

# Keaton Hamm

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*Department of Mathematics  
University of Texas at Arlington  
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Pickard Hall, Room 478  
Arlington, TX 76019*

## EDUCATION

Ph.D. Mathematics, Texas A&M University – 2015

- ⊕ Advisors: Thomas Schlumprecht and N. Sivakumar
- ⊕ Dissertation Title: On the Interpolation of Smooth Functions via Translates of Radial Basis Functions

B.S. Mathematics (Honors), Texas A&M University – 2010

B.S. Chemical Engineering, Texas A&M University – 2010

## EMPLOYMENT

2020 – Present: University of Texas at Arlington, Assistant Professor

2018 – 2020: University of Arizona, Postdoctoral Research Associate

- ⊕ Researcher in the NSF TRIPODS Program (Transdisciplinary Research in Principles of Data Science)
- ⊕ Supervisors: David Glickenstein (Math) and Stephen Kobourov (Computer Science)

2015 – 2018: Vanderbilt University, Assistant Professor (Non-Tenure Track)

- ⊕ Postdoctoral Supervisors: Akram Aldroubi and Alex Powell

2010 – 2015: Texas A&M University, Graduate Assistant

## FUNDING

### *Federal Grants:*

- ⊕ PI: Army Research Office (ARO) – “Optimal Transport Methods for Nonlinear Dimensionality Reduction and Applications,” June 2023- May 2026
  - Total award amount – \$304,447.30
  - Total amount awarded to UTA – \$304,447.30
  - Amount to Keaton Hamm – \$304,447.30
  - Amount to students – \$119,050.76
- ⊕ coPI (Hristo Kojouharov PI, coPIs Christopher Kribs, Souvik Roy, Pedro Maia): National Science Foundation (NSF) – “[RTG: Vertically Integrated Interdisciplinary Training in Mathematics for Human Health](#),” Sept 2023 – Aug 2028
  - Total award amount – \$1,099,792
  - Total amount awarded to UTA – \$1,099,792

- Credit distributed equally among 5 PI/coPIs
- Amount to students – \$1,016,140
- ⊕ coPI (Jianzhong Su PI, coPIs Gautam Das, Bryan Samuel, Suvra Pal, Shuo Linda Wang, Hong Jiang, Chengkai Li, Li Wang, William Beksi, Ren-Cang Li): United States Department of Agriculture (USDA) Agricultural Research Service (ARS) – [“USDA ARS Research Apprenticeship Program at University of Texas at Arlington,”](#) Aug 2022 – Sept 2024
  - Total award amount – \$484,440.28
  - Total amount awarded to UTA – \$400,000.28
  - Amount to Keaton Hamm – \$36,363.66
  - Amount to students -- \$328,609.28
- ⊕ coPI (Jianzhong Su PI, coPIs Jaime Cantu, and Dengdeng Yu): United States Department of Agriculture (USDA) – [“Developing an Alliance for Training and Apprenticeship in Climate-Smart Agriculture \(DATA-Ag\),”](#) Nov 2021 – Oct 2024
  - Total award amount – \$500,000.50
  - Total amount awarded to UTA – \$216,797.50
  - Amount to Keaton Hamm – \$125,000
- ⊕ PI: Army Research Office (ARO) W911NF-20-1-0076 – “CUR Decompositions and Clustering Applications,” May 2020 – Feb. 2021 (at University of Arizona)
  - Total award amount – \$48,866

*Conference Grants:*

- ⊕ CoPI (with Akram Aldroubi, Javad Mashreghi, and Armenak Petrosyan): Canadian National Science Foundation, [“Focused Program on Data Science, Approximation Theory, and Harmonic Analysis,”](#) Fields Institute, Toronto, Canada, May-June 2022 – \$70,000 (CAD)

*Local Grants:*

- ⊕ PI: UTA Research Enhancement Program (REP), “Optimal Transport Methods in Nonlinear Dimensionality Reduction,” June 2022 – Aug 2023 – \$10,000
- ⊕ CoPI (with Vahan Huroyan): Postdoc Collaborative Grant Award – University of Arizona Department of Mathematics Postdoc Committee, May-July 2021 – \$3,000

*Travel Awards:*

- ⊕ MAA/PIC Math Workshop on Data Science, Provo, Utah, May 2019 (\$1,000)
- ⊕ ICERM Workshop on Optimization Methods in Computer Vision and Image Processing, Providence, RI, May 2019 (\$1,300)
- ⊕ ICERM Topical Workshop on Frame Theory and Exponential Bases, Providence, RI, June 2018 (\$1,400)
- ⊕ International Conference on Mathematics of Data Science (ICDMS), Norfolk, VA, November 2018 (\$500)

- ⊕ February Fourier Talks (FFT), College Park, MD, February 2019 (\$350)
- ⊕ February Fourier Talks (FFT), College Park, MD, February 2018 (\$350)

## P U B L I C A T I O N S

(\* indicates Graduate Student Collaborators, \*\* indicates Undergraduate Student Collaborators)

It is the convention in Mathematics and Theoretical Computer Science to place authors in alphabetical order.

Standards of authorship in these fields is assumed to be equal contribution among all authors unless otherwise specified.

The role of Corresponding Author in these publications is considered to be unimportant (and typically merely an extra burden) and is thus rotated among the authors. Therefore, it is not listed in the publications below.

