

EMILY J. KING

ASSISTANT PROFESSOR – MATHEMATICS DEPARTMENT, COLORADO STATE UNIVERSITY

Research Interests: Pure & Applied Harmonic Analysis, Data Analysis, Frame Theory, Sparse & Redundant Representations, Signal & Image Processing

Education

Degrees

University of Maryland

College Park, MD, USA

Ph.D. in Mathematics

9/2005–8/2009

“Wavelet and Frame Theory: Frame Bound Gaps, Generalized Shearlets, Grassmannian Fusion Frames, and p -adic Wavelets”

Advisors: Dr. John J. Benedetto and Dr. Wojciech Czaja

Oral Preliminary Exam: “Density of Gabor Systems,” 2007

Written Exams: Analysis, Algebra, Topology, 2006

Language Exam: Russian, 2006

Texas A&M University

College Station, TX, USA

M.S. in Mathematics

9/2004–8/2005

Advisor: Dr. David Larson

Texas A&M University

College Station, TX, USA

B.S. in Applied Mathematics

9/2000–12/2003

Non-Degree Study

Foundation for the Advanced Education in the Sciences Graduate School

Bethesda, MD, USA

Computational Biology & Bioinformatics

2/2010–12/2010

University of Maryland

College Park, MD, USA

Advanced Special Student - Bioengineering

9/2009–12/2009

Budapest Semesters in Mathematics

Budapest, Hungary

Discrete Math & Number Theory

2/2004–6/2004

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Positions

Current

Colorado State University Fort Collins, CO, USA
Assistant Professor 8/2019–

Previous

University of Bremen Bremen, Germany
Junior Professor „Computational Data Analysis“ 4/2014–7/2019
Associate, Zentrum für Technomathematik (Center for Industrial Mathematics)

University of Bremen Bremen, Germany
Wissenschaftliche Mitarbeiterin (Postdoctoral Researcher), 11/2013–3/2014
Zentrum für Technomathematik (Center for Industrial Mathematics)

Technical University of Berlin Berlin, Germany
Humboldt Postdoctoral Fellow, FG Angewandte Funktionalanalysis 3/2012–6/2013

Berlin Mathematical School Berlin, Germany
Postdoctoral Faculty Member 8/2012–6/2013

University of Bonn Bonn, Germany
Humboldt Postdoctoral Fellow, Institute for Numerical Simulation 10/2011–2/2012

Universität Osnabrück Osnabrück, Germany
Humboldt Postdoctoral Fellow, Applied Analysis Group 7/2011–9/2011

University of Maryland College Park, MD, USA
Postdoctoral Research Associate, Norbert Wiener Center 9/2009–6/2011

National Institutes of Health Bethesda, MD, USA
Postdoctoral IRTA Fellow, Laboratory of Integrative and Medical Biophysics 9/2009–2/2011

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Papers and Other Publications

Journal Papers and Preprints

1. Matthew Fickus, Joseph W. Iverson, John Jasper, Emily J. King “Grassmannian codes from paired difference sets” (2020) <https://arxiv.org/pdf/2010.06639.pdf>.
2. Chris Cox, Emily J. King, Dustin G. Mixon, and Hans Parshall, “Uniquely optimal codes of low complexity are symmetric” (2020) <https://arxiv.org/pdf/2008.12871.pdf>.
3. Scott Mahan, Emily J. King, and Alex Cloninger, “Nonclosedness of the Set of Neural Networks in Sobolev Space” (2020) <https://arxiv.org/abs/2007.11730>.
4. Emily J. King, “Constructing Subspace Packings from Other Packings” (2019) <https://arxiv.org/abs/1902.07145>.
5. Emily J. King, “New Constructions and Characterizations of Flat and Almost Flat Grassmannian Fusion Frames,” (2019) <https://arxiv.org/abs/1612.05784>.
6. Sören Schulze and Emily J. King, “Sparse Pursuit and Dictionary Learning for Blind Source Separation in Polyphonic Music Recordings” (2019) <https://arxiv.org/abs/1806.00273>.
7. Sören Dittmer, Emily J. King, and Peter Maass, “Singular Values for ReLU Layers,” *IEEE Transactions on Neural Networks and Learning Systems*, **31:9** (September 2020): 3594–3605
8. Bernhard Bodmann and Emily J. King, “Optimal arrangements of classical and quantum states with limited purity,” *Journal of the London Mathematical Society*, **101:1** (February 2020): 393–431.
9. Emily J. King and Xiaoxian Tang, “New Upper Bounds for Equiangular Lines by Pillar Decomposition,” *SIAM Journal on Discrete Mathematics*, **33:4** (2019): 2479–2508.
10. Rafael Reisenhofer and Emily J. King, “Edge, Ridge, and Blob Detection with Symmetric Molecules” (2019) <https://arxiv.org/abs/1901.09723>. *SIAM Journal on Imaging Sciences*, **12:4** (2019): 1585–1626.
11. Matthew Fickus, John Jasper, Emily J. King, and Dustin G. Mixon, “Equiangular tight frames that contain regular simplices,” *Linear Algebra and Applications*, **555** (2018): 98–138.
12. Emily J. King and Maria A. Skopina, “On biorthogonal p -adic wavelet bases,” *Notes of Scientific Seminars of the St. Petersburg Department of the Steklov Mathematical Institute, Russian Academy of Sciences*, **455** (2017):67-83. (in Russian) English version *Journal of Mathematical Sciences*, **234:2** (October 2018): 158–169, Springer.

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13. Rafael Reisenhofer, Johannes Kiefer, Emily J. King, "Shearlet-based detection of flame fronts," *Experiments in Fluids*, 57 (2016): 41–55.
14. Wojciech Czaja and Emily J. King, "Anisotropic shearlet transforms for $L^2(\mathbb{R}^k)$," *Mathematische Nachrichten*, 287.8–9 (June 2014): 903–916.
15. Emily J. King, Gitta Kutyniok, and Xiaosheng Zhuang, "Analysis of Inpainting via Clustered Sparsity and Microlocal Analysis," *Journal of Mathematical Imaging and Vision*, 48.2 (2014): 205–234.
16. Emily J. King, "Smooth Parseval frames for $L^2(\mathbb{R})$ and generalizations to $L^2(\mathbb{R}^d)$," *Int. J. Wavelets Multi*, 11.6 (November 2013).
17. Wojciech Czaja and Emily J. King, "Isotropic shearlet analogs for $L^2(\mathbb{R}^k)$ and localization operators," *Numerical Functional Analysis and Optimization*, 33 (2012): 872–905.
18. Emily J. King and Maria A. Skopina, "Quincunx multiresolution analysis for $L^2(\mathbb{Q}_2^3)$," *p-Adic Numbers, Ultrametric Analysis, and Applications*, 2.3 (September 2010): 222–231.
19. John J. Benedetto and Emily J. King, "Smooth functions associated with wavelet sets on \mathbb{R}^d , $d \geq 1$, and frame bound gaps," *Acta Appl. Math.*, 107.1-3 (July 2009): 121–142.

Refereed Conference Proceedings and Reports

1. Emily J. King, "2- and 3-Covariant Equiangular Tight Frames" (2019) <https://arxiv.org/abs/1901.10612>. To appear, *Sampling Theory in Signal and Image Processing: Special Issue SampTA 2019*.
2. Martin Ehler, Julia Dobrosotskaya, Emily J. King, and Robert F. Bonner, "Quantification of Retinal Chromophores Through Autofluorescence Imaging to Identify Precursors of Age-Related Macular Degeneration," *Excursions in Harmonic Analysis: The February Fourier Talks at the Norbert Wiener Center*, Eds.: T. Andrews, R. Balan, J. J. Benedetto, W. Czaja, K. A. Okoudjou, Birkhäuser Basel (2013): 355–372.
3. Julia Dobrosotskaya, Martin Ehler, Emily J. King, Robert Bonner, and Wojciech Czaja, "Sparse Representations and Variational Methods in Retinal Image Processing," *IFMBE Proceedings Series: Intern. Fed. for Medical & Biological Engineering, 26th Southern Biomedical Engineering Conference (SBEC 2010)*, Springer (2010): 344–347.
4. Martin Ehler, Zigurts Majumdar, Emily J. King, Julia Dobrosotskaya, Emily Chew, Wai Wong, Denise Cunningham, Wojciech Czaja, and Robert F. Bonner, "High-Resolution Autofluorescence Imaging for Mapping Molecular Processes Within the Human Retina," *IFMBE Proceedings Series: Intern. Fed. for Medical & Biological Engineering, 26th Southern Biomedical Engineering Conference (SBEC 2010)*, Springer (2010): 361–364.

