Analysis: Application to Discriminating Normal and Malignant Microarray Colon Tissue Sections*. Tech. rep. 1311. Dept. Comp. Sci.: Yale University, 2004.

[95] Charles K. Chui et al. "Characterization of Tight Wavelet Frames with Arbitrary Matrix Dilations and Tightness Preserving Oversampling". In: *J Four Anal App* 8.2 (2002), pp. 173–200.

[96] Nets H. Katz, Elliot Krop, and Mauro Maggioni. "Remarks on the box problem". In: *Math. Research Letters* 4 (2002), pp. 515–519. URL: https://core.ac.uk/display/20985482.

[97] Mauro Maggioni. "Critical Exponent of Short Even Filters and Biorthogonal Burt-Adelson Wavelets". In: *Monats. Math.* 131.1 (2000), pp. 49–70.

[98] Mauro Maggioni. "M-Band Burt-Adelson Wavelets". In: *Appl. Comput. Harm. Anal.* 3 (2000), pp. 286–311.

PROFESSIONAL ACTIVITIES

IPAM workshop *Collective Variables in Classical Mechanics*, Fall 2016, organizer.

ICERM workshop *Stochastic numerical algorithms, multiscale modeling and high-dimensional data analytics*, July 2016, organizer.

Duke workshop on *Sensing and Analysis of High-Dimensional Data* on July 27-29th, 2015, organizer.

Hausdorff Research Institute program in *Mathematics of Signal Processing*, 2016, organizer.

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

Duke workshop on *Sensing and Analysis of High-Dimensional Data* on July 23-25th, 2013, 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 or; Applied Computational Harmonic Analysis, associate editor for Information & Inference, associate editor for Applied and Numerical Harmonic Analysis (ANHA).
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.; Proc. Nat. Acad. Sci.; Nature Comm..
4 U.S. patents pending, one for segmentation of CMRIs, one for hyper-spectral imaging, two for data analysis, organization and visualization.

TEACHING

Spring 2020: Mathematical and Computational Foundations of Data Science; Spring 2020: High-Dimensional Approximation, Probability, and Statistical Learning; Spring 2019: Introduction to Harmonic Analysis and Its Applications; Fall 2018: High-Dimensional Approximation, Probability, and Statistical Learning; Spring 2018: Introduction to Harmonic Analysis and its Applications; Fall 2017: High-Dimensional Approximation, Probability, and Statistical Learning; Spring 2017: Introduction to Statistical Learning, Data Analysis and Signal Processing; Spring 2016: Advanced Calculus; Fall 2015: Scientific Computing I; Spring 2015: Topics in Statistical Learning Theory; Topics in Probability; Fall 2014 :Scientific Computing I; Spring 2014: Advanced Calculus; Spring 2013: Topics in Statistical Learning, High Dimensional Geometry and Random Matrices; Fall 2012: Introduction to High Dimensional Data Analysis; Scientific Computing I; Fall 2011: Topics in Probability; Scientific Computing I; Fall 2010: Real Analysis; ...

TRAINING OF STUDENTS

Master students: Y. Huang, '18; Ph.D students: S. Yang, D. Popescu '21, M. P. Martin '21, Z. Lubberts (co-advisor), J. Miller '17-'21, J. Zhou; Miles Crosskey, Ph.D. student, '09-'14 (now: industry); Prakash Balachandran, Ph.D. on *Dimensionality Reduction and Learning on Networks*, 7/11 (now: industry); Anna V. Little, Ph.D. on *Estimating the Intrinsic Dimension of High-Dimensional Data Sets: A Multiscale, Geometric Approach*, 5/11 (now: U. of Utah); Jason D. Lee, undergraduate thesis advisor, 4/10 (now: Princeton); Arthur D. Szlam, co-advisor, Ph.D. on *Non-Stationary Analysis on Datasets and Applications*, Yale, 5/06 (now: Facebook).

TRAINING OF POSTDOC's

Christoph Kummerle, '19-; Xiaofeng Ye, '18-'21 (now: U. Albany); Ming Zhong, Postdoc, '16-'21 (now: U. Texas); Paul Escande, Postdoc, '16-'18 (now: CNRS); Sui Tang, Visiting Asst. Prof., '16-'20 (now: UCSB); James Murphy, Visiting Asst. Prof., '15-'18 (now: Tufts U.); Stefano Vigogna, Visiting Asst. Prof., '15-'18 (now: U. Genova); Wenjing Liao, Visiting Asst. Prof., '13-'17 (now: GeorgiaTech); Stas Minsker, Visiting Asst. Prof., '12-'14 (now: U.S.C.); Samuel Gerber, Visiting Asst. Prof., '12-15 (now: industry); David Lawlor, Visiting Asst. Prof., '12-15 (now: industry); Joshua Vogelstein, Visiting Asst. Prof., '12-14 (now: Johns Hopkins U.); Nate Strawn, Visiting Asst. Prof., '11-'13 (now: Georgetown U.); Mark Iwen, Visiting Asst. Prof., '10-'13 (now: Michigan State U.); Guangliang Chen, Visiting Asst. Prof., '09-'13 (now: SJSU); Jake Bouvrie, Visiting Asst. Prof., '09-'12 (now: industry); Yoon-Mo Jung, postdoc, 08-10 (now: Yonsei U.)