David Barmherzig

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Education

Doctor of Philosophy Candidate, 2013-
Stanford University, Institute for Computational and Mathematical Engineering
Thesis: *The Phase Retrieval Problem: Theory, Algorithms, and Applications*
Principal advisor: Emmanuel J. Candès
Thesis committee: Emmanuel J. Candès, Walter Murray, Gordon Wetzstein

Master of Science, 2013
University of Toronto, Mathematics
Thesis: *Polyphase representations in mathematical signal processing*
Thesis advisors: George A. Elliott and Yue M. Lu (Harvard)

Bachelor of Applied Science in Engineering Science, 2011
University of Toronto
Thesis: *The Uniqueness theorem for the Cuntz algebras*
Thesis advisor: George A. Elliott

Visiting Appointments

Fellow of Electrical Engineering, 2013
Harvard University, John A. Paulson School of Engineering and Applied Sciences
Sponsoring faculty: Yue M. Lu

Publications

I. Peer-Reviewed Publications

David A. Barmherzig, Ju Sun, Emmanuel J. Candès, T.J. Lane, and Po-Nan Li. ***Dual-Reference Design for Holographic Coherent Diffraction Imaging.*** Accepted to SampTA. 2019.

David A. Barmherzig, Ju Sun, Emmanuel J. Candès, T.J. Lane, and Po-Nan Li. ***Holographic Phase Retrieval and Optimal Reference Design.*** Accepted to Inverse Problems. 2018.

David Barmherzig and Ju Sun. ***1D Phase Retrieval and Spectral Factorization***.
Mathematics in Imaging, Optical Society of America. 2018.

David Barmherzig, Ju Sun, Po-Nan Li, and T.J. Lane. ***On Block-Reference Coherent Diffraction Imaging***. Computational Optical Sensing and Imaging, Optical Society of America. 2018.

David Barmherzig and Ju Sun. ***A Local Analysis of Block Coordinate Descent for Gaussian Phase Retrieval***. Optimization for Machine Learning, Neural Information Processing Systems. 2018.

II. Preprints, Theses, Technical Reports, and Manuscripts (available upon request)

David Barmherzig. ***The Phase Retrieval Problem: Theory, Algorithms, and Applications.*** Ph.D. Thesis. Thesis advisor: Emmanuel J. Candès (Stanford University). 2019.

David Barmherzig and Moshe Praver. ***Applications of Principal Component Analysis to Decentralized Consensus for Accreditation.*** 2017.

David Barmherzig, Leonidas J. Guibas, and Justin Solomon. ***Functional Maps in Computational Geometry.*** 2014.

David Barmherzig. ***Polyphase Representations in Mathematical Signal Processing.*** M.Sc. Thesis. Thesis advisors: George A. Elliott (University of Toronto, Fields Institute) and Yue M. Lu (Harvard). 2013.

David Barmherzig and George A. Elliott. ***Classical Limits of the Feynman Path Integral and Schrodinger Equation.*** 2012.

David Barmherzig. ***The Uniqueness Theorem for the Cuntz Algebras.*** B.A.Sc. Honours Thesis. Thesis advisor: George A. Elliott (University of Toronto, Fields Institute). 2012.

Presentations

The Phase Retrieval Problem: Theory, Algorithms, and Applications
Thesis Defense, Stanford University.
Stanford University, Stanford, CA, USA. May 23, 2019.

Holographic Phase Retrieval and Dual-Reference Design
Candès group meeting, Department of Statistics, Stanford University.
Stanford University, Stanford, CA, USA. March 7, 2019.

Holographic Phase Retrieval and Optimal Reference Design
Candès group meeting, Department of Statistics, Stanford University.
Stanford University, Stanford, CA, USA. December 6, 2018.

1D Phase Retrieval and Spectral Factorization
Mathematics in Imaging, Optical Society of America Imaging and Applied Optics Congress.
Orlando, FL, USA. June 28, 2018.

On Block-Reference Coherent Diffraction Imaging
Computational Optical Sensing and Imaging, Optical Society of America Imaging and Applied Optics Congress. Orlando, FL, USA. June 28, 2018.

A Local Analysis of Block Coordinate Descent for Gaussian Phase Retrieval
10th NIPS Workshop on Optimization for Machine Learning, Neural Information Processing Systems (NIPS). Stanford University, Stanford, CA, USA. May 18, 2018.

A Matrix Algebra Approach to the Fourier Phase Retrieval Problem
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada. January 9, 2018.

A Local Analysis of Block Coordinate Descent for Gaussian Phase Retrieval
10th NIPS Workshop on Optimization for Machine Learning, Neural Information Processing Systems (NIPS). Long Beach, CA, USA. December 9, 2017.