### *Submitted Preprints*

Keaton Hamm, Caroline Moosmüller, Bernhard Schmitzer, and Matthew Thorpe, **Manifold Learning in Wasserstein Space** (Approximately 40 pages) [PDF](#)

Keaton Hamm and Varun Khurana\*, **Lattice Approximations in Wasserstein Space** (Approximately 15 pages, Working Manuscript) [PDF](#)

Zahidur Talukder\*, Muhammad Rana\*, Keaton Hamm, Mohamed Islam, **FedSRC: Federated Learning with Self-Regulating Clients** (Approximately 21 pages, Submitted)

Keaton Hamm and Andrzej Korzienowski, **On Wasserstein distances for affine transformations of random vectors** (Approximately 20 pages, Submitted) [PDF](#)

Alex Cloninger, Keaton Hamm, Varun Khurana\*, and Caroline Moosmüller, **Linearized Wasserstein Dimensionality Reduction with Approximation Guarantees** (Approximately 38 pages, Submitted) [PDF](#)

Keaton Hamm, Zhaoying Lu\*, Wenbo Ouyang\*, and Helen Zhang, **Boosting Nyström Method**, (Approximately 10 pages, Revising to Resubmit) [PDF](#)

### *Peer-Reviewed Journal Articles*

Keaton Hamm, Nick Henscheid, and Shujie Kang, **Wassmap: Wasserstein Isometric Mapping for Image Manifold Learning**, *SIAM Journal on Mathematics of Data Science*, 5(2) (2023), 475-501. [PDF](#)

Keaton Hamm, **Generalized Pseudoskeleton Decompositions**, *Linear Algebra and its Applications*, Approximately, 664 (2023), 236-252. [PDF](#)

HanQin Cai, Keaton Hamm, Longxiu Huang, and Deanna Needell, **Mode-wise Tensor Decompositions: Multi-dimensional Generalizations of CUR Decompositions**, *Journal of Machine Learning Research*, 22 (2021), 1-36. [PDF](#)

HanQin Cai, Keaton Hamm, Longxiu Huang, and Deanna Needell **Robust CUR Decompositions: Theory and Imaging Applications**, *SIAM Journal on Imaging Sciences*, 14(4) (2021), 1472-1503. [PDF](#)

Keaton Hamm, Benjamin Hayes, and Armenak Petrosyan, **An Operator Theoretic Approach to the Convergence of Rearranged Fourier Series**, *Journal d'Analyse Mathématique*, 143 (2021), 503-534. [PDF](#), [Video of ICERM Presentation](#)

Keaton Hamm and Longxiu Huang, **Perturbations of CUR**, *SIAM Journal on Matrix Analysis and Applications*, 42(1) (2021), 351-375. [PDF](#)

HanQin Cai, Keaton Hamm, Longxiu Huang, Jiaqi Li\*\*, and Tao Wang, **Rapid Robust Principal Component Analysis: CUR Accelerated Inexact Low Rank Estimation**, *IEEE Signal Processing Letters*, 28 (2021), 116-120. [PDF](#)

Keaton Hamm and Longxiu Huang, **Stability of Sampling for CUR Decompositions**, *Foundations of Data Science*, 2(2) (2020), 83-99. [PDF](#)

Reyan Ahmed\*, Greg Bodwin, Faryad Darabi Sahneh, Keaton Hamm, Stephen Kobourov, Mohammad Javad Latifi Jebelli\*, and Richard Spence\*, **Graph Spanners: A Tutorial Review**, *Computer Science Review*, 37 (2020), 100253. [PDF](#)

Keaton Hamm and Longxiu Huang, **Perspectives on CUR Approximations**, *Applied and Computational Harmonic Analysis*, 48(3) (2020), 1088-1099. [PDF](#)

Akram Aldroubi, Keaton Hamm, Ahmet Bugra Koku, and Ali Sekmen, **CUR Decompositions, Similarity Matrices, and Subspace Clustering**, *Frontiers in Applied Mathematics and Statistics – Mathematics of Computation and Data Science Section*, Vol. 4, Article 65 (2019), 1-16. [PDF](#), [Video of TRIPODS Presentation](#)

Keaton Hamm, **On the Gibbs—Wilbraham Phenomenon for Sampling and Interpolatory Series**, *Proceedings of the Edinburgh Mathematical Society*, Vol. 62 (2019), 1163-1171. [PDF](#)

Keaton Hamm and Jeff Ledford, **Regular Families of Kernels for Nonlinear Approximation**, *Journal of Mathematical Analysis and Applications*, 475(2) (2019), 1317-1340. [PDF](#)

Keaton Hamm and Jeff Ledford, **On the Structure and Interpolation Properties of Quasi Shift-Invariant Spaces**, *Journal of Functional Analysis*, 274(7) (2018) 1959-1992. [PDF](#)

Keaton Hamm and Jeff Ledford, **Cardinal Interpolation with General Multiquadrics: Convergence Rates**, *Advances in Computational Mathematics*, 44(2) (2018), 1205-1233. [PDF](#)

Jean-Luc Bouchot and Keaton Hamm, **Stability and Robustness of RBF Interpolation**, *Sampling Theory in Signal and Image Processing*, 16 (2017), 37-53. [PDF](#)

Keaton Hamm, **Nonuniform Sampling and Recovery of Bandlimited Functions in Higher Dimensions**, *Journal of Mathematical Analysis and Applications*, 240(2) (2017), 1459-1478. [PDF](#)

Keaton Hamm and Jeff Ledford, **Cardinal Interpolation with General Multiquadrics**, *Advances in Computational Mathematics*, 42(5) (2016), 1149-1186. [PDF](#)

Keaton Hamm, **Approximation Rates for Interpolation of Sobolev Functions via Gaussians and Allied Functions**, *Journal of Approximation Theory*, 189 (2015), 101-122. [PDF](#)

### *Refereed Conference Publications*

Standards in the fields of Machine Learning (ML) and Computer Science (CS) place importance on conference papers. In contrast to some mathematical fields, conference papers in ML and CS are peer-reviewed and may be highly competitive. All conference papers below were peer-reviewed prior to publication.