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Abstract-Refereed Conference Proceedings and Reports

1. Sören Schulze and Emily J. King, "A Frequency-Uniform and Pitch-Invariant Time-Frequency Representation." *Proceedings in Applied Mathematics and Mechanics – 90th GAMM Annual Meeting*, **19:1** (November 2019).
2. John Jasper, Emily J. King, and Dustin Mixon, "Game of Sloanes: Best Known Packings in Complex Projective Space," *Wavelets and Sparsity XVIII, SPIE Proceedings*, **11138** (2019).
3. Emily J. King and James M. Murphy, "A theoretical guarantee for data completion via geometric separation," *Proceedings in Applied Mathematics and Mechanics*, **17.1** (2018).
4. Emily J. King, "Algebraic and geometric spread in finite frames," *Wavelets and Sparsity XVI, SPIE Proceedings*, **9597** (2015).
5. Emily J. King, Rafael Reisenhofer, Johannes Kiefer, Wang-Q Lim, Zhen Li, and Georg Heygster, "Shearlet-Based Edge Detection: Flame Fronts and Tidal Flats," *Applications of Digital Image Processing XXXVIII, SPIE Proceedings*, **9599** (2015).
6. Emily J. King, Gitta Kutyniok, and Wang-Q Lim, "Image inpainting: theoretical analysis and comparison of algorithms," *Wavelets and Sparsity XV, SPIE Proceedings*, **8858** (2013).
7. Emily J. King, "Frame theory for locally compact abelian groups," *Wavelets and Sparsity XV, SPIE Proceedings*, **8858** (2013).
8. Emily J. King, Gitta Kutyniok, and Xiaosheng Zhuang, "Analysis of data separation and recovery problems using clustered sparsity," *Wavelets and Sparsity XIV, SPIE Proceedings*, **8138** (2011).
9. Martin Ehler, Julia Dobrosotskaya, Emily J. King, Wojciech Czaja, and Robert F. Bonner, "Modeling Photo-bleaching Kinetics to Map Local Variations in Rod Rhodopsin Density," *Medical Imaging 2011: Computer-Aided Diagnosis, SPIE Proceedings*, **7963**.
10. Julia Dobrosotskaya, Martin Ehler, Emily J. King, Robert F. Bonner, and Wojciech Czaja, "Modeling of the rhodopsin bleaching with variational analysis of retinal images," *Medical Imaging 2011: Image Processing, SPIE Proceedings*, **7962**.

Unrefereed Conference Proceedings and Reports

1. Emily J. King (joint work with Alex Fink, Cynthia Vinzant, and Shayne Waldron), "Decomposing (equiangular) tight frames into (equiangular) tight frames for their spans," *Oberwolfach Reports – Applied Harmonic Analysis and Sparse Approximation*, **46** (2018): 29 – 32.

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2. Emily J. King (joint work with Gitta Kutyniok and Xiaosheng Zhuang), “Analysis of Inpainting via Clustered Sparsity and Microlocal Analysis,” *Oberwolfach Reports – Applied Harmonic Analysis and Sparse Approximation*, **29** (2012): 44 – 48.
3. Emily J. King (joint work with Wojtek Czaja), “Shearlets and representation theory (and the Wick calculus),” *Oberwolfach Reports – Operator Algebras and Representation Theory: Frames, Wavelets and Fractals*, **8.1** (2011): 961 – 963.

Other Publications and Papers

1. Emily J. King, “A Matricial Algorithm for Polynomial Refinement,” <http://arxiv.org/abs/1110.6061> (2011)
2. Olga I. Glazunova, *Rush to Russian*, 2nd ed., English-language editor: Emily J. King, Izdatel’ckijdom “Mirs” (Publishing House Mirs), St. Petersburg (2010): 304 pages. ISBN 978-5-91395-048-2
3. Emily J. King, “A Journal of the Budapest Semesters in Mathematics,” *MAA: Math Horizons*, **14** (September 2006).
4. Emily J. King, “Grassmannian fusion frames,” <https://arxiv.org/abs/1004.1086> (2013)
5. Emily J. King, Review of *Codes and Ciphers: Julius Caesar, the Enigma, and the Internet* by Robert Churchhouse, *MAA: Math Horizons*, **11** (April 2004).

Fellowships, Awards, and Grants

Grants

- Co-Spokesperson / Project Leader: Helmholtz School for Marine Data Science (MarDATA), € 6,000,000.00 (total program), Helmholtz Association, 2019 – [left 2019]
- Project Leader: Graduiertenkolleg “Research Training Group π^3 : Parameter Identification – Analysis, Algorithms, Application,” € 208,837.50 (my portion, less overhead costs), Deutsche Forschungsgemeinschaft, 2016 – [left 2019]
- Coauthor/PI: Explorationsprojekt “Hilbert Space Frames and Algebraic Geomery” with Eva-Maria Feichtner, € 245,535, Zentrale Forschungsförderung der University of Bremen, 2014 – 2016
- Author: AMS-Simons Travel Grant, \$4000, July 1, 2013 – June 30, 2015
- Author: Jacob K. Goldhaber Travel Grant, \$600, Graduate School, University of Maryland, June 2009
- Author: Kaplan Travel Funds, \$600, University of Maryland, Alumni Association, Summer 2009
- Coauthor: MAA-Tensor Grant, \$1500 for Women in Mathematics at the University of Maryland, Spring 2009

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Fellowships & Scholarships

Humboldt Postdoctoral Research Fellowship, July 2011 – June 2013

IRTA Postdoctoral Fellow, National Institutes of Health, September 2009 – February 2011

Norbert Wiener Center Summer Research Assistantship, University of Maryland, Summer 2009

Ann G. Wylie Dissertation Fellow, University of Maryland, August 2008 – December 2008

GAANN Fellow, University of Maryland, August 2005 – August 2008

Lechner Scholar, Texas A&M University, August 2000 – December 2004

National Merit Scholar, Texas A&M University, August 2000 – December 2003

Academic Achievement Scholar, Texas A&M Mathematics, August 2002 – December 2003

NSF-VIGRE Fellow, Texas A&M University, Summer 2002, Summer 2003

Mechanical Engineering Scholar, Texas A&M University, August 2000 – May 2001

Directors Excellence Scholar, Texas A&M University, August 2000 – May 2001

Prizes & Awards

Seymour Goldberg Writing Competition Winner, University of Maryland, March 2007

Rank 403.5/3615, Putnam Exam, Fall 2003

4th place winner, US National Collegiate Mathematics Championship, MathFest, Boulder, Colorado, USA, August 2003

Pi Mu Epsilon/AMS Outstanding Student Talk, MathFest, Boulder, Colorado, USA, August 2003

Conferences, Workshops, & Seminars

Invited Conference and Workshop Presentations

[Tentatively postponed to Fall 2022 due to COVID-19] Title TBA, Special session on Algebraic Combinatorics and its Application to Harmonic Analysis, AMS Western Sectional Meeting, University of Utah, Salt Lake City, UT, USA, October 24–25, 2020

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[Tentatively postponed until Spring 2022 due to COVID-19] “Combinatorics and Group Symmetry in [Hilbert Space] Frames,” ALCOMA 20 (international conference on algebraic combinatorics and applications), Kloster Banz, Germany, March 29–April 4, 2020

[Tentatively postponed to 2021 due to COVID-19] Title TBA (plenary), Workshop on Applied Algebra in Data Science, Max Planck Institute, Leipzig, Germany, September 17–19, 2020

[Tentatively postponed until September 2021 due to COVID-19] Title TBA, 8th International Conference on Computational Harmonic Analysis, Munich, Germany, September 14–18, 2020

[Tentatively postponed until June 2021 due to COVID-19] Title TBA, Conference on the Mathematics of Complex Data, Stockholm, Sweden, June 8–11, 2020

Title TBA, Focus Week on Computational Harmonic Analysis and Linear Algebra, Focus Program on Data Science, Approximation Theory, and Harmonic Analysis, Fields Institute, Toronto, Canada, May 17–21, 2021

The Combinatorics of Equiangular Tight Frame Substructures, Special Session on Frame Theory, DFT 2020: The District Fourier Talks, American University, Washington, DC, USA, October 24, 2020 [Held over Zoom]

[Canceled due to COVID-19] Title TBA, SUnMaRC Undergraduate Maths Research Conference, Colorado State University, Fort Collins, CO, USA, April 3–5, 2020

“Small World Graphs: What Facebook, Roundworm Brains, and My Career Have in Common,” CSU Sonia Kovalevsky Day, March 12, 2020

“ReLU-Singular Values and Gaussian Mean Width in Neural Networks,” AMS-AWM Special Session on Mathematical and Computational Research in Data Science, Joint Mathematics Meetings, Denver, CO, USA, January 15–18, 2020

“Algebraic and Geometric Spread of Linear Measurements in Applications,” Keynote Address, Wavelets & Sparsity XVIII, SPIE Optics & Photonics 2019, San Diego, CA, USA, August 11–15, 2019

“2- and 3-Covariant Equiangular Tight Frames,” SampTA 2019, Bordeaux, France, July 8–12, 2019

“Edge, ridge, and blob detection with symmetric molecules,” AWM Research Symposium, Rice University, Houston, TX, USA, April 6–7, 2019

“Negative Cliques in Sets of Equiangular Lines,” 7th International Conference on Computational Harmonic Analysis, Vanderbilt University, Nashville, TN, USA, May 14–18, 2018