ADMM for Phase Retrieval
Candès group meeting, Department of Statistics, Stanford University.
Stanford University, Stanford, CA, USA. October 25, 2017.

The Phase Retrieval Problem: Theory and Algorithms
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada. December 29, 2016.

Recent Advances of the Phase Retrieval Problems
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada. December 15, 2015.

Analyzing Fienup Algorithms for Phase Retrieval
Candes group meeting, Department of Statistics, Stanford University.
Stanford University, Stanford, CA, USA. November 13, 2015.

Functional Map Methods in Computational Geometry
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada. December 18, 2014.

Functional Maps in Computational Geometry
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Guibas group meeting, Department of Computer Science, Stanford University.
Stanford University, Stanford, CA, USA. November 19, 2014.

Mathematical Signal Processing and Operator Algebras
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada.
Series of three talks - August 1, September 3, and September 10, 2013.

Classical Limits of the Feynman Path Integral and Schrodinger Equation
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada. August 14, 2012.

The Uniqueness Theorem for the Cuntz Algebras
Operator Algebras Seminar, Fields Institute for Mathematical Research.
Toronto, ON, Canada. August 18, 2011.

Awards and Honors

Stanford Teaching Assistantship, 2016

Simons Math+X Fellow, Simons Foundation, 2015-2016

Stanford Research Assistantship, Stanford University, 2014-2015

Stanford Departmental Fellowship, Institute for Computational and Mathematical Engineering, School of Engineering, Stanford University, 2013

Alexander Graham Bell Canada Graduate Scholarship, Natural Sciences and Engineering Research Council of Canada, 2013

NSERC Postgraduate Scholarship, Natural Sciences and Engineering Research Council of Canada, 2013

Ontario Graduate Scholarship, Ontario Ministry of Training, Colleges and Universities, 2012

University of Toronto Tuition Fellowship, University of Toronto, 2012

Graduated with Honours, Bachelor of Applied Science in Engineering Science, Faculty of Applied Science and Engineering, University of Toronto, 2012

Dean's Honour List, Faculty of Applied Science and Engineering (Engineering Science), University of Toronto, 2007 - 2012

Undergraduate Student Research Award, Natural Sciences and Engineering Research Council of Canada, 2010

University of Toronto Excellence Award, University of Toronto, 2007

University of Toronto Scholars Program National Scholarship, University of Toronto, 2006

George Roderick Fraser Scholarship in Mathematics, University of Toronto, 2006

Millennium Excellence Award, Canadian Millennium Scholarship Foundation, 2006

Teaching

Course Instructor, ICME Refresher Course – Multivariable Calculus, Stanford University, 2016

Teaching Assistant, CME106/ENGR155C Introduction to Probability and Statistics for Engineers, Stanford University, 2016

Interim Teaching Assistant, MAT137Y1 Calculus!, University of Toronto, 2012

Conferences Attended

Mathematics in Imaging, Optical Society of America Imaging and Applied Optics Congress. Orlando, FL, USA. June 25-29, 2018.

Computational Optical Sensing and Imaging, Optical Society of America Imaging and Applied Optics Congress. Orlando, FL, USA. June 25-29, 2018.

10th NIPS Workshop on Optimization for Machine Learning, Neural Information Processing Systems (NIPS). Long Beach Convention Center. December 9, 2017.

Neural Information Processing Systems (NIPS). Long Beach Convention Center. December 4-9, 2017.

Phaseless Imaging in Theory and Practice: Realistic Models, Fast Algorithms, and Recovery Guarantees, Institute for Mathematics and its Applications, University of Minnesota. August 14 - 18, 2017.

Bay Area Vision Meeting. Stanford University, October 3, 2014.

ONR Workshop on Structured Learning for Scene Understanding. Stanford University. October 2, 2014.

Canadian Operator Symposium. University of Toronto. May 27-31, 2013.

Workshop on Applications to Operator Algebras. Fields Institute for Mathematical Research, University of Toronto. September 10-14, 2012.

Canadian Operator Symposium. Queen's University. May 21-25, 2012.

Workshop on Positivity. University of Toronto. August 2-4, 2011.

Professional Services

Technical Consultant, MedX Protocol

Reviewer, IEEE Transactions on Signal Processing

Professional Affiliations

Member, Society of Industrial and Applied Mathematics

Student Member, IEEE

Member, American Mathematical Society

Member, Canadian Mathematical Society

Member, Optical Society of America

Member, Engineering Intern, Professional Engineers Ontario