Reyan Ahmed, Keaton Hamm, Stephen Kobourov, Mohammad Javad Latifi Jebelli, Faryad Sahneh, and Richard Spence, **Multi-priority Graph Sparsification**, *34th International Workshop on Combinatorial Algorithms (IWOCA 2023)*, Tainan, Taiwan. [PDF](#)

Keaton Hamm, Mohamed Meskini\*, and HanQin Cai, **Riemannian CUR Decompositions for Robust Principal Component Analysis**, *ICML 2022 Workshop on Topology, Algebra, and Geometry in Machine Learning*. PMLR 2022. [PDF](#)

Reyan Ahmed\*, Greg Bodwin, Keaton Hamm, Stephen Kobourov, and Richard Spence\*, **On Additive Spanners in Weighted Graphs with Local Error**, *47th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2021)*, Warsaw, Poland. [PDF](#)

Reyan Ahmed\*, Greg Bodwin, Faryad Darabi Sahneh, Keaton Hamm, Stephen Kobourov, and Richard Spence\*, **Multi-Level Weighted Additive Spanners**, *Proceedings of the 19th Symposium on Experimental Algorithms, SEA 2021*. [PDF](#)

Reyan Ahmed\*, Faryad Darabi Sahneh, Keaton Hamm, Stephen Kobourov, and Richard Spence\*, **Kruskal-based Approximation Algorithm for the Multi-Level Steiner Tree Problem**, *Proceedings of the European Symposium on Algorithms (ESA 2020)*. [PDF](#)

Keaton Hamm and Longxiu Huang, **On Column-Row Matrix Approximations**, *13th International Conference on Sampling Theory and Applications (SampTA 2019)*, Bordeaux, France, IEEE. [PDF](#)

Keaton Hamm, Benjamin Hayes, and Armenak Petrosyan\*, **Rearranged Fourier Series and Generalizations to Non-Commutative Groups**, *13th International Conference on Sampling Theory and Applications (SampTA 2019)*, Bordeaux, France, IEEE. [PDF](#)

Reyan Ahmed\*, Mohammad Javad Latifi Jebelli\*, Keaton Hamm, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence\*, **Approximation Algorithms and an Integer Program for Multi-Level Graph Spanners**, *Special Event on Analysis of Experimental Algorithms (S(EA)<sup>2</sup> 2019)*, Kalamata, Greece. [PDF](#)

Ali Sekmen, Akram Aldroubi, Ahmet Bugra Koku, and Keaton Hamm, **Principal Coordinate Clustering**, *IEEE International Conference on Big Data 2017*, Boston, MA, 2095-2102. [PDF](#)

Ali Sekmen, Akram Aldroubi, Ahmet Bugra Koku, and Keaton Hamm, **Matrix Reconstructions: Skeleton Decomposition Versus Singular Value Decomposition**, *2017 International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS)*, IEEE, 1-8. [PDF](#)

Keaton Hamm and Jeff Ledford, **On Bases of Cardinal Functions and Their Role in Approximate Sampling Methods**, *12<sup>th</sup> International Conference on Sampling Theory and Applications (SampTA 2017)*, IEEE, 203-206. [PDF](#)

Keaton Hamm, **Sampling and Recovery Using Multiquadrics**, *11<sup>th</sup> International Conference on Sampling Theory and Applications (SampTA 2015)*, Washington D.C., IEEE, 124-128. [PDF](#)

#### *Other Peer-Reviewed Works*

David Glickenstein, Keaton Hamm, Xiaoming Huo, Yajun Mei, and Martin Stoll, **Editorial: Mathematical Fundamentals of Machine Learning**, *Frontiers in Applied Mathematics and Statistics*, 7:674785, 2021, doi: 10.3389/fams.2021.674785. [PDF](#)

#### *Dissertation*

Keaton Hamm, **On the Interpolation of Smooth Functions via Translates of Radial Basis Functions**. (PhD Dissertation).

## **A W A R D S**

- ⊕ Houston A&M Mother's Club Outstanding Teaching Assistant Award – 2014
  - Teaching award given yearly to the best 4-6 teaching assistants (out of approximately 150 total T.A.s)
- ⊕ Graduate Teaching Academy Fellow (Texas A&M University) – 2015
  - Now called Academy for Future Faculty: a program designed to train graduate students and new faculty for teaching excellence. Consisted of a year's worth of weekly seminars on

teaching strategies, course development, and best writing practices, as well as classroom observations of faculty.

## OTHER ACADEMIC PRODUCTS

- ⊕ [Lecture Notes](#) from an advanced undergraduate/beginning graduate course on Linear Algebra and Data Science

## PRESENTATIONS

### *Colloquia*

(All colloquia are 1 hour talks)

*Getting More with Less: Matrix and Tensor Algorithms from Subsampling Modes* – Colloquium, Northern Illinois University, 3 November 2023.