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- “Fourier Analysis on Groups and Grassmannian Packings,” Spring Mini Courses in Analysis and Geometry, Louisiana State University, Baton Rouge, Louisiana, USA, February 8–11, 2018
- “Difference Sets and Grassmannian Packings,” International Workshop on Wavelets, Frames and Applications III, Kirori Mal College, University of Delhi, Delhi, India, December 14–20, 2017
- “Combinatorial Frame Design,” AFG Summer Party, TU Berlin, Berlin, Germany, August 25–26, 2016
- “Optimal Frames,” Section on Mathematical Signal and Image Processing, Joint Annual Meeting of GAMM and DMV, Braunschweig, Germany, March 7–11, 2016
- “Algebraic and Geometric Spread in Finite Frames,” Applied and Computational Harmonic Analysis Section, DMV-Jahrestagung, Hamburg, Germany, September 21–25, 2015
- “Algebraic and geometric spread in finite frames,” Wavelets & Sparsity XVI, SPIE Optics & Photonics 2015, San Diego, CA, USA, August 9–13, 2015
- “Shearlet-Based Edge Detection: Flame Fronts and Tidal Fronts,” GAMM 86th Annual Meeting of the International Association of Applied Mathematics and Mechanics, Section on Mathematical Signal and Image Processing, Lecce, Italy, March 23–27, 2015
- “Sparsity-Based Approaches to Image Processing: Bridging Theory and Application,” GAMM 85th Annual Meeting of the International Association of Applied Mathematics and Mechanics, Section on Mathematical Signal and Image Processing, Erlangen, Germany, March 10–14, 2014
- “Frame Theory for Locally Compact Abelian Groups,” Wavelets & Sparsity XV, SPIE Optics & Photonics 2013, San Diego, CA, USA, August 25–29, 2013
- “Image Inpainting: Theoretical Analysis and Comparison of Algorithms,” Wavelets & Sparsity XV, SPIE Optics & Photonics 2013, San Diego, CA, USA, August 25–29, 2013
- “Harmonic Analysis for Locally Compact Abelian Groups,” International Workshop on p -Adic Methods for Modeling of Complex Systems, Zentrum für interdisziplinäre Forschung (Center for Interdisciplinary Research), Bielefeld, Germany, April 15–19, 2013
- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” Young Researcher Mini-Symposium on Compressed Sensing and Applications, GAMM 84th Annual Meeting of the International Association of Applied Mathematics and Mechanics, Novi Sad, Serbia, March 18–22, 2013
- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” Sparse Representation of Functions: Analytic and Computational Aspects, MATHEON, TU Berlin, Berlin, Germany, December 10–14, 2012

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- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” Advances in Mathematical Image Processing, Göttingen, Germany, September 4–6, 2012
- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” Workshop on Applied Harmonic Analysis and Sparse Approximation, Mathematisches Forschungsinstitut Oberwolfach, Germany, June 11–15, 2012
- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” International Conference on Multivariate Approximation, Hagen, Germany, September 24–27, 2011
- “Shearlets and Representation Theory (and the Wick calculus),” Workshop on Operator Algebra and Representation Theory: Frames, Wavelets and Fractals, Mathematisches Forschungsinstitut Oberwolfach, Germany, March 27–April 2, 2011
- “Generalized Shearlets and Representation Theory,” February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 17–18, 2011
- “Quincunx MRA for $L^2(\mathbb{Q}_2^2)$ and self-similar tilings,” AMS Special Session on Wavelets, Tilings, and Iterated Function Systems, Joint Mathematics Meetings, New Orleans, LA, USA, January 6–9, 2011
- “High-Resolution Autofluorescence Imaging for Mapping Macular Processes Within the Human Retina” (poster), NICHD Sixth Annual Meeting of Postdoctoral, Clinical, & Visiting Fellows, Warrenton, VA, USA, May 3–4, 2010
- “Representation theory of generalized shearlets,” Illinois/Missouri Applied Harmonic Analysis Seminar, Northern Illinois University, Dekalb, IL, USA, April 24, 2010
- “Grassmannian fusion frames,” Workshop on Optimal Frames and Operator Algebras, San Francisco State University, San Francisco, CA, USA, January 17–19, 2010
- “Grassmannian fusion frames,” Mini-conference in Harmonic Analysis on the Occasion of John Benedetto’s 70th Birthday, University of Maryland, College Park, MD, USA, August 21, 2009
- “Grassmannian fusion frames,” Graduation Conference, University of Maryland College Park, May 1, 2009
- “The Geometry of Wavelets: Fractals and Group Representations,” Graduation Conference, University of Maryland, College Park, MD, USA, April 13, 2007

Contributed and Self-Invited Conference and Workshop Presentations

- “Introduction to Group Actions in Harmonic Analysis,” Special Session on Group Actions in Harmonic Analysis, Joint Mathematics Meetings, Denver, Colorado, USA, January 15–18, 2020

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- “Grassmannian Frames and the Game of Sloanes,” Jubilee of Fourier Analysis and Applications: A Conference Celebrating John Benedetto’s 80th Birthday, University of Maryland, College Park, MD, USA, September 19–21, 2019
- “Game of Sloanes: Best Known Packings in Complex Projective Space,” Wavelets & Sparsity XVIII, SPIE Optics + Photonics, San Diego, CA, USA, August 11–15, 2019
- “Optimal subspace and spectrahedron arrangements in frame theory and quantum information theory,” Minisymposium on Algebra, Geometry, and Combinatorics of Subspace Packings, SIAM Conference on Applied Algebra Geometry, Bern, Switzerland, July 9–13, 2019
- “Introduction to Low Complexity Models in Data Analysis and Machine Learning,” Special Session on Low Complexity Models in Data Analysis and Machine Learning, Joint Mathematics Meetings, Baltimore, MD, USA, January 16–19, 2019
- “Difference Sets and Grassmannian Packings,” AMS Contributed Paper Session on Combinatorics and Graph Theory, III, Joint Mathematics Meetings, Baltimore, MD, USA, January 16–19, 2019
- “Introduction to Algebraic, Geometric, and Combinatorial Methods in Frame Theory,” Mini-Workshop on Algebraic, Geometric, and Combinatorial Methods in Frame Theory, Oberwolfach, Germany, October 1–5, 2019
- “Negative cliques in sets of equiangular lines,” Tight Frames and Approximation, Taipa, New Zealand, February 20–23, 2018
- “Difference Sets and Grassmannian Packings,” SIAM Conference on Applied Algebraic Geometry, Atlanta, GA, USA, July 31–August 4, 2017
- “Difference Sets and Grassmannian Packings,” European Women in Mathematics – German Chapter Conference 2017, University of Bielefeld, Bielefeld, Germany, June 9–10, 2017
- “Shearlet-Based Morphological Component Analysis: Theory and Applications,” Applied Inverse Problems 2017, Hangzhou, China, May 29–June 6, 2017
- “Shearlet-Based Morphological Component Analysis: Theory and Applications,” GAMM 88th Annual Meeting of the International Association of Applied Mathematics and Mechanics, Section on Mathematical Signal and Image Processing, Weimar, Germany, March 6–10, 2017
- “Shearlets and Morphological Component Analysis,” Mathematics of Signal Processing Hausdorff Trimester Program, Bonn, Germany, February 24, 2016

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- “Algebraic and Geometric Spread in Finite Frames” (poster), 2nd International Matheon Conference on Compressed Sensing and its Applications, TU Berlin, Berlin, Germany, December 7–11, 2015
- “Shearlet-Based Edge Detection: Flame Fronts and Tidal Flats,” Applications of Digital Image Processing XXXVIII, SPIE Optics & Photonics 2015, San Diego, CA, USA, August 9–13, 2015
- “Sparse Representations and Compressed Sensing,” Compressed Sensing Workshop, Bremen, Germany, March 17, 2015
- “Multiscale Geometric Analysis” (copresented with Martin Storath), GAMM 85th Annual Meeting of the International Association of Applied Mathematics and Mechanics, Young Researchers’ Minisymposium on Multiscale Geometric Image Analysis, Erlangen, Germany, March 10–14, 2014
- “Quincunx wavelets for $L^2(\mathbb{Q}_2^2)$ and self-similar tilings,” Operator Algebras, Frames, and Undergraduate Research: A Conference in Honor of the 70th Birthday of David R. Larson, Texas A&M University, College Station, TX, USA, July 20–22, 2012
- “Generalized shearlets and the extended metaplectic group,” Baton Rouge Workshop in Analysis and Geometry, Louisiana State University, Baton Rouge, LA, USA, January 4–5, 2011
- “Age-related molecular degeneration & retinal image processing and RNA pseudoknots” (poster), Program in Physical Biology Retreat, National Institutes of Health, Bethesda, MD, USA, November 17, 2010
- “Generalized shearlets and the extended metaplectic group,” Joint Mathematics Meetings, San Francisco, CA, USA, January 13–16, 2010
- “Smooth functions associated with wavelet sets on \mathbb{R}^d , $d \geq 1$, and frame bound gaps,” The International Conference: Wavelets and Applications, Euler International Mathematical Institute St. Petersburg, Russia, June 15–19, 2009
- “Smooth functions associated with wavelet sets on \mathbb{R}^d and frame bound gaps,” D.C. Math Graduate Student Meeting, George Washington University, Washington DC, USA, April 25–26, 2009
- “Smooth functions associated with wavelet sets on \mathbb{R}^d and frame bound gaps” (poster), February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 19–20, 2009
- “Smooth functions associated with wavelet sets on \mathbb{R}^d , $d \geq 1$, and frame bound gaps,” AMS Special Session on Harmonic Analysis, Joint Mathematics Meetings, Washington DC, USA, January 3–8, 2009
- “Frame Theory” (an expository talk), Progress in Mathematics for Communication Systems Summer Academy at the International Center for Transdisciplinary Studies School of Engineering and Science, Jacobs University, Bremen, Germany, July 2–13, 2007

