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Degrees:

Ph.D., Mathematics, University of California, Berkeley, 1999.
M.A., Mathematics, University of California, Berkeley, 1994.
B.Sc. (Hons.), Mathematics, University of Manitoba, 1993.

Awards and Fellowships:

LANL Exploratory Research grant, $900K, FY2008–FY2010.
LANL Certificate of Appreciation, R&D 100 Awards Entry "Muon Tomography Scanner," 2007.
LANL Programmatic Impact Award, 2006.
LANL Teamwork Award, 2005.
UC Berkeley Mathematics Department Research Fellowship, 1998.
Teaching Effectiveness Award, UC Berkeley, 1996–97.
Outstanding Graduate Student Instructor Award, UC Berkeley, 1996–97.
Earl C. Anthony Fellowship, UC Berkeley, 1995.
Governor General's Medal for best graduating bachelor's student in Mantioba, 1993.

Research Experience:

Technical Staff Member, Los Alamos National Laboratory, September 2005–present. Working on compressive sensing, signal reconstructions from very few data, optimization, modeling the geometry of images and image processes in high dimensions, novel forms of image reconstruction, radiographic inversions, data-informed regularizations, and novel forms of tomography.

Postdoctoral Research Associate, Los Alamos National Laboratory, October 2003–September 2005. Worked on new regularization methods for image reconstruction, developed image warping algorithm for solving the Monge-Kantorovich problem; applied support-vector machine classification to cosmic-ray muon-scattering data for detection of nuclear material.

Research Assistant Professor, University of Illinois at Chicago, Fall 2000–Spring 2002. Operators on holomorphic function spaces, sequential dynamical systems.

Visiting Assistant Professor, Middlebury College, Fall 1999–Spring 2000. Operators and structure of holomorphic function spaces.

Graduate Student, UC Berkeley, Fall 1993–Summer 1999. Operators and structure of holomorphic function spaces.

Teaching Experience:

Research Assistant Professor, University of Illinois at Chicago, Fall 2000–Spring 2002. Calculus I, Multivariable Calculus, Linear Algebra I and II.

Visiting Assistant Professor, Middlebury College, Fall 1999–Spring 2000. Calculus I and II, Multivariable Calculus, How to Read and Write Proofs, Measure and Integration.

Instructor, UC Berkeley, Summers 1994–1999, Fall 1996, Spring 1998. Precalculus, Calculus, Introduction to Analysis.

Teaching Assistant, UC Berkeley, Fall 1993–Spring 1999. Calculus, Honors Calculus, Analytic Geometry and Calculus, Linear Algebra, Multivariable Calculus, Introduction to Topology and Analysis.

Teaching Assistant, University of Manitoba, Fall 1990–Winter 1993. Calculus I, II, IIIA, and IIIB, Honors Calculus, Linear Algebra. Total of 54 discussion sections over 6 semesters and two summers.

Invited Presentations:

"Fast algorithms for nonconvex compressive sensing." Compressive Sensing Workshop, Duke University, February, 2009.

"Nonconvex compressive sensing: getting the most from very little information (and the other way around)." Washington State University, Data Challenge Cooperative Lecture Series, November, 2008.

"Nonconvex compressive sensing." Shanks Workshop, Vanderbilt University, October, 2008.

"Nonconvex compressive sensing." University of New Mexico, Computer Science Colloquium, October, 2008.

"Nonconvex compressive sensing: random vs. structured sampling." SIAM Conference on Imaging Science, San Diego, California, July 2008.

"Nonconvex compressive sensing." SIAM Conference on Imaging Science, San Diego, California, July 2008.

"Nonconvex compressive sensing." INFORMS Optimization Conference, Atlanta, Georgia, March 2008.

"Nonconvex compressive sensing." Rice University, Electrical and Computer Engineering, Computer and Information Technology Institute, Dean of Engineering, and IEEE Signal Processing Society Colloquium, November 2007.

"Nonconvex minimization and compressed sensing." Second Mathematical Programming Society International Conference on Continuous Optimization, Hamilton, Ontario, August 2007.

"Nonconvex compressed sensing." AMS von Neumann Symposium, Snowbird, Utah, July 2007.

"Algorithms for total-variation regularization with general data fidelity terms." SIAM Conference on Imaging Science, Minneapolis, Minnesota, May 2006.

"A variational approach to reconstructing images corrupted by Poisson noise." AMS Section Meeting, Annandale-on-Hudson, New York, October 2005.

"A gradient descent solution to the Monge-Kantorovich problem." Clarkson University, Mathematics Colloquium, September 2004. Montana State University, DynaChat, September 2004. UCLA, Applied Mathematics Colloquium, October 2004. UC Berkeley, PDE seminar, October 2004. Georgetown University, Mathematics Colloquium, February 2005. LANL, DDMA Speaker Series, February 2005.

