Shashanka Ubaru

IBM Research
Austin, TX, USA
✉ *shashanka.u@gmail.com*
🖥 *shashankaubaru.github.io*

Research Interests

Machine learning, artificial intelligence, numerical matrix and tensor algebra, quantum computing, approximation theory and algorithms, coding theory applications.

Positions

2018 - present	**IBM Research**, *Yorktown Heights/Austin*, USA.	
	Senior Research Scientist	June, 2025 - present
	Staff Research Scientist	May, 2022 - May, 2025
	Research Staff Member	Jan, 2020 - May, 2022
	Goldstine Postdoctoral Fellow	Aug, 2018 - Dec, 2019
2022 - present	**Oden Institute**, *University of Texas at Austin*, TX, USA.	
	Lecturer	Jan, 2024 - present
	Visiting Researcher	June, 2022 - present
2013 - 2018	**University of Minnesota**, *Minneapolis*, MN, USA.	
	Research Assistant, Department of Computer Science.	Sep, 2013 - May, 2018
2016 & 2017	**Lawrence Berkeley National Laboratory**, *Berkeley*, CA, USA.	
	Research Intern, Neural Systems and Data Science Lab	June - Aug, 2017
	Research Intern, Scientific Data Management group	May - Aug, 2016
2013	**Seagate Technology**, *Shakopee*, MN, USA.	
	Signal Processing Intern	May - Aug, 2013
2011 - 2012	**Raman Research Institute**, *Bengaluru*, India.	
	Visiting Research Student	June, 2011 - Aug, 2012

Education

2012-18	**University of Minnesota**, *Minneapolis*, MN, USA.	
	Ph.D. Computer Science	May 2018
	Advisor: Yousef Saad	
	Thesis: *Algorithmic advances in learning from large dimensional matrices and scientific data*	
	M.S. Computer Science	October 2015
	M.S. Electrical Engineering	November 2014
	Advisors: Yousef Saad and Arya Mazumdar	
	Thesis: *Randomized techniques for matrix decomposition and estimating the approximate rank of a matrix*	
2008-12	**M.S. Ramaiah Institute of Technology**, *Bengaluru*, India.	
	B.Eng. Electronics and Communication	

Publications

Journal articles

[17] *PCENet: High Dimensional Surrogate Modeling for Learning Uncertainty.*
P.F. Shustin, **S. Ubaru**, M. Zimon, S. Lu, V. Kalantzis, L. Horesh, and H. Avron
SIAM/ASA Journal on Uncertainty Quantification (JUQ), accepted, 2025

[16] *Capacity Analysis of Vector Symbolic Architectures.*
K.L. Clarkson, **S. Ubaru**, and E. Yang
Journal of Artificial Intelligence Research (JAIR), accepted, 2025.

[15] *Quantum and classical Monte Carlo algorithms for estimating Betti numbers of clique complexes.*
I. Akhalwaya, A. Bhayat, A. Connolly, S. Herbert, L. Horesh, J. Sorci, and **S. Ubaru**
Quantum, accepted, 2025.

[14] *Combinatorial Multi-armed Bandits: Arm Selection via Group Testing.*
A. Mukherjee, **S. Ubaru**, K. Murugesan, K. Shanmugam, Ali Tajer
Transactions on Machine Learning Research (TMLR), 2835-8856, 2025

[13] *Multivariate trace estimation using quantum state space linear algebra.*
L. Yosef, **S. Ubaru**, L. Horesh, and H. Avron
SIAM Journal on Matrix Analysis and Applications (SIMAX), 46(1), 172–209, 2025.

[12] *Randomized matrix-free quadrature: unified and uniform bounds for stochastic Lanczos quadrature and the kernel polynomial method.*
T. Chen, T. Trogdon, and **S. Ubaru**
SIAM Journal on Scientific Computing (SISC), 47 (3), A1733-A1757, 2025

[11] *Single-Pass Top-N Subgraph Centrality of Graphs via Subspace Projections.*
V. Kalantzis, G. Kollias, **S. Ubaru**, L. Horesh and N. Abe
Journal of Complex Networks 13 (1), cnae049, 2025

[10] *Representation of the Fermionic Boundary Operator.*
I.Y. Akhalwaya, Y.H. He, L. Horesh, V. Jejjala, W. Kirby, K. Naidoo, and **S. Ubaru**
Physical Review A, volume 106, 022407, 2022.