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- “The Geometry of Wavelets: Shearlets, Fractals and Group Representations,” Spotlight on Graduate Research, University of Maryland, College Park, MD, November 8, 2006
- “Some Constructions of Finite Tight Frames,” Spotlight on Graduate Research, University of Maryland, College Park, MD, USA, Fall 2005
- “Tight Frames and Sampling Theory” (poster with Nathaniel Strawn), Undergraduate Student Poster Session, Joint Mathematics Meetings, Phoenix, AZ, USA, January 7–10, 2004
- “A Matricial Algorithm for Polynomial Refinement,” MathFest, Boulder, CO, USA, July 31–August 2, 2003
- “Refinability of Multivariate Polynomials” (copresented with Justin Turner and Philip Watkins), TAMU REU/VIGRE Student Miniconference, Texas A&M University, College Station, TX, USA, July 22, 2003
- “A Matricial Algorithm for Polynomial Refinement,” Nebraska Conference for Undergraduate Women in Mathematics, University of Nebraska, Lincoln, NE, USA, February 1–3, 2002
- “A Matricial Algorithm for Polynomial Refinement” (poster), Sigma Xi Student Research Conference, Galveston, TX, USA, November 15–17, 2002
- “A Matrix System for Polynomial Refinement,” REU Conference, Texas A&M University, College Station, TX, USA, July 2002
- “Methodologies and Emergent Patterns in Forming Elliptical Tight Frame Sequences,” REU Conference, Texas A&M University, College Station, TX, USA, July 2002

Colloquium Talks

- “Low Complexity Models in Data Analysis,” Department of Mathematics and Statistics Colloquium Series, Georgetown University, Washington, DC, USA, September 11, 2020 [Held over Zoom]
- “The Algebra, Geometry, and Combinatorics of Frames,” Fisk Distinguished Speaker Series, University of Wyoming, Laramie, WY, USA, February 20, 2020
- “Combinatorics and Group Symmetry in [Hilbert Space] Frames,” Colloquium of the Mathematics and Statistics Department, Vassar College, Poughkeepsie, NY, USA, October 8, 2019
- “(Hilbert Space) Frames, Algebraic Combinatorics, and Geometry,” DMS Colloquium, Auburn University, Auburn, AL, USA, March 30, 2018
- “Shearlet Theory and Applications,” Lothar Collatz Kolloquium für Angewandte Mathematik, University of Hamburg, Hamburg, Germany, February 1, 2018

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EMILY J. KING

“Optimal Representation Systems and Sparsity,” AWI Kolloquium, Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, January 17, 2018

“(Hilbert Space) Frames, Algebraic Combinatorics, and Geometry,” Mathematisches und Mathematikdidaktisches Kolloquium, Carl von Ossietzky University of Oldenburg, Oldenburg, Germany, October 25, 2017

“Frames and Geometry,” Institut für Mathematik Kolloquium, University of Osnabrück, Osnabrück, Germany, July 1, 2015

“Shearlets: From Algebra to Applications,” Mathematisches Kolloquium, University of Bremen, Germany, November 11, 2014

“Frames Meet Algebraic Geometry,” Kolloquium über Angewandte Mathematik, University of Göttingen, Germany, July 22, 2014

Seminar Talks

[Tentatively postponed until Spring 2021 due to COVID-19] “Linear Dimensionality Reduction: PCA vs. Linear Regression vs. Johnson-Lindenstrauss,” 4th paradigm Data Science Club, Colorado State University, Fort Collins, CO, USA, April 22, 2020

“Low Complexity Models in Data Analysis,” Computational and Applied Math Seminar, Tufts University Department of Mathematics, Medford, MA, USA, February 8, 2021 [To be held over Zoom]

“Low Complexity Models in Data Analysis,” Data Seminar, University of Missouri, Columbia, MO, USA, December 1, 2020 [To be held over Zoom]

“Group Actions in Harmonic Analysis,” Seminario Harmonic Analysis and Fractal Geometry, CONICET-Universidad de Buenos Aires, Buenos Aires, Argentina, November 24, 2020 [To be held over Zoom]

“Pure & Applied Harmonic Analysis: Choosing the right building blocks for the task at hand,” Who is? What is? Seminar, Colorado State University, Fort Collins, CO, USA, September 15, 2020 [Held over Zoom]

“Combinatorics and Group Symmetry in Frames,” Analysis Seminar, University of Rochester, Rochester, NY, USA, July 17, 2020 [Held over Zoom]

“John Conway and Optimal Grassmannian Packings,” Algebratorics Lab, Colorado State University, Fort Collins, CO, USA, April 21, 2020

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- “Strongly Regular Graphs (and Frames),” Algebratorics Lab, Colorado State University, Fort Collins, CO, USA, April 7, 2020
- “Lie Algebras and Quantum Information Theory,” Algebraic Lie Theory Seminar, University of Colorado, Boulder, CO, USA, December 10, 2019
- “ReLU-Singular Values and Gaussian Mean Width in Neural Networks,” Image Analysis Seminar, University of Houston, Houston, TX, USA, November 26, 2019
- “Low Complexity Models in Image Processing and Data Analysis,” guest lecture in DSCI 100, Colorado State University, Fort Collins, CO, USA, November 18, 2019
- “Shearlet Theory and Applications,” Applied Math Seminar, Colorado State University, Fort Collins, CO, USA, October 3, 2019
- “Low Complexity Models in Image Processing and Data Analysis,” Data Science Seminar, Colorado State University, Fort Collins, CO, USA, September 26, 2019
- “Combinatorics and Group Symmetry in [Hilbert Space] Frames,” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University, Fort Collins, CO, USA, September 13, 2019
- “Sparsity-Based Inpainting and Data Separation,” Seminar in Inverse Problems, Colorado State University, Fort Collins, CO, USA, September 5, 2019
- “Glühwein* and Block Designs. *Glühwein not included,” FB3 Weihnachtsfeier, University of Bremen, Bremen, Germany, December 19, 2018
- “Combinatorics and Discrete Geometry in (Hilbert Space) Frames,” Kombinatorische Strukturen in der Geometrie Kollegseminar, University of Osnabrück, Osnabrück, Germany, November 12, 2018
- “Edge, Ridge, and Blob Detection with Symmetric Molecules,” Image Analysis Seminar, University of Houston, TX, USA, August 27, 2018
- “Frames and Bases over Locally Compact Abelian Groups,” Analysis Seminar, University of Houston, Houston, TX, USA, October 6, 2017
- “Difference Sets and Grassmannian Packings,” Seminario de Análisis Real, Armónico y Geometría Fractal, Universidad de Buenos Aires, Buenos Aires, Argentina, August 27, 2017
- “Difference Sets and Grassmannian Packings,” Harmonic Analysis Theory & Applications Seminar, Danmarks Tekniske Universitet, Kongens Lyngby, Denmark, September 19, 2016.

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- “Optimal Representation Systems and Sparsity,” Department of Mathematics and Statistics Seminar, AFIT, OH, USA, May 25, 2016
- “Optimal Representation Systems and Sparsity,” Fachgebiet Technische Thermodynamik Seminar, University of Bremen, Germany, December 5, 2015
- “Wavelets: Ergodic Sets and Fractal Tilings,” Dynamical Systems and Geometry Oberseminar, University of Bremen, Germany, November 27, 2014
- “Optimal Representation Systems and Sparsity,” Seminar on Physics and Chemistry of the Atmosphere, University of Bremen, Germany, July 11, 2014
- “Frames Meet Algebraic Geometry,” AFG Oberseminar, TU Berlin, Berlin, Germany, March 27, 2014
- “(Hilbert Space) Frames Meet Algebraic Geometry,” ALTA Oberseminar, University of Bremen, Bremen, Germany, February 5, 2014
- “Harmonic Analysis on Locally Compact Abelian Groups,” AFG Oberseminar, TU Berlin, Berlin, Germany, June 20, 2013
- “Harmonic Analysis on Locally Compact Abelian Groups: What is known and new frontiers,” Danmarks Tekniske Universitet, Kongens Lyngby, Denmark, May 14, 2013
- “Protein-Protein Docking and the Fast Fourier Transform,” Department of Mathematics Undergraduate Colloquium, University of Houston, Houston, TX, USA, March 26, 2013
- “Shearlet-Based Inpainting,” Analysis Seminar, University of Houston, Houston, TX, USA, March 25, 2013
- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” Oberseminar Angewandte Funktionalanalysis, TU Berlin, Berlin, Germany, February 28, 2013
- “Isotropic shearlet analogs for $L^2(\mathbb{R}^k)$ and localization operators,” Seminario de Análisis y Aplicaciones, Universidad Autónoma de Madrid, Madrid, Spain, January 18, 2013
- “Image Inpainting via Analysis-Side ℓ^1 -Minimization,” Institute of Biomathematics and Biometry Colloquium, Helmholtz Zentrum München, Munich, Germany, May 4, 2012
- “Generalized Shearlets, Representation Theory, and the Wick Calculus,” Applied Harmonic Analysis Group Seminar, University of Bonn, Germany, October 20, 2011
- “Grassmannian Fusion Frames,” Jacobs Computational Analysis Seminar, Jacobs University, Bremen, Germany, April 6, 2011