"Detecting nuclear materials from muon-scattering data." Montana State University, Physics Colloquium, September 2004. American Association for the Advancement of Science, Annual Meeting, February 2005. Institute for Pure and Applied Mathematics, Graduate Summer School, July 2005.

"Multipliers and Carleson Measures for $D(\mu)$." AMS Section Meeting, Birmingham, Alabama, October 2000. Joint Meetings, New Orleans, January 2001. Southeastern Analysis Meeting, Athens, Georgia, March 2001. Operators and Function Theory conference, Berkeley, January 2003.

"Toeplitz operators on $D(\mu)$." Joint Meetings, San Antonio, January 1999.

"Zero sets and invariant subspaces of Hilbert spaces of holomorphic functions." AMS Section meeting, Manhattan, Kansas, March 1998.

Professional Service:

Secretary, SIAM Activity Group on Imaging Science, Jan. 2008–present.

Lead Guest Editor, IEEE Journal of Selected Topics in Signal Processing, Special Issue on Compressive Sensing, 2009.

Referee for SIAM Journal on Imaging Sciences, IEEE Transactions on Image Processing, IEEE Transactions on Signal Processing, IEEE Signal Processing Letters, IEEE Transactions on Medical Imaging, Inverse Problems, Journal of Mathematical Imaging and Vision, Applied Mathematics Research Express, Computers & Chemical Engineering, and Journal of Geophysical Research.

Panel reviewer for NSF on four occasions.

Professional Memberships:

Society for Industrial and Applied Mathematics, Secretary of the Activity Group on Imaging Science. American Mathematical Society. American Association for the Advancement of Science. Institute of Electrical and Electronics Engineers. Mathematical Programming Society.

Symposia Organized:

"Mathematics and America's Future: A Call to Action." American Association for the Advancement of Science, Annual Meeting, San Francisco, California, February, 2007. Science policy leaders from four professional societies.

"Mathematical Methods for the Analysis of Images and High-Dimensional Data." American Mathematical Society, Eastern Section Meeting, Annandale-on-Hudson, New York, October 2005. Fifteen speakers.

"Detecting the Unseen with Cosmic-Ray Muons." American Association for the Advancement of Science, Annual Meeting, Washington, D.C., February 2005. Four speakers from three countries. Media coverage resulted in thousands of news stories appearing across the planet.

Publications:

[1] R. Chartrand, "Fast algorithms for nonconvex compressive sensing: MRI reconstruction from very few data," in *IEEE International Symposium on Biomedical Imaging*, 2009.

[2] R. Chartrand and V. Staneva, "Restricted isometry properties and nonconvex compressive sensing," *Inverse Problems*, vol. 24, no. 035020, pp. 1–14, 2008.

[3] R. Chartrand, "Nonconvex compressive sensing and reconstruction of gradient-sparse images: random vs. tomographic Fourier sampling," in *IEEE International Conference on Image Processing (ICIP)*, 2008.

[4] R. Chartrand and W. Yin, "Iteratively reweighted algorithms for compressive sensing," in *33rd International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2008.

[5] R. Saab, R. Chartrand, and Özgür Yilmaz, "Stable sparse approximations via nonconvex optimization," in *33rd International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2008.

[6] E. Y. Sidky, I. Reiser, R. M. Nishikawa, X. Pan, R. Chartrand, D. B. Kopans, and R. H. Moore, "Practical iterative image reconstruction in digital breast tomosynthesis by non-convex TpV optimization," in *SPIE Medical Imaging*, 2008.

[7] R. Chartrand, "Exact reconstructions of sparse signals via nonconvex minimization," *IEEE Signal Process. Lett.*, vol. 14, pp. 707–710, 2007.

[8] C. L. Morris, C. C. Alexander, J. D. Bacon, G. S. Blanpied, K. N. Borozdin, R. Chartrand, D. J. Clark, C. J. Espinoza, A. M. Fraser, M. C. Galassi, J. J. Gomez, J. S. Gonzales, J. A. Green, N. W. Hengartner, G. E. Hogan, A. V. Klimenko, P. McGaughey, J. J. Medina, F. E. Pazuchanics, W. C. Priedhorsky, J. C. Ramsey, A. Saunders, R. C. Schirato, L. J. Schultz, and M. J. Sossong, "Tomographic imaging with cosmic ray muons," *Sci. Glob. Secur.*, vol. 16, pp. 37–53, 2008.

[9] R. Chartrand, K. R. Vixie, B. Wohlberg, and E. M. Bollt, "A gradient descent solution to the Monge-Kantorovich problem," *Appl. Math. Sci.*, vol. 3, pp. 1071–1080, 2009.

[10] E. M. Bollt, R. Chartrand, S. Esedoḡlu, K. R. Vixie, and P. Schultz, "Graduated, adaptive image denoising: local compromise between total variation and isotropic diffusion," *Adv. Comp. Math*, 2009. To appear.

[11] R. Chartrand and V. Staneva, "A faster-converging algorithm for image segmentation with a modified Chan-Vese model," in *International Conference on Image Processing, Computer Vision, and Pattern Recognition (IPCV)*, 2008.

[12] E. Y. Sidky, R. Chartrand, and X. Pan, "Image reconstruction from few views by nonconvex optimization," in *IEEE Medical Imaging Conference Record*, 2007.

[13] R. Chartrand, "Nonconvex compressed sensing and error correction," in *32nd International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2007.

[14] R. Chartrand, "Nonconvex regularization for shape preservation," in *IEEE International Conference on Image Processing (ICIP)*, 2007.

[15] R. Chartrand and V. Staneva, "Nonconvex regularization for image segmentation," in *International Conference on Image Processing, Computer Vision, and Pattern Recognition (IPCV)*, 2007.

[16] R. Chartrand and V. Staneva, "Total variation regularisation of images corrupted by non-Gaussian noise using a quasi-Newton method," *IET Image Process.*, vol. 2, pp. 295–303, 2008.

[17] T. Le, R. Chartrand, and T. J. Asaki, "A variational approach to reconstructing images corrupted by Poisson noise," *J. Math. Imaging Vision*, vol. 27, pp. 257–263, 2007.

[18] R. Chartrand, "Numerical differentiation of noisy, nonsmooth data." Submitted.

[19] T. J. Asaki, P. R. Campbell, R. Chartrand, C. E. Powell, K. R. Vixie, and B. Wohlberg, "Abel inversion using total variation regularization: applications," *Inverse Probl. Sci. Eng.*, vol. 14, pp. 873–885, 2006.

[20] J. A. Green, C. Alexander, T. Asaki, J. Bacon, G. Blanpied, K. Borozdin, A. Canabal-Rey, M. Cannon, R. Chartrand, D. Clark, C. Espinoza, E. Figueroa, A. Fraser, M. Galassi, J. Gomez, J. Gonzales, A. Green, N. Hengartner, G. Hogan, A. Klimenko, P. McGaughey, G. McGregor, J. Medina, C. Morris, K. Mosher, C. Orum, F. Pazuchanics, W. Priedhorsky, A. Sanchez, A. Saunders, R. Schirato, L. Schultz, M. Sossong, M. Sottile, J.Tenbrink, R. V. de Water, K. Vixie, and B. Wohlberg, "Optimizing the tracking efficiency for cosmic ray muon tomography," in *IEEE Nuclear Science Symposium Conference Record*, 2006.

[21] K. Borozdin, T. Asaki, R. Chartrand, M. Galassi, A. Greene, N. Hengartner, G. Hogan, A. Klimenko, C. Morris, W. Priedhorsky, A. Saunders, R. Schirato, L. Schultz, and

M. Sottile, "Cosmic-ray muon tomography and its application to the detection of high-Z materials," in *Proceedings of the 46th Annual Meeting*, Institute of Nuclear Materials Management, 2005.

[22] T. J. Asaki, R. Chartrand, K. R. Vixie, and B. Wohlberg, "Abel inversion using total-variation regularization," *Inverse Problems*, vol. 21, pp. 1895–1903, 2005.

[23] K. Borozdin, T. Asaki, R. Chartrand, N. Hengartner, G. Hogan, C. Morris, W. Priedhorsky, R. Schirato, L. Schultz, M. Sottile, K. Vixie, B. Wohlberg, and G. Blanpied, "Information extraction from muon radiography data," in *ISAS/CITSA 2004: International Conference on Cybernetics and Information Technologies, Systems and Applications and 10th International Conference on Information Systems Analysis and Synthesis, Vol 2, Proceedings : Communications, Information and Control Systems, Technologies and Applications*, pp. 27–30, International Institute of Informatics and Systemics, 2004.

[24] R. Chartrand, "Multipliers and Carleson measures for $D(\mu)$," *Integral Equations Operator Theory*, vol. 45, pp. 309–318, 2003.

[25] R. Chartrand, "Toeplitz operators on Dirichlet-type spaces," *J. Operator Theory*, vol. 48, pp. 3–13, 2002.

[26] R. Chartrand, *Hilbert spaces of holomorphic functions: zero sets, invariant subspaces, and Toeplitz operators*. PhD thesis, University of California, Berkeley, 1999.

[27] R. Chartrand and T. Kucera, "Deissler rank complexity of powers of indecomposable injective modules," *Notre Dame J. Formal Logic*, vol. 35, pp. 398–402, 1994.