[9] *Dynamic graph and polynomial chaos based models for contact tracing data analysis and optimal testing.*
S. Ubaru, G. Cohen, and L. Horesh
Journal of Biomedical Informatics, Novel Informatics Approaches to COVID-19 Research, 122, 103901, 2021.

[8] *Spectrum-Adapted Polynomial Approximation for Matrix Functions.*
L. Fan, D. Shuman, **S. Ubaru**, and Y. Saad
Algorithms, Special Issue: Efficient Graph Algorithms in Machine Learning, 13(11), 295, 2020.

[7] *Sampling and multilevel coarsening algorithms for fast matrix approximations.*
S. Ubaru and Y. Saad
Numerical Linear Algebra with Applications 26.3 : e2234, 2019.

[6] *Fast estimation of $\mathtt{tr}(f(A))$ via Stochastic Lanczos Quadrature.*
S. Ubaru, J. Chen, and Y. Saad
SIAM Journal on Matrix Analysis and Applications (SIMAX), 38(4), 1075–1099, 2017.

[5] *Low rank approximation and decomposition of large matrices using error correcting codes.*
S. Ubaru, A. Mazumdar, and Y. Saad
IEEE Transactions on Information Theory, 63(9), 5544–5558, 2017.

[4] *Formation enthalpies for transition metal alloys using machine learning.*
S. Ubaru, A. Miedlar, Y. Saad, and J R. Chelikowsky
Physical Review B, (Vol.95, No.21), 2017.

[3] *Fast estimation of approximate matrix ranks using spectral densities.*
S. Ubaru, Y. Saad, and A.-K. Seghouane
Neural Computation, 29(5):1317–1351, 2017.

[2] *Improving the Incoherence of a Learned Dictionary via Rank Shrinkage.*
S. Ubaru, A.-K. Seghouane, and Y. Saad
Neural Computation, 29(1):263–285, 2017.

[1] *Displaying gray scales by cross pairing select and data voltages in multi-line addressed LCD.*
S. Ubaru and T.N. Ruckmongathan
IEEE Journal of Display Technology, 8(11), 669–677, 2012.

Conference proceedings

[24] *Transformers Learn Faster with Semantic Focus.*
P. Ram, K. Clarkson, T. Klinger, **S. Ubaru**, and A. Gray
Advances in Neural Information Processing Systems (NeurIPS), 2025.

[23] *Iterative Solution of Sparse Linear Systems on Hybrid Architectures Using Homomorphic Encryption.*
L. Horesh, V. Kalantzis, B. Trager, and **S. Ubaru**
IEEE High Performance Extreme Computing (HPEC), 2025.

[22] *Power iteration with probabilistic updates for systems with heterogeneous performance.*
S. Ghosh, L. Horesh, V. Kalantzis, G. Kollias, Y. Lu, T. Nowicki, and **S. Ubaru**
IEEE High Performance Extreme Computing (HPEC), 2025.

[21] *On Efficient Solutions of General Structured Markov Processes in Quantum Computational Environments.*
V. Kalantzis, M. S. Squillante, and **S. Ubaru**
IFIP Performance Conference, 2025.

[20] *Topological Data Analysis on Noisy Quantum Computers.*
I. Akhalwaya[*], **S. Ubaru**[*], K. Clarkson, M. Squillante, V. Jejjala, Y. He, K. Naidoo, V. Kalantzis, and L. Horesh.
International Conference on Learning Representations (ICLR), 2024(***Oral presentation,*** 1.2% ***of submissions***)

[19] *Asynchronous Randomized Trace Estimation.*
V. Kalantzis, **S. Ubaru**, G. Kollias, C.W. Wu, and L. Horesh.
International Conference on Artificial Intelligence and Statistics (AISTATS), 2024.