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- “Protein-Protein Docking and the FFT,” NWC Seminar, Norbert Wiener Center, College Park, MD, USA, November 2, 2010
- “Biological Network Theory – How Actors are Like Neurons in *C. elegans*,” AMSC Student Seminar, University of Maryland, College Park, MD, USA, October 19, 2010
- “Biological Network Theory – How Actors are Like Neurons in *C. elegans*, I & II,” NICHD Postbac Course: Becoming an Effective Scientist, National Institutes of Health, Bethesda, MD, USA, October 4 & 18, 2010
- “Protein-Protein Docking,” Building 9 Computational Bio Journal Club, National Institutes of Health, Bethesda, MD, USA, July 29, 2010
- “Biological Pattern Formation,” Building 9 Computational Bio Journal Club, National Institutes of Health, Bethesda, MD, USA, January 7, 2010
- “Harmonic Analysis on Locally Compact Abelian Groups,” Student Analysis and PDE Seminar, University of Maryland, College Park, MD, USA, April 14, 2009
- “ p -Adic Wavelets and Pseudodifferential Operators,” Student Analysis and PDE Seminar, University of Maryland, College Park, MD, USA, March 31, 2009
- “Hadamard Matrices: Theory and Applications,” Women in Mathematics Lunch, University of Maryland, College Park, MD, USA, March 25, 2009
- “The Extended Metaplectic Group,” Student Analysis and PDE Seminar, University of Maryland, College Park, MD, USA, February 10, 2009
- “Smooth functions associated with wavelet sets on \mathbb{R}^d , $d \geq 1$, and frame bound gaps,” NWC Seminar, Norbert Wiener Center, College Park, MD, USA, December 9, 2008
- “Hadamard Matrices: Theory & Applications,” Graduate MiniCourse, University of Maryland, College Park, MD, USA, March 31, 2008
- “The Geometry of Wavelets: Fractal Tilings, Representations and Shearlets,” Graduate MiniCourse, University of Maryland, College Park, MD, USA, March 24, 2008
- “Intro to Harmonic Analysis: Finite Frame Theory,” NWC Seminar, Norbert Wiener Center, College Park, MD, USA, September 27, 2007
- “Density of Gabor Frames,” NWC Seminar, Norbert Wiener Center, College Park, MD, USA, February 8, 2007

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Short Courses and Special Lectures

[Invited; tentatively postponed until March 2021 due to COVID-19] “Low Complexity Modeling in Data Analysis and Image Processing,” 3 hour short course, IK Interdisciplinary College, Günne at Lake Möhne, Germany, March 13–20, 2020

“Low Complexity Modeling in Data Analysis and Image Processing,” 90-minute lecture, 3rd Annual Neuroengineering Retreat of the Elite MSc in Neuroengineering of the Technical University of Munich, Brixlegg, Austria, May 30–June 2, 2019

“Data Analysis and Image Processing: Low Complexity Modeling,” short course with 7.5 hours of lecture and 7.5 hours of problem sessions, Research Training Group, π^3 Parameter Identification, Bremen, Germany, January 23–27, 2017

“Mathematical Transforms and Sparsity: Harmonic Analysis and its Applications,” 4 hour short course team taught with Rafael Reisenhofer, IK Interdisciplinary College, Günne at Lake Möhne, Germany, March 3–5, 2016

Talks for the Open Public

“Millennium-Probleme,” Open Campus, University of Bremen, Bremen, Germany, June 15, 2019

“Millennium-Probleme,” Open Campus, University of Bremen, Bremen, Germany, June 11, 2015

Other Conferences and Workshops Attended

AlCoVE – an Algebraic Combinatorics Virtual Expedition, Zoom, June 15–16, 2020

38th Northern German Colloquium on Applied Analysis and Numerical Mathematics, Hamburg University of Technology, Hamburg, Germany, May 4–5, 2017

Summer Informal Regional Functional Analysis Seminar (SUMIRFAS), Texas A&M University, College Station, TX, USA, July 29–31, 2016

Concentration Week on Geometric Functional Analysis, Texas A&M University, College Station, TX, USA, July 25–29, 2016

Workshop on Harmonic Analysis, Graphs and Learning, Hausdorff Research Institute for Mathematics, Bonn, Germany, March 14–18, 2016

Workshop on Finite Weyl-Heisenberg Groups in mathematics, quantum physics, and engineering, Hausdorff Research Institute for Mathematics, Bonn, Germany, February 22–24, 2016

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Workshop on Low Complexity Models in Signal Processing, Hausdorff Research Institute for Mathematics, Bonn, Germany, February 15–19, 2016

Winter School on Advances in Mathematics of Signal Processing, Hausdorff Research Institute for Mathematics, Bonn, Germany, January 11–15, 2016

February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 19–20, 2015

IUP – AWI Blockseminar : Human Impact on the Earth System, University of Bremen, Bremen, Germany, February 6, 2015

IUP – AWI Blockseminar : Ice – Ocean Interaction, Alfred Wegener Institut, Bremerhaven, Germany, July 29, 2014

IUP – AWI Blockseminar: Climate Change, University of Bremen, Bremen, Germany, February 3, 2014

Matheon Workshop on Compressed Sensing and its Applications, TU Berlin, Berlin, Germany, December 9–13, 2013

(Invited Workshop Participant), Frame Theory Intersects Geometry, American Institute of Mathematics, Palo Alto, CA, USA, July 29–August 2, 2013

Computational Analysis in Systems Biology, National Institutes of Health, Bethesda, MD, USA, September 23, 2010

Mini-Symposium: Random Walks in Biology and Beyond In Honor of Dr. George H. Weiss, National Institutes of Health, Bethesda, MD, USA, May 26, 2010

From Banach Spaces to Frame Theory and Applications: In Honor of Professor Pete Casazza's 65th Birthday, University of Maryland, College Park, MD, USA, May 20–22, 2010

Southern Biomedical Engineering Conference, University of Maryland, College Park, MD, USA, April 30–May 2, 2010

International Conference on Social Computing, Behavioral Modeling, and Prediction Pre-Conference Tutorials, National Institutes of Health, Bethesda, MD, USA, March 29, 2010

February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 18–19, 2010

IPAM Workshop on Mathematical Problems, Models and Methods in Biomedical Imaging, Institute for Pure and Applied Mathematics, Los Angeles, CA, USA, February 8–12, 2010

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Systems Biology Collaboration Workshop, University of Maryland, College Park, MD, USA, January 26, 2010

The Inter-Institute Workshop on Optical Diagnostic and Biophotonic Methods from Bench to Bedside, National Institutes of Health, Bethesda, MD, USA, October 1–2, 2009

Summer Time Frequency Talks: Workshop on Biomedical Image Analysis and Algorithms, National Institutes of Health, Bethesda, MD, USA, August 20, 2009

AMS Short Course on Quantum Computation and Quantum Information, Joint Mathematics Meetings, Washington DC, USA, January 3–8, 2009

Workshop on Random Matrix Theory and Wireless Communications, University of Colorado, Boulder, CO, USA, July 14–17, 2008

Summer Time Frequency Talks, Norbert Wiener Center, College Park, MD, USA, June 26, 2008

February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 21–22, 2008

Nebraska Conference for Undergraduate Women in Mathematics, University of Nebraska, Lincoln, NE, USA, February 8–10, 2008

Joint Mathematics Meetings, San Diego, CA, USA, January 6–9, 2008

IPAM Short Course Sparse Representations and High Dimensional Geometry, Institute for Pure and Applied Mathematics, Los Angeles, CA, USA, May 30–June 1, 2007

February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 15–16, 2007

Joint Mathematics Meetings, New Orleans, LA, USA, January 5–8, 2007

February Fourier Talks, Norbert Wiener Center, College Park, MD, USA, February 16–17, 2006

Joint Mathematics Meetings, San Antonio, TX, USA, January 12–15, 2006

Combinatexas, Texas State University, San Marcos, TX, USA, February 25–26, 2005

Joint Mathematics Meetings, Atlanta, GA, USA, January 5 – 8, 2005

Joint Mathematics Meetings, Baltimore, MD, USA, January 15 – 18, 2003

Society of Women Engineers Regional Conference, Texas Tech University, Lubbock, TX, USA, October 13 – 14, 2000

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Research Visits

Outgoing Research Visits

- Prof. Shayne Waldron, University of Auckland, Auckland, New Zealand, November 10–16, 2019
- Prof. Bernhard Bodmann, University of Houston, Houston, TX, USA, April 8–12, 2019
- Prof. Bernhard Bodmann, University of Houston, Houston, TX, USA, August 13–31, 2018
- Prof. Nate Strawn, Georgetown University, Washington DC, USA, July 21–August 3, 2018
- Prof. Luke Oeding, Auburn University, Auburn, AL, USA, March 28–30, 2018
- Prof. Bernhard Bodmann, University of Houston, Houston, TX, USA, September 27– October 13, 2017
- Prof. Victoria Paternostro, Universidad de Buenos Aires, Buenos Aires, Argentina, August 14–September 1, 2017
- Summer of Frame Theory 2, Air Force Institute of Technology, Dayton, OH, USA, July 25–28, 2017
- Prof. Jakob Lemvig, Danmarks Tekniske Universitet, Kongens Lyngby, Denmark, September 19–23, 2016
- Prof. Bernhard Bodmann / Prof. Demetrio Labate / Prof. Manos Papadakis, University of Houston, Houston, TX, USA, July 5–22, 2016
- Norbert Wiener Center, University of Maryland / Prof. Nate Strawn, Georgetown University / Prof. Chris Manon, George Mason University, College Park, MD / Washington DC / Fairfax, VA, June 3–14, 2016
- Summer of Frame Theory, Air Force Institute of Technology, Dayton, OH, USA, May 4–June 1, 2016
- Mathematics of Signal Processing, Hausdorff Trimester Program, Bonn, Germany, January 4–March 24, 2016
- FG Angewandte Funktionalanalysis, TU Berlin, Berlin, Germany, March 26–28, 2014
- Prof. Jakob Lemvig, Danmarks Tekniske Universitet, Kongens Lyngby, Denmark, May 13–20, 2013
- Prof. Eugenio Hernández, Universidad Autónoma de Madrid, Madrid, Spain, January 15–18, 2013
- Dr. Martin Ehler, Helmholtz Zentrum München, Munich, Germany, May 4–8, 2012
- Prof. Maria Skopina, Euler Institute, St. Petersburg, Russia, June 1–30, 2009

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Research Visitors

Prof. John Jasper, South Dakota State University, Brookings, SD, USA, February 26–March 5, 2020

Prof. Joey Iverson, Iowa State University, Ames, IA, USA, February 26–March 1, 2020

Sören Schulze, University of Bremen, Bremen, Germany, October 21–30, 2019

Prof. Cynthia Vinzant, North Carolina State University, NC, USA, June 30–July 3, 2019

Prof. Dustin Mixon, Ohio State University, OH, USA, June 10–12, 2018

Dr. Erik Bekkers, Technische Universiteit Eindhoven, Netherlands, January 10–12, 2018

Prof. Jakob Lemvig, Danmarks Tekniske Universitet, Kongens Lyngby, Denmark, December 14–15, 2015

Prof. Jakob Lemvig, Danmarks Tekniske Universitet, Kongens Lyngby, Denmark, June 19–21, 2013

Dr. Jameson Cahill, University of Missouri, USA, June 3–7, 2013

Dr. Nathaniel Strawn, Duke University, USA, June 3–7, 2013

Remote Research Gatherings

Summer of Frame Theory 2020, Zoom, May 18–August 14, 2020

- Dr. Chris Cox, Iowa State University, Ames, IA, USA
- Prof. Matt Fickus, Air Force Institute of Technology, Wright-Patterson AFB, OH, USA
- Prof. Joey Iverson, Iowa State University, Ames, IA, USA
- Prof. John Jasper, South Dakota State University, Brookings, SD, USA
- Prof. Dustin Mixon, Ohio State University, OH, USA
- Prof. Hans Parshall, Western Washington University, Bellingham, WA, USA

Teaching & Pedagogy

Teaching & Grading

Instructor of Record, Algebraic, Geometric and Combinatorial Methods in Frame Theory MATH 676, Colorado State University, Fall 2020

Instructor of Record, Linear Algebra I MATH 369, Colorado State University, Spring 2020

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- Instructor of Record, Projects in Applied Mathematics MATH 435, Colorado State University, Spring 2020
- Instructor of Record, Linear Algebra I MATH 369, Colorado State University, Fall 2019
- Instructor of Record, Algebraic, Geometric and Combinatorial Methods in Frame Theory [upper-level lecture with problem sessions], University of Bremen, Summer 2019
- Instructor of Record, Harmonic Analysis: Theory and Applications [upper-level lecture with problem sessions], University of Bremen, Winter 2018–2019
- Co-Instructor, Inverse Methods and Data Analysis [master’s course in environmental physics and space science] (Matlab assignments), University of Bremen, Winter 2018–2019
- Discussion Leader, Randomization in data analysis [reading course for doctoral students], University of Bremen, Winter 2017–2018
- Discussion Leader, Sparse and redundant representation systems [reading course for doctoral students], University of Bremen, Winter 2017–2018
- Co-Instructor, Inverse Methods and Data Analysis [master’s course in environmental physics and space science] (Matlab assignments), University of Bremen, Winter 2017–2018
- Instructor of Record, Analysis 2, [large lecture course with additional “Plenum” section], University of Bremen, Summer 2017
- Co-Instructor, Inverse Methods and Data Analysis [master’s course in environmental physics], University of Bremen, Winter 2016–2017
- Co-Instructor, Introduction to Mathematical Parameter Identification [one week block course as part of a 6 week program], Winter 2016–2017
- Instructor of Record, Analysis 1, [large lecture course with “Plenum” section], University of Bremen, Winter 2016–2017
- Co-Instructor, Inverse Methods and Data Analysis [master’s course in environmental physics] (Matlab assignments), University of Bremen, Winter 2015–2016
- Instructor of Record, Compressed Sensing, [graduate-level lecture with problem sessions], University of Bremen, Summer 2015
- Co-Instructor, Inverse Methods and Data Analysis [master’s course in environmental physics] (Matlab assignments), University of Bremen, Winter 2014–2015

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Co-Instructor, Frames: Eine Einführung [combined proseminar and seminar], University of Bremen, Winter 2014–2015

Instructor of Record, Dictionaries and Transforms [upper-level harmonic analysis lecture with problem sessions], University of Bremen, Summer 2014

Grader, Precalculus MATH 115 and Elementary Calculus I MATH 220, University of Maryland, Summer 2009

Recitation Leader, Intro to Linear Algebra MATH 240 (Matlab assignments), University of Maryland, Spring 2009

Mentor and T.A., Graduate Student Boot Camp – Linear Algebra, University of Maryland, Summer 2008

Recitation Leader, Applied Statistics & Probability STAT 400, University of Maryland, Spring 2008

Recitation Leader, Elementary Calculus II MATH 221 [calculus for business and life science majors] (Web Assign assignments), University of Maryland, Fall 2007

Grader, Cryptography MATH 470 (online course, Matlab assignments), Texas A&M University, Summer 2005

Recitation Leader, Engineering Mathematics I MATH 151 [calculus for engineers] (Maple assignments), Texas A&M University, Spring 2005

Recitation Leader, Functions MATH 150 [precalculus] (iLrn quizzes and exams), Texas A&M University, Fall 2004

Grader, Foundations of Mathematics MATH 220 [logic, set theory, and discrete math for math majors], Texas A&M University, Fall 2003

Private Mathematics Tutor [high school algebra II, college algebra, calculus I/II, business math, business calculus, applied calculus, statistics and linear algebra], Spring 2003–Summer 2004

Training

Supporting Students' Mental Health in a Virtual Environment, CSU College of Natural Science, webinar, Zoom, October 22, 2020

How to move your math or science class online with Maria Andersen, Almy Education, webinar, Zoom, March 14, 2020

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Ideas for Motivating Students to Succeed in Difficult Classes, Master Teaching Initiative, luncheon and lecture, Colorado State University, Fort Collins, CO, USA, September 24, 2019

Professionelle, gender- und diversitätsgerechte Personalauswahl in der Wissenschaft (Professional, gender- and diversity-appropriate personnel selection in science), University of Bremen, Bremen, Germany, March 6–7, 2019

Zertifikatsprogramm Hochschule Didaktische Qualifizierung (Certificate Program in University-Level Didactics), 200 classroom hours, University of Bremen, Bremen, Germany, February 2017–April 2019

Rhetorik – Professionell und motivierend vortragen, Universität of Bremen Personalentwicklung (University of Bremen Personnel Development), Bremen, Germany, March 23, 2017

National Institute of Child Health and Human Development Teaching Workshop, National Institutes of Health, Bethesda, MD, USA, March 2010

TA Teaching Seminar MATH 695 (required), University of Maryland, College Park, MD, USA, Fall 2007

Graduate Teaching Academy, Center for Teaching Excellence, Texas A&M, College Station, TX, USA, Fall 2004–Spring 2005

Advising & Mentoring

Postdocs

Advisor, Xiaoxian Tang, postdoc, December 2015 – November 2016

Doctoral Students

Co-Advisor, Lander ver Hoef, Ph.D., “Topological data analysis and harmonic analysis in data science” (working title), Colorado State University, June 2020 – Now

Advisor, Harley Meade, Ph.D., “Realization of matroids as equiangular tight frames” (working title), Colorado State University, June 2020 – Now

Advisor, Sören Schulze, Dr. rer. nat., “Separation of Musical Instruments” (working title) University of Bremen, December 2016 – Now

Advisor, Rafael Reisenhofer, Dr. rer. nat., “Image Analysis via Applied Harmonic Analysis: Perceptual Image Quality Assessment, Visual Servoing, and Feature Detection”, University of Bremen, November 2014 – September 2018

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Co-Advisor, Frederieke Miesner, Dr. rer. nat., “Advanced Inverse Modeling of Sediment Thermal Diffusion Processes: Reconstructing Temporal Variant Boundary Conditions for the One-Dimensional Heat Equation”, University of Bremen, June 2017 – July 2018

Master’s Students

Advisor, Lennart Abels, M.S., “Randomized Image Decomposition and Reconstruction - RIDeR” University of Bremen, February 2019 – February 2020

Advisor, Sören Dittmer, M.S., “Mathematical Analysis of Information Loss and Errors in Neural Networks”, University of Bremen, February – September 2017

Advisor, Sören Schulze, M.S., “Spectrogram-based Musical Instrument Separation via Pitch-invariant Dictionaries,” University of Bremen, January – October 2016

Advisor, Alina Stürck, M.S., “Shearlet-Based Image inpainting,” University of Bremen, August 2014 – March 2015

Bachelor’s Students

Advisor, Julian Gebken, B.S., “Nutzung verallgemeinerter Singulärwerte zur Untersuchung künstlicher neuronaler Netze” (Use of generalized singular values for the investigation of artificial neural networks), University of Bremen, December 2018 – November 2019

Advisor, Laura Breilkopf, B.S., “Tangent and Curvature Estimation of 2D Point Clouds,” University of Bremen, January – September 2018

Other Doctoral & Master’s Committees

Committee Member, Michael Moy, M.S., Colorado State University, October 2020 – Now

Committee Member, Shannon Golden, Ph.D., Colorado State University, August 2020 – Now

Committee Member Mridula Bontha (outside member), M.S. (computer science), Colorado State University, Planned defense: February 2021

Committee Member (outside member), Matt Gorbett, M.S. (computer science), “Utilizing network features to detect erroneous inputs,” Colorado State University, October 2020

Committee Member (medlem av betygskommitten [member of the grading committee]), Irina Dumitru, Ph.D. (physics), “Studies in the Geometry of Quantum Measurements,” Stockholm University, September 2020 [Defense held over Zoom.]

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Committee Member (Prüfungsausschuss [non-grading committee member]), Florian Bürgel, Dr. rer. nat., “Effective and Efficient Reconstruction Schemes for the Inverse Medium Problem in Scattering,” University of Bremen, August 2019 [I joined the defense over Skype.]

Committee Member (Prüfungsausschuss [non-grading committee member]), Daniel Lantzberg, Dr. rer. nat., “Quantum Frames and Uncertainty Principles Arising from Symplectomorphisms,” University of Bremen, February 2019

Committee Member (2. Gutachter [grader]), Tobias Schnier, Dr.-Ing. (electrical engineering), “Acquisition and Reconstruction of Compressed Signals with Applications in Wireless Neural Systems,” University of Bremen, November 2017 – February 2019

Committee Member (Prüfungsausschuss [non-grading committee member]), Thuong Huyen Nguyen, Dr. rer. nat., “Mathematical aspects of catalyst positioning in Lithium/air batteries,” University of Bremen, December 2018

Committee Member (2. Gutachter [grader]), Lukas Zumvorde, M.S., “Distributed Kalman Filtering for Large-Scale Dynamic Systems with Sparcely [sic] Coupled States,” University of Bremen, March 2018 – September 2018

Committee Member (Prüfungsausschuss [non-grading committee member]), Florian Lieb, Dr.-Ing., “The Affine Uncertainty Principle, Associated Frames and Applications in Signal Processing,” University of Bremen, July 2018

Committee Member (2. Gutachter [grader]), Marcel Rennoch, Dr. rer. nat., “Regularization Methods in Banach Spaces Applied to Inverse Medium Scattering Problem,” University of Bremen, March – June 2017

Committee Member (Prüfungsausschuss [non-grading committee member]), Anna Kemper, Dr.-Ing., “Modellbasierte optimale Mehrgrößenregelung und optimale Reglerparametrisierung für Luftsysteme von Pkw-Dieselmotoren,” University of Bremen, July 2015

Committee Member (2. Gutachter [grader]), Joshua Belding, M.S., “From One-Dimensional Signals to Hyperspectral Images: Robustness and Numerical Experiments in Compressed Sensing,” University of Bremen, August 2014 – January 2015

Committee Member (External referee), Lucia Mantovani, Ph.D., “Admissible Vectors and Discretization for 2-dimensional Signals,” Università degli Studi di Genova, Genoa, Italy, January 2013

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EMILY J. KING

Other Advising Roles

Advisor, Henry Cafaro, Fort Collins High School student, various topics like frame theory, topological group theory, functional analysis, and more, Colorado State University, USA, January–May 2020

Reading Course Advisor, Janek Gödeke, M.S. student, “Discussion of the axioms of a (Frame) Multiresolution Analysis,” University of Bremen, Germany, April–September 2019

Advisor, Scott Mahan, visiting graduate student from University of California San Diego, “Approximation of Sobolev Functions in Neural Networks,” University of Bremen, June–July, 2019

Reading Course Advisor, Barbara Stolerek, M.S. student, “Dictionary-Learning und K-SVD Algorithmus,” University of Bremen, Germany, April–December 2018

Reading Course Advisor, Sören Dittmer, M.S. student, “Frame Theory and Feature Extraction” and “Representation Theory of Lie Groups,” University of Bremen, Germany, March 2016–February 2017

Advisor, Tianlin Liu, undergraduate intern from Jacobs University, “Compressed Sensing and Structured Dictionary Learning,” University of Bremen, Germany, June–September 2015

Advisor, David Rea, visiting graduate student from Clemson University, “Structured Dictionary Learning,” University of Bremen, Summer 2014

Mentor, Sandra Kneiper, M.S. student, “Analysis of Generalized Ridge Functions in High Dimensions,” TU Berlin, Summer 2012

Mentoring

[Tentatively postponed until March 2021 due to COVID-19] Panelist, “Career Pathways to Lived Curiosity in Industry and Academia,” IK Interdisciplinary College, Günne at Lake Möhne, Germany, March 13–20, 2020

[Tentatively postponed until March 2021 due to COVID-19] Speaker, “Curiosity, Risk, and Reward in the Academic Job Search,” IK Interdisciplinary College, Günne at Lake Möhne, Germany, March 13–20, 2020

Mentor, CSU AWM mentoring program, Fall 2019–Spring 2020

Faculty Participant, Nebraska Conference for Undergraduate Women in Mathematics, Lincoln, Nebraska, USA, January 31–February 2, 2020

[Volunteered; assigned student did not participate] Faculty Guide, Multicultural Undergraduate Research, Art and Leadership Symposium (MURALS 2020), Fall 2019 – Spring 2020

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Speaker, Panel Discussion on Women in Academia, AWM Seminar, Colorado State University, Fort Collins, CO, USA, November 5, 2019

Seminar Speaker, Women in Math Seminar, University of Houston, TX, USA, August 29, 2018

Mentor, Postgraduate Programme Environmental Physics, University of Bremen, Germany, January 2018 – July 2019

Mentor, Tea-Time mit Professorinnen, navigare - Career Coaching for International Females in Science, University of Bremen, Bremen, Germany, April 26, 2018

Graduate Student Mentor, Nebraska Conference for Undergraduate Women in Mathematics, University of Nebraska, Lincoln, NE, USA, February 2008

Graduate Student Mentor, REU in Matrix Analysis and Wavelet Theory, Texas A&M University, College Station, TX, USA, Summer 2005

Other Service Activities

Conference and Special Session Planning

Co-Chair, SPIE Wavelets and Sparsity XIX (2022) and onwards

Member Planungskommission (steering committee), Interdisciplinary College IK, 2019–now

Co-Organizer, Special Session on Group Actions in Harmonic Analysis, Joint Mathematics Meetings, Denver, CO, USA, January 15–18, 2020

Co-Organizer, Workshop for John Benedetto's 80th Birthday, University of Maryland, College Park, MD, USA, September 19–21, 2019

Co-Organizer, Special Sessions on Optimal Frames and Subspace Packings and Applications of Frames and Related Transforms, Wavelets & Sparsity XVIII, SPIE Optics & Photonics, San Diego, California, USA, August 11–15, 2019

Co-Organizer, Minisymposium on Algebra, Geometry, and Combinatorics of Subspace Packings, SIAM Conference on Applied Algebraic Geometry, Bern, Switzerland, July 9–13, 2019

Co-Chair, Out of Your Senses – From Data to Insight, Interdisciplinary College IK 2019, Möhnesee-Günne, Germany, March 12–19, 2019

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Co-Organizer, Special Session on Low Complexity Models in Data Analysis and Machine Learning, Joint Mathematics Meetings, Baltimore, MD, USA, January 16–19, 2019

Co-Organizer, Oberwolfach Mini-workshop 1840c: Algebraic, Geometric, and Combinatorial Methods in Frame Theory, Oberwolfach, Germany, September 20–October 6, 2018

Organizing Committee Chair, Mathematical Signal Processing and Data Analysis, Annual Workshop of the GAMM Working Group in Mathematical Signal and Image Processing, University of Bremen, Germany, September 18–20, 2017.

Co-Organizer, Minisymposium on Algebra and Geometry in Frame Theory, SIAM Conference on Applied Algebraic Geometry, Atlanta, Georgia, USA, July 31–August 4, 2017

Co-Organizer, Minisymposium on Inverse Problems and Low Complexity Models, Applied Inverse Problems 2017, Hangzhou, China, May 29–June 2, 2017

Co-Organizer, Workshop on Frames and Algebraic & Combinatorial Geometry, University of Bremen, July 27–31, 2015

Co-Organizer, Minisymposium on Inverse Problems in Atmospheric Remote Sensing, Applied Inverse Problems 2015, Helsinki, Finland, May 25–29, 2015

Co-Organizer, Bremen Compressed Sensing Workshop, University of Bremen, March 17, 2015

Co-Organizer, Young Researcher Minisymposium on Multiscale Geometric Image Analysis, 85th Annual Meeting of the GAMM, Nuremberg-Erlangen, Germany, March 10–14, 2014

Organizing Committee Chair, Frame Theory and Maps Between Operator Algebras, Texas A&M University, College Station, TX, USA, July 16–19, 2012

Organizing Committee Chair, A Birthday Conference in Honor of David Larson, Texas A&M University, College Station, TX, USA, July 20–22, 2012

Co-Organizer, Graduation Conference, Mathematics Department, University of Maryland, College Park, MD, USA, May 2, 2008

Seminars Organized

Co-Founder and Co-Organizer, CodEx Seminar, pan-university remote seminar, May 2020–Now

Organizing Committee, What is ...? Seminar, Berlin Mathematical School, Berlin, Germany, October 2012–June 2013

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Organizer, FG Angewandte Funktionalanalysis Oberseminar, TU Berlin, Berlin, Germany, March 2012–June 2013

Founder and Organizer, Institut für Numerische Simulation Journal Club, University of Bonn, Bonn, Germany, October 2011–February 2012

Organizer, Building 9 Computational Bio Journal Club, National Institutes of Health, Bethesda, MD, USA, 2010–2011

Organizer, Women Who Use Applied Statistics & Stochastic Processes: A celebration of women across the campus who use applied statistics and stochastic processes in their research, University of Maryland, College Park, MD, USA, April 15, 2009

Organizer, Women in Mathematics Lunch Seminar, University of Maryland, College Park, MD, USA, 2008–2009

Co-Organizer, Norbert Wiener Center Seminar, University of Maryland, College Park, MD, USA, 2007–2008

Elected Positions

President, Women in Mathematics (a student chapter of the Association for Women in Mathematics), University of Maryland, 2008–2009

Mathematics Graduate Student Representative, University of Maryland, 2007–2009

Chair, Association for Women in Mathematics, Texas A&M University, 2004–2005

Treasurer, Math Club, Texas A&M University, Fall 2003

President, Math Club, Texas A&M University, 2002–2003

Committee Work

Colorado State University 2020–

Data Science Research Institute Steering Committee

The Data Science Research Institute will be an umbrella organization of data science research and groups at CSU.

Colorado State University 2020–2021

Executive Committee Member

Math department executive committee.

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- University of Bremen** February–August 2019
Berufungskommission W2-Professur Mathematische Modellierung
Hiring committee (for ~ associate professor position) member.
- University of Bremen** March 2018–July 2019
Netzwerk „Chancengleichheit in Forschungsverbänden“
A network to bring together researchers involved with gender and diversity in funded research programs
- University of Bremen** January 2018–July 2019
Mitgliederin im Prüfungsausschuss für den 2-Fächer-Bachelor
Actively participated as a substitute and then official member in the exam committee for the math education bachelor's degree.
- University of Bremen** December 2017–July 2019
Beauftragte für Einstufungsprüfung Mathematik
Official representative of the Mathematics Department in the committee to decide if certain students may study at the university without the typical qualifications.
- University of Bremen** May 2017–July 2019
Wissenschaftskommunikationsgruppe / Webseite Task Force
Member of the committees working to increase visibility of the Mathematics and Computer Science Department and specifically to overhaul the departmental website.
- University of Bremen** October 2016–July 2019
Co-PI in charge of Gender and Diversity
PI in charge of Guests
Coorganized training and support in gender and diversity and organized guest visits for the Research Training Group π^3 : Parameter Identification – Analysis, Algorithms, Application
- University of Bremen** June 2016–February 2017
Berufungskommission W3-Professur Technische Mathematik der Erdsystemwissenschaften
Hiring committee (for ~ full professor position) member.
- University of Bremen** Winter 2015–2016
ZUK II / AG Internationalisierung
Met to discuss issues related to the future direction of and internationalization of the university.

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EMILY J. KING

TU Berlin

March 2012–June 2013

Gruppenaktivitäten Koordinator, FG Angewandte Funktionalanalysis

Organized research group activities.

Association for Women in Mathematics

2009–2011

AWM Student Chapters Committee

Member of the national committee to improve the AWM student chapters program.

National Institute of Child Health and Human Development

2010–2011

NICHD Fellows Committee

Founding member of the committee to improve the status of fellows in NICHD and also improve communication among fellows.

MAA *Math Horizons*

2003–2005

Student Advisory Committee

Provided many ideas integrated into the *Math Horizons* magazine and wrote articles printed in the publication.

Journal Editing

Sampling Theory, Signal Processing and Data Analysis

2020–

Editor

Member of the Editorial Board for the Springer journal Sampling Theory, Signal Processing and Data Analysis.

Journal & Conference Talk Refereeing

Advances in Computational Mathematics

Applicable Analysis

Applied and Computational Harmonic Analysis

Applied Numerical Mathematics

Complex Analysis and Operator Theory

Excursions in Harmonic Analysis (Springer book series)

Houston Journal of Mathematics

IEEE Signal Processing Letters

IEEE Transactions on Signal Processing

IEEE Transactions on Information Theory

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International Journal of Remote Sensing

International Journal of Wavelets Multiresolution and Information Processing

Journal of Fourier Analysis and Applications

Journal of Geometric Analysis

Journal of Imaging

Journal of Physics A

Journal of Scientific Computing

Linear and Multilinear Algebra

Numerical Functional Analysis and Optimization

Remote Sensing Letters

Science Asia

SIAM Journal on Applied Algebra and Geometry

Studia Mathematica

Mathematical Reviews (MathSciNet)

Zentralblatt

Proceedings of the Matheon Workshop on Compressed Sensing and its Applications 2013

Talk referee and metareviewer, SampTA 2019, 13th International Conference on Sampling Theory and Applications, Bordeaux, France, July 8–9, 2019

Talk referee, SampTA 2017, 12th International Conference on Sampling Theory and Applications, Tallinn, Estonia, July 3–7, 2017

Talk referee, SampTA 2015, 11th International Conference on Sampling Theory and Applications, Washington DC, USA, May 25–26, 2015

Program Committee (talk referee), Signal Processing with Adaptive Sparse Structured Representations, EPFL, Lausanne, Switzerland, July 8–11, 2013

Talk referee, SampTA 2013, 10th International Conference on Sampling Theory and Applications, Bremen, Germany, July 1–5, 2013

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Miscellaneous Service at CSU

Undergraduate Advising Fall 2020–Now

Primary Advising Contact

Advised a couple of math upperclassmen.

Choose CSU May 1, 2020

Undergraduate Recruitment

Assisted in an online undergrad recruitment event.

Celebrate Undergraduate Research and Creativity April 21–30, 2020

Faculty Poster Judge

Judge of undergraduate posters. Competition held online due to COVID-19.

[Volunteered; canceled due to COVID-19]

Multicultural Undergraduate Research, Art and Leadership Symposium (MURALS 2020) March 27, 2020

Faculty Poster Judge

Judge of undergraduate posters.

CSU Math Day November 2019

Competition Moderator

Moderated rounds of a team mathematics competition for high schoolers.

Skills

Programming & Markup Languages

Matlab

L^AT_EX

Python

HTML/CSS

Perl

Math Websites Designed

CodEx Seminar, <https://www.math.colostate.edu/~king/codex/index.html>, May 2020

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Game of Sloanes, <https://www.math.colostate.edu/~king/GameofSloanes.html>, August 2019

Mathematical Signal Processing and Data Analysis, Annual Workshop of the GAMM Working Group in Mathematical Signal and Image Processing, <http://www.math.uni-bremen.de/cda/GAMM-MSIP2017/>, Fall 2017, Note: Updated by Yovany Cordero

Gesellschaft für Angewandte Mathematik und Mechanik Activity Group Mathematical Signal and Image Processing, <http://gamm-msip.math.lmu.de/>, May 2012, Note: Revamped since then, but the core design remains. The color scheme was imposed by the national organization.

Concentration Week in Frame Theory and Maps Between Operator Algebras & Operator Algebras, Frames, and Undergraduate Research: A Conference in Honor of the 70th Birthday of David R. Larson, (no longer online), 2012

Programs for Women in Math, <http://wim.math.umd.edu/programs.php>, 2008, Note: I was only responsible for the content.

Norbert Wiener Center Seminar, <http://www.math.umd.edu/research/seminars/wavelets/>, 2007

Spoken Languages

English (mother tongue)

German (Common European Framework of Reference for Languages C1)

Russian (basic)

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Professional Societies

Pi Mu Epsilon (U.S. honorary national mathematics society), lifetime member

Dobro Slovo (National Slavic Honor Society), lifetime member

AMS (American Mathematical Society), 2004–2011, 2019–Now

AWM (Association for Women in Mathematics), 2004–2005, 2008–2011, 2019–Now

GAMM (Gesellschaft für angewandte Mathematik und Mechanik), 2013–Now

SPIE (International Society for Optics and Photonics), 2013–Now

Erdős Number

My Erdős Number is 3. (Wojciech Czaja → Charles Chui → Paul Erdős).

I also have a number of paths of length 4,

Wojciech Czaja → Guido Weiss → Svante Janson (+1 additional coauthor of Weiss with Erdős Number 1) → Paul Erdős

Wojciech Czaja → Mauro Maggioni → Charles Chui → Paul Erdős

Gitta Kutyniok → David Donoho → Craig A. Tovey → Paul Erdős

Gitta Kutyniok → Robert Calderbank → Peter C. Fishburn (+ 9 additional coauthors of Calderbank with Erdős Number 1) → Paul Erdős

Maria Skopina → Sergei V. Konyagin → Carl Pomerance (+7 additional coauthors of Konyagin with Erdős Number 1) → Paul Erdős

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