*Optimal Transport Based Manifold Learning* – Colloquium, Colorado School of Mines, 21 April 2023.

*Rearrangements of Fourier Series* – Colloquium, University of Texas at Arlington, 23 October, 2020.

*Structures in Data* – Colloquium, Boise State University, 30 January, 2020.

*Structures in Data* – Colloquium, University of Texas at Dallas, 27 January, 2020.

*Structures in Data* – Colloquium, University of Texas at San Antonio, 5 December, 2019.

*Structured Approximation of Data* – Colloquium, University of Texas at Arlington, 18 November, 2019.

*Column Selection Methods and Subspace Clustering* – Applied Math Colloquium, UCLA, 23 October, 2019.

*Rearrangements of Fourier Series and Extensions* – Colloquium, Texas Christian University (TCU), Fort Worth, TX, 20 September, 2019.

*Dimension Reduction, Matrix Factorizations, and Clustering Algorithms* – Colloquium, University of North Texas, Denton TX, 18 February, 2019.

*Dimension Reduction, Matrix Factorizations, and Subspace Clustering Algorithms* – Colloquium, New Mexico State University, Las Cruces, NM, 12 October, 2018.

*Data Clustering Algorithms* – Colloquium, Texas A&M Corpus Christi, Corpus Christi, TX, 6 April, 2018.

*Data Clustering Algorithms* – Colloquium, University of San Francisco, San Francisco, CA, 29 January, 2018.

*Data Clustering Algorithms* – Millican Colloquium, University of North Texas, Denton, TX, 20 November, 2017.

*Data Clustering Algorithms* – Colloquium, University of Oklahoma, Norman, OK, 2 November, 2017.

### *Mini-Courses*

*Mini-Course on Dimensionality Reduction and Manifold Learning (3 hours)* – Workshop in Harmonic Analysis, Sampling Theory, Machine Learning, and Data Science, Universidad de Buenos Aires, Buenos Aires, Argentina, Nov 21-25, 2022.

Part 1: Linear Dimensionality Reduction

Part 2: Nonlinear Dimensionality Reduction and Manifold Learning

*Mini-Course on Dimensionality Reduction (2 hours)* – CIMAT/TRIPODS Workshop, CIMAT, Guanajuato,

Mexico, 6-7 January, 2020.

Part 1: *Deterministic Dimensionality Reduction.*

Part 2: *Randomized Dimensionality Reduction*

### *Invited Seminar and Conference Talks*

*(Upcoming) Manifold Learning in Wasserstein Space (1 hr)* – Workshop on Data Science, Signal Processing and Harmonic Analysis, Universidad de Buenos Aires, Buenos Aires, Argentina, Aug 5-10, 2024.

*(Upcoming) Manifold Learning in Wasserstein Space (1 hr)* – 1 World Mathematics of Information, Data, and Signals (MINDS) Seminar, University of California San Diego (simulcast virtually), San Diego, CA, April 18, 2024.

*(Upcoming) Linearized Optimal Transport for Manifold Learning in Wasserstein Space (30 min)* – Special Session on Geometry and Symmetry in Data Science, AMS Spring Southeastern Sectional Meeting, Tallahassee, FL, March 24, 2024.

*Manifold Learning in Wasserstein Space (1 hr)* – 1 World Minds Seminar on Mathematics of Machine Learning (Virtual: [Video](#)), Feb 7, 2024.

*Getting More with Less: Matrix and Tensor Algorithms from Subsampling Modes (30 min)* – Special Session on Sparse Signal Learning and Its Applications in Data Science, 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Wilmington, NC, May 31 - June 4, 2023.

*Wasserstein Isometric Mapping (30 min)* – International Conference on Approximation Theory and Beyond, Nashville, TN, May 15-18, 2023

*Optimal Transport and Manifold Learning* – Workshop on Optimal Transport in Data Science, ICERM, Providence, RI, May 8-12, 2023.

*Optimal Transport Based Manifold Learning (1 hour)* – Joint IDA (Inverse Problems/Data



- Sciences/Applied Math) Seminar, Colorado State University, Fort Collins, CO, April 27, 2023.
- Wasserstein Isometric Mapping* (30 min) – Special session on Harmonic Analysis and its Applications to Signals and Information, AMS Spring Central Sectional Meeting, Cincinnati, OH, April 15, 2023.
- Wassmap: Wasserstein Isometric Mapping for Image Manifold Learning* (1 hour) – Seminar on Integrable Systems and Nonlinear Mechanics, UT Rio Grande Valley and TAMU Corpus Christi joint seminar (Virtual presentation), March 21, 2023.
- Getting More with Less: Matrix and Tensor Algorithms from Subsampling Modes* (1 hour) – Do NASK Seminar, NASK (Naukowa i Akademicka Sieć Komputerowa – National Academy of Computer Science), Warsaw, Poland, 1 March, 2023.
- Wassmap: Wasserstein Isometric Mapping for Image Manifold Learning* (1 hour) – Department of Statistical Science Seminar, Southern Methodist University (SMU), Dallas, TX, 24, February 2023.
- Getting More with Less: Matrix and Tensor Algorithms from Subsampling Modes* (30 min) – Special session on Mathematics of Information, Pacific Rim Mathematical Association (PRIMA) Congress, Vancouver, British Columbia, Canada, Dec 6, 2022.
- Modewise Tensor Decompositions and Applications* (30 min) – Minisymposium on Tensor Modeling and Applications, SIAM TX-LA Section Meeting, Houston, TX Nov 5, 2022.
- Wassmap: Wasserstein Isometric Mapping for Image Manifold Learning* (30 min) – Minisymposium on Optimal Transport, Manifold Learning, and Dimensionality Reduction, SIAM Mathematics of Data Science 2022, San Diego, CA Sept 30, 2022.
- What the heck is a CUR decomposition?* (1 hour) – Working Group on Tensor Factorizations and Applications, Harvey Mudd College, Claremont, CA, August 2, 2022.
- Wasserstein Isometric Mapping and Image Manifold Learning* (30 min) – Workshop on PDE Methods in Data Science and Machine Learning, in Focus Program on Data Science, Approximation Theory, and Harmonic Analysis, Fields Institute, Toronto, Ontario, Canada, 2 June, 2022.
- Interpolation in Quasi-Shift Invariant Spaces* (20 min) – Special Session on Frame Theory and Applications, Joint Mathematics Meeting (JMM) Virtual, April 8, 2022.
- Optimal Transport Methods in Nonlinear Dimensionality Reduction* (30 min)– SIAM Southeastern Atlantic Section Conference, Auburn, AL, 18 September, 2021.
- Dimensionality Reducing Embeddings using Wasserstein distances* (1 hour)– Banach and Metric Spaces Seminar, Texas A&M University, College Station, TX, September, 2021.
- Column Subset Selection and You* (1 hour)– Codes and Expansions (CodEX) Seminar, Online, 9 March, 2021.
- The Subspace Clustering Problem* – Research Training Group on Data-Oriented Mathematical and Statistical Sciences, Arizona State University, Tempe, AZ, 30 March, 2020. (Given online due to Covid-19)
- Structure in Data* – Brown Bag U.S. Air Force Academy, Colorado Springs, CO, 24 January, 2020.

*Wasserstein ISOMAP for Image Manifold Learning* – Joint Mathematics Meetings, AMS Special Session on Group Actions in Harmonic Analysis, Denver, CO, 15 January, 2020.

*Wasserstein ISOMAP for Image Manifold Learning* – CIMAT/TRIPODS Workshop, Guanajuato, Mexico, 7 January, 2020.

*CUR Decompositions and Subspace Clustering* – Applied Math Seminar, University of Texas at Arlington, Arlington, TX, 27 September, 2019.

*CUR Decompositions and Subspace Clustering* – Applied Math Seminar, University of Texas at Dallas, Richardson, TX, 20 September, 2019.

*Multi-Level Graph Sketches* – Special Session on Recent Trends of Mathematics of Data, AMS Fall Central Sectional Meeting, Madison, WI, 14-15 September, 2019.

*CUR Decompositions* – Analysis and Applications Seminar, University of Arizona, Tucson AZ, 19 March, 2019.

*CUR Decompositions and Applications* – Special Session on Applied Harmonic Analysis: Frame Theory and Applications, AMS Fall Western Sectional Meeting, San Francisco, CA, 27-28 October, 2018.

*CUR Decompositions and the Subspace Clustering Problem* – Special Session on Extensions-Interpolation-Shape Matching in  $\mathbb{R}^d$ , Symmetry-Invariance, Algorithms and Related Topics, AMS Fall Central Sectional Meeting, Ann Arbor, MI, 20-21 October, 2018.

*Dimension Reduction, Matrix Factorizations, and Clustering Algorithms* – TRIPODS Seminar, University of Arizona, Tucson, AZ, 24 September, 2018.

*On Rearrangements of Fourier Series* – ICERM Topical Workshop on Frame Theory and Exponential Bases, Providence, RI, 4-8 June, 2018. [[Video of Talk](#)]

*CUR Matrix Decomposition and Subspace Clustering* – AMS Special Session on Interactions of Inverse Problems, Signal Processing, and Imaging, I, Joint Mathematics Meeting, San Diego, CA, 10-13 January, 2018.

*CUR Matrix Decomposition and Subspace Segmentation* – Special Session on Applied Harmonic Analysis: Frames, Samplings, and Applications, AMS Fall Southeastern Sectional Meeting, Orlando, FL, 23 September, 2017.

*Approximation and Quasi Shift-Invariant Spaces* – Special Session on Banach Spaces and Applications, AMS Fall Central Sectional Meeting, Denton, TX, 9 September, 2017.

*CUR Matrix Decomposition and Subspace Segmentation* – Seminar on Applied Mathematics, Hong Kong University of Science and Technology, Kowloon, Hong Kong, 19 August, 2017.

*On Bases of Cardinal Functions and Their Role in Approximate Sampling Methods* – 12<sup>th</sup> International Conference on Sampling Theory and Applications (SampTA 2017), Tallin, Estonia, 7 July, 2017.

*Gabor Frames of Cardinal Functions* – AMS Special Session on Frame Theory, AMS Spring Southeastern Sectional Meeting, Charleston, SC, 12 Mar, 2017.

*Structure and Function Interpolation in Quasi Shift-Invariant Spaces* – Analysis, Logic and Physics Seminar, Virginia Commonwealth University, Richmond, VA, 3 Mar, 2017.

*Interpolation in Shifted Function Spaces* – AMS Session on Topics in Analysis II, Joint Mathematics Meetings, Atlanta, GA, 6 Jan, 2017.

*Interpolation in Shifted Function Spaces* – AMS Special Session on Bases in Function Spaces: Sampling, Interpolation, Expansions and Approximations, Joint Mathematics Meetings, Atlanta, GA, 4 Jan, 2017.

*Sampling on Lattices via Radial Basis Functions* – 15<sup>th</sup> International Conference on Approximation Theory, San Antonio, TX, 25 May, 2016.

*Sampling and Interpolation with Radial Basis Functions* – Computational Analysis Seminar, Vanderbilt University, 9 September, 2015.

*Convergence Rates for Cardinal Interpolation Using Multiquadrics* – Workshop in Analysis and Probability Seminar, Texas A&M University, 15 July, 2015.

*Riesz Bases of Exponentials and Connections with Multivariate Interpolation* – Joint Banach Spaces and Approximation Theory Seminar, Texas A&M University, 1 May, 2015.

*Sampling and Recovery of Bandlimited Functions* – Graduate Student Organization Seminar, Texas A&M University, 12 March, 2015

*Approximation Rates for Scattered-data Interpolation via Gaussians* – AMS Session on Topics in Analysis II, Joint Mathematics Meetings, San Antonio, TX, 13 Jan, 2015.

*Approximation Rates for Scattered-data Interpolation via Gaussians* – Special Session on Harmonic Analysis and its Applications, AMS Sectional Meeting, Albuquerque, NM, 5 April, 2014.

*Approximation Rates for Scattered-data Interpolation via Gaussians* – Joint Banach Spaces and Approximation Theory Seminar, Texas A&M University, 22 November, 2013.

### *Contributed Talks and Posters*

*CUR Decompositions and Motion Segmentation* – International Congress on Industrial and Applied Mathematics (ICIAM 2019, Poster Session), Valencia, Spain, July 2019.

*On Column-Row Matrix Factorizations* – 13<sup>th</sup> International Conference on Sampling Theory and Applications (SampTA 2019, Poster Session), Bordeaux, France, July 2019.

*CUR Decompositions and Motion Segmentation* – ICERM Workshop on Optimization Methods in Computer Vision and Image Processing (Poster Session), Providence, RI, 1 May, 2019.

*Rearrangements of Fourier Series* – February Fourier Talks (Poster Session), University of Maryland, 21 February, 2019.

*CUR Decompositions and Subspace Clustering* – 2<sup>nd</sup> International Conference on Mathematics of Data Science, Norfolk, VA, 2-4 November, 2018.

*On Rearrangements of Fourier Series* – 34<sup>th</sup> Southeastern Analysis Meeting (SEAM), Georgia Institute of Technology, Atlanta, GA, 23-25 Mar, 2018.

*Regular Families of Kernels for Nonlinear Approximation* – 7<sup>th</sup> Ohio River Analysis Meeting (ORAM), University of Cincinnati, Cincinnati, OH, 26 Mar, 2017.

*Regular Families of Kernels for Nonlinear Approximation* – 33<sup>rd</sup> Southeastern Analysis Meeting (SEAM), University of Tennessee, Knoxville, TN, 18 Mar, 2017.

*Regular Families of Kernels for Nonlinear Approximation* – February Fourier Talks (Poster Session), University of Maryland, 16 Feb, 2017.

*Sampling and Recovery Using Multiquadrics* – 11<sup>th</sup> International Conference on Sampling Theory and Applications (SampTA 2015), Washington D.C., 25 May, 2015.

## TEACHING EXPERIENCE

### UNIVERSITY OF TEXAS AT ARLINGTON

#### *Instructor of Record*

MATH 3330, Linear Algebra – Fall 2023

DATA 3401, Python for Data Science 1 – Fall 2021, Spring 2022, Fall 2022

MATH 6310, Foundations of Data Science – Fall 2020, Fall 2022

MATH 4381, Mathematics Research – Summer 2021

MATH 5399/5699/5999, Research in Mathematics – Most semesters

#### *Course Design*

ASDS 5302, Principles of Data Science

ASDS 5303, Statistical and Scientific Computing I

ASDS 6305, Statistical and Scientific Computing II

#### *Capstone Project Supervision*

Students in DATA 4381 and 4382 at UTA

- ⊕ Phuong Trinh – “Optimal Transport Based Dimensionality Reduction for Supervised Learning” – Fall 2023 – Spring 2024
- ⊕ Ryan Bui – “Optimal Transport Based Dimensionality Reduction for Unsupervised Learning” – Fall 2023 – Spring 2024
- ⊕ Khoa Truong – “Dimensionality Reduction and Deep Learning for House Price Forecasting in DFW” – Fall 2022 – Spring 2023

### UNIVERSITY OF ARIZONA

#### *Instructor of Record*

MATH 496T/577, Advanced Linear Algebra for Data Science – Spring 2020

MATH REU (research on Monte-Carlo Tree Search, co-supervised with Kwang-Sun Jun  
(Computer Science)) – Spring 2020

MATH REU (research on Subspace Clustering) – Fall 2019 – Summer 2020

MATH 492, Undergraduate Research – Fall 2019

MATH 129, Calculus II – Fall 2018

## VANDERBILT UNIVERSITY

### *Instructor of Record*

MATH 3620/5620, Introduction to Numerical Mathematics – Spring 2018

MATH 3100, Introduction to Analysis – Fall 2017

MATH 2420, Methods of Ordinary Differential Equations – Spring 2017

MATH 2300, Multivariable Calculus – Fall 2015

MATH 1301, Accelerated Single-Variable Calculus II – Fall 2017

MATH 1300, Accelerated Single-Variable Calculus I – Fall 2016

MATH 1011, Introduction to Probability and Statistical Inference II – Spring 2016, 2017

### *Teaching Assistant*

MATH 1300, Accelerated Single-Variable Calculus I – Fall 2015, Spring 2016

### *Other*

Reading course on Mathematical Signal Processing – Spring 2016

## TEXAS A&M UNIVERSITY

### *Instructor of Record*

MATH 131, Math Concepts - Calculus – Summer 2014

### *Teaching Assistant*

MATH 150, Functions – Spring 2011

MATH 151, Engineering Calculus I – Fall 2011, Fall 2013

MATH 152, Engineering Calculus II – Spring 2012, Spring 2014

MATH 409, Advanced Calculus I – Summer 2012 (online course)

MATH 411, Mathematical Probability – Spring 2013

MATH 437, Principles of Numerical Analysis, Fall 2014

MATH 446, Principles of Analysis I – Fall 2012

MATH 601, Methods of Applied Mathematics I – Fall 2010

MATH 664, Quantum Computation and Quantum Information – Summer 2015

## RESEARCH SUPERVISION

### UNIVERSITY OF TEXAS AT ARLINGTON

#### *Postdoctoral Researchers*

- ⊕ Shujie Kang (PhD from University of Maryland) – 2020-2022

#### *PhD Students*

- ⊕ Christopher Eads – Optimal Transport and Manifold Learning – Fall 2022-present (on leave in Spring 2024)
- ⊕ Muhammad Rana – Deep Learning – Spring 2021-present
- ⊕ Mohamed Meskini – Robust PCA – Fall 2021-2023 (paused degree progress in Spring 2023)

#### *Masters Students*

- ⊕ Marcus Hawkins – Manifold Learning in Robotics (joint with William Beksi, CSE) – Fall 2022-Spring 2024

#### *Undergraduate Students*

- ⊕ Christopher Moorehead – Robust PCA – Summer 2021
- ⊕ Jason Bard – Machine Learning for Self-driving Tractors – USDA ARS Intern program Summer 2022

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#### *Graduate Students*

- ⊕ Zhaoying Lu (University of Arizona) – Boosting Nyström Method – 2021-2023
- ⊕ Wenbo Ouyang (University of Arizona) – Ensemble CUR Decompositions – 2021-2023

#### *Undergraduate Students*

- ⊕ Hari Krishnan – Active Learning and Monte Carlo Tree Search (joint with Kwang-Sung Jun – Computer Science) – 2020-2022
- ⊕ Eva Huie -- Matrix Factorizations for Subspace Clustering – Fall 2019
- ⊕ Reeshad Arian – Matrix Factorizations for Subspace Clustering – 2019-2021
- ⊕ Former Student Mentor to an undergraduate mathematics student at Texas A&M – Fall 2012—Fall 2013.

## SERVICE (RESEARCH COMMUNITY)

### *Editorial Work*

- ⊕ Co-Editor and Organizer (with David Glickenstein, Xiaoming Huo, Yajun Mei, and Martin Stoll) of a [Special Issue on Mathematical Fundamentals of Machine Learning](#) in *Frontiers in Applied Mathematics and Statistics – Mathematics of Data Science Section*.

### *Conference Organization*

- ⊕ Lead Organizer (with Steven Damelin) of the Minisymposium on Optimal Transport, Manifold Learning, and Dimensionality Reduction at the SIAM Conference on Mathematics of Data Science (MDS22), San Diego, CA Sept 2022.
- ⊕ Co-organizer (with Akram Aldroubi, Javad Mashreghi, and Armenak Petrosyan) of the Workshop on the Interaction between Data Science, Approximation Theory, and Harmonic Analysis, (Fields Institute, Toronto, Canada, 4 weeks May-June 2022).
- ⊕ Lead organizer (with HanQin Cai and Longxiu Huang) of the Minisymposium on Computational Linear Algebra in Data Science at the SIAM Conference on Computational Science and Engineering (CSE21), March 1-5, 2021 (Online due to Covid-19).
- ⊕ Lead organizer (with Faryad Sahneh, Vahan Huroyan, Raymundo Navarrete, and Brooke Valmont) of the TRIPODS Southwestern Summer Conference on Data Science, University of Arizona, May 2019.
- ⊕ Co-organizer (with Akram Aldroubi and Alex Powell) of the 33<sup>rd</sup> Annual Shanks Conference and Lecture in conjunction with the International Conference on Computational Harmonic Analysis and Applications, Vanderbilt University, May 14-18, 2018.
- ⊕ Co-organizer (with Alex Powell) of a Birthday Workshop in honor of Akram Aldroubi's 60<sup>th</sup> birthday, Vanderbilt University, May 19, 2018.
- ⊕ Co-organizer (with Akram Aldroubi, Michael Northington V, and Alex Powell) of the Special Session on Harmonic Analysis, Functional Analysis, and Their Applications, Spring Southeastern AMS Sectional Meeting, Vanderbilt University, April 14-15, 2018.
- ⊕ Co-organizer (with Sui Tang) of a Minisymposium on Approximation Theory in Signal Processing at the 15<sup>th</sup> International Conference on Approximation Theory, San Antonio, TX, May 22-25, 2016.

### *Referee Work*

- ⊕ NSF Panelist – 2021

⊕ Journal Reviewer

- *Applied and Computational Harmonic Analysis*
- *Proceedings of the American Mathematical Society*
- *PLOS One*
- *SIAM Journal on Mathematics of Data Science*
- *IMA Journal of Numerical Analysis*
- *IEEE Transactions on Signal Processing*
- *BIT Numerical Mathematics*
- *Journal of Fourier Analysis and Applications*
- *Linear Algebra and its Applications*
- *Journal of Approximation Theory*
- *Advances in Computational Mathematics*
- *Journal of Computational and Applied Mathematics*
- *Canadian Mathematical Bulletin*
- *Analysis Mathematica*
- *Advances in Computational Analysis*
- *Journal of Mathematical Analysis and Applications*
- *Banach Journal of Mathematical Analysis*
- *Journal of Computational and Applied Mathematics*
- *Numerical Functional Analysis and Applications*
- *Science China Mathematics*
- *Results in Applied Mathematics*
- *Sampling Theory in Signal and Image Processing*
- *Numerical Functional Analysis and Optimization*
- *IEEE Pacific Visualization Conference Proceedings*
- *SampTA Conference Proceedings*
- *SIAM Undergraduate Research Online*

- ⊕ Book reviewer (giving initial feedback on scope and suitability of draft textbooks for publishers)  
– twice in 2020-2024.

**S E R V I C E ( L O C A L C O M M U N I T Y )**



- ⊕ Executive Committee for the Division of Data Science (UTA College of Science) – Jan 2024-
- ⊕ Executive Committee for the Center for Data Science Research and Education (CDSRE) – Jan 2023-Dec 2023. (The Center was absorbed into the Division of Data Science)
- ⊕ Data Science Undergraduate Curriculum Committee Chair – Fall 2020-present.
- ⊕ Design and Proposal Committee for Masters degree in Applied Statistics and Data Science (MS ASDS) – May 2021-May 2023.
- ⊕ Design and Proposal Committee for 4+1 Bachelors Data Science to MS ASDS Track – May 2022-May 2024.
- ⊕ College of Science NTT Hiring committee (twice in 2020-2024)
- ⊕ College of Science Associate/Full Professor Hiring committee (2022)
- ⊕ Division of Data Science Academic Advisor Hiring committee (Jan 2024)
- ⊕ Mathematics Assistant Professor Hiring committee (Oct 2023-March 2024)
- ⊕ Data Science TA Hiring committee (twice in 2020-2023)
- ⊕ Design and Proposal Committee for PhD in Data Science – Jan 2024-April 2024.
- ⊕ MS Applied Statistics and Data Science Curriculum Committee Member – May 2023-present.
- ⊕ MATH Awards Committee – May 2021-April 2025.
- ⊕ MATH Graduate Affairs Committee (GAC) – Sept 2021-Aug 2022.
- ⊕ Data Science Technology Committee Member – Fall 2020-Fall 2023.
- ⊕ Organizer of Machine Learning Reading Group – Jan 2021-May 2021.
- ⊕ MATH Prelim A Committee Member – December 2020-present.
- ⊕ MATH Prelim A Committee Chair – January 2023.
- ⊕ MATH Prelim proctor (3 times)
- ⊕ MATH Prelim grader (3 times)

#### Prior to UTA

- ⊕ Organizer of Research Working Group 2 (Visualization and Machine Learning) in the UA TRIPODS Program – Fall 2019–Spring 2020.
- ⊕ Organizer of Research Working Group 3 (Imaging) in the UA TRIPODS Program – Spring 2018–Spring 2020.
- ⊕ Co-organizer of the TRIPODS Seminar at University of Arizona – Fall 2018–Spring 2020.
- ⊕ Website maintenance for the UA TRIPODS Website – Fall 2018–Spring 2020.

- ⊞ Organizer of the Computational Analysis Seminar at Vanderbilt University – Fall 2016—Spring 2018.
- ⊞ Served on a panel for advice from graduating students on navigating the job market for the same seminar – Spring 2015.
- ⊞ Organized (and gave weekly lectures in) an informal working seminar on Fourier analysis and function interpolation at Texas A&M – Fall 2014.
- ⊞ Took part in a panel of graduate students on selecting an advisor for the “First Semester Graduate Students Seminar” – Fall 2013.

## **O U T R E A C H**

- ⊞ Guest lecture on Optimal Transport in Machine Learning – DATA 4381 Data Science Capstone I – Fall 2023.
- ⊞ Speaker – Voices Live Podcast at UTA Science Week – April 2022. [Recording](#)
- ⊞ Guest lecture on Structure in Data – DATA 4380 Data Problems – Spring 2021.
- ⊞ Guest speaker on Structure in High-dimensional Data for MAA Seminar at UTA – Spring 2021.

### Prior to UTA

- ⊞ Co-leader of the [Machine Learning Literacy Project](#) at University of Arizona – a Hackathon to teach undergraduates basics of Machine Learning and give student groups the chance to give Lightning Talks about ML uses in their major (Fall 2019—Spring 2020).
- ⊞ Panelist for Q&A Session on AI and Machine Learning for PenguinAI.py, the Tucson, AZ University High School AI Club – Dec. 2019.
- ⊞ Research mini-talk on signal processing for an REU at Texas A&M – Summer 2014.

## **M E M B E R S H I P   I N   P R O F E S S I O N A L   O R G A N I Z A T I O N S**

American Mathematical Society

Society for Industrial and Applied Mathematics

## **O T H E R   S K I L L S**

*Languages:*

Spanish – Reading, writing, and conversational speaking

Matlab – Proficient

Python – Proficient