[18] *Solving Sparse Linear Systems via Flexible GMRES with In-Memory Analog Preconditioning.*
V. Kalantzis, M.S. Squillante, C. W. Wu, A. Gupta, **S. Ubaru**, T. Gokmen, and L. Horesh
IEEE High Performance Extreme Computing (HPEC), 2023.

[17] *Quantum Graph Transformers.*
G. Kollias, V. Kalantzis, T. Salonidis, and **S. Ubaru**
International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2023.

[16] *Accelerating matrix trace estimation by Aitken's Δ^2 process.*
V. Kalantzis, G. Kollias, **S. Ubaru**, and T. Salonidis
International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2023.

[15] *Efficient Scaling of Dynamic Graph Neural Networks.*
V. Chakaravarthy, S. Pandian, S. Raje, Y. Sabharwal, T. Suzumura, and **S. Ubaru**
Supercomputing (SC21), 2021.

[14] *Analysis of stochastic Lanczos quadrature for spectrum approximation.*
T. Chen, T. Trogdon, and **S. Ubaru**
International Conference on Machine Learning (ICML), 2021. (***Long presentation,*** 3% ***of submissions***)

[13] *Projection techniques to update the truncated SVD of evolving matrices.*
V. Kalantzis, G. Kollias, **S. Ubaru**, A. Nikolakopoulos, L. Horesh, and K.L. Clarkson
International Conference on Machine Learning (ICML), 2021.

[12] *Sparse graph based sketching for fast numerical linear algebra.*
D. Hu, **S. Ubaru**, A. Gittens, K. Clarkson, L. Horesh, and V. Kalantzis
International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2021.

[11] *Dynamic Graph Convolutional Networks Using the Tensor M-Product.*
O. Malik, **S. Ubaru**, L. Horesh, M. Kilmer, and H. Avron
SIAM International Conference on Data Mining (SDM), 2021.

[10] *Multilabel Classification by Hierarchical Partitioning and Data-dependent Grouping.*
S. Ubaru, S. Dash, O. Gunluk, and A. Mazumdar
Advances in Neural Information Processing Systems (NeurIPS), 2020.

[9] *Spectrum-Adapted Polynomial Approximation for Matrix Functions.*
L. Fan, D. Shuman, **S. Ubaru**, and Y. Saad
International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2019.

[8] *Find the dimension that counts: Fast dimension estimation and Krylov PCA.*
S. Ubaru, A.-K. Seghouane, and Y. Saad
SIAM International Conference on Data Mining (SDM), 2019.

[7] *Spectral Sums Beyond Fast Matrix Multiplication: Algorithms and Hardness.*
C. Musco, P. Netrapalli, A. Sifford, **S. Ubaru**, and D. P. Woodruff
Innovations in Theoretical Computer Science (ITCS), 2018.

[6] *UoI-NMF$_{cluster}$: A Robust Nonnegative Matrix Factorization Algorithm for Noisy Data.*
S. Ubaru, K. Wu, and K. E. Bouchard
IEEE International Conference on Machine Learning and Applications (ICMLA), 2017. (***Best Paper Award***)

[5] *Union of Intersections (UoI) for Interpretable Data Driven Discovery and Prediction.*
K. E. Bouchard, A. F. Bujan, F. Roosta-Khorasani, **S. Ubaru**, Prabhat, A. M. Snijders, J.-H. Mao, E. F. Chang, M. W. Mahoney, and S. Bhattacharyya
Advances in Neural Information Processing Systems (NeurIPS), 2017.

[4] *Multilabel Classification with Group Testing and Codes.*
S. Ubaru and A. Mazumdar
International Conference on Machine Learning (ICML), 2017.

[3] *Fast methods for estimating the Numerical rank of large matrices.*
S. Ubaru and Y. Saad
International Conference on Machine Learning (ICML), 2016.

[2] *Group testing schemes from low-weight codewords of BCH codes.*
S. Ubaru, A. Mazumdar, and A. Barg
IEEE International Symposium on Information Theory (ISIT), 2016.

[1] *Low rank approximation using error correcting coding matrices.*
S. Ubaru, A. Mazumdar, and Y. Saad
International Conference on Machine Learning (ICML), 2015.

Book chapters

[2] *Quantum Computing Algorithms For Decision Making Under Uncertainty.*
L. Horesh, K. Clarkson, V. Kalantzis, M. Squillante, **S. Ubaru**, and A. Abboud
Air Force Research Lab Technical Report, AFRL-RI-RS-TR-2021-121, 2021.

[1] *Applications of trace estimation techniques.*
S. Ubaru and Y. Saad
High Performance Computing in Science and Engineering, LNCS book series, vol. 11087, ch. 2, pp 19–33, 2018.

Workshop papers and posters

[9] *Quantifying policy uncertainty in generative flow networks with uncertain rewards.*
R. Kaluarachchi, R. Sawko, **S. Ubaru**, D. Huh, M. Zimon, and L. Horesh
NeurIPS - ML×OR Workshop, 2025.

[8] *Fast Linear Solvers via AI-Tuned Markov Chain Monte Carlo-based Matrix Inversion.*
A. Lebedev, W. Lee, S. Ghosh, O. Yaman, V. Kalantzis, Y. Lu, T. Nowicki, **S. Ubaru**, L. Horesh, V. Alexandrov
Supercomputing (SC25): ScalAH Workshop, 2025.

[7] *Counting Triangles of Graphs via Matrix Partitioning.*
G. Kollias, V. Kalantzis, L. Horesh, **S. Ubaru**, and P. Traganitis
IEEE International Workshop on Machine Learning for Signal Processing (MLSP) 2024.

[6] *On Quantum Algorithms for Efficient Solutions of General Classes of Structured Markov Processes.*
V. Kalantzis, M. S. Squillante, and **S. Ubaru**
Workshop on Mathematical performance Modeling and Analysis (MAMA), 2024.

[5] *Topological Data Analysis on Noisy Quantum Computers.*
S. Ubaru, I Akhalwaya, K. Clarkson and L. Horesh
Quantum Information Processing (QIP), 2023.

[4] *On Quantum Algorithms for Random Walks in the Nonnegative Quarter Plane.*
V. Kalantzis, M. S. Squillante, **S. Ubaru**, and L. Horesh
Workshop on Mathematical performance Modeling and Analysis (MAMA), 2022.

[3] *Multilabel prediction in log time and data-dependent grouping.*
S. Ubaru, S. Dash, O. Gunluk, and A. Mazumdar
NeurIPS - Workshop on Information Theory and Machine Learning, 2019.

[2] *Tensor graph neural networks for prediction on time varying graphs.*
O. Malik, **S. Ubaru**, L. Horesh, M. Kilmer, and H. Avron
NeurIPS - Workshop on Graph Representation Learning, 2019.

[1] *Union of Intersections (UoI) for interpretable data driven discovery and prediction in neuroscience.*
K. E. Bouchard, P. Sachdeva, S. Bhattacharyya, M. Balasubramanian, and **S. Ubaru**
Computational and Systems Neuroscience (Cosyne), 2019.

Preprints

[6] *Surrogate-Based Quantification of Policy Uncertainty in Generative Flow Networks.*
R. Kaluarachchi, R. Sawko, **S. Ubaru**, D. Huh, M. Zimon, L. Horesh, and Y. Bengio, 2025.

[5] *Analysis of Power Iteration Algorithm with Partially Observed Matrix-vector Products.*
S. Ghosh, L. Horesh, V. Kalantzis, Y. Lu, T. Nowicki, and **S. Ubaru**, 2025.

[4] *Multi-Function Multi-Way Analog Technology for Sustainable Machine Intelligence Computation.*
V. Kalantzis, M.S. Squillante, **S. Ubaru**, et al., 2024.

[3] *Quantum Topological Data Analysis with Linear Depth and Exponential Speedup.*
S. Ubaru, I. Akhalwaya, M. Squillante, K. Clarkson, and L. Horesh, 2021.

[2] *Unsupervised Hierarchical Graph Representation Learning with Variational Bayes.*
S. Ubaru and J. Chen, 2020.

[1] *Provably convergent acceleration in factored gradient descent with applications in matrix sensing.*
T Ajayi, D Mildebrath, A Krylidis, **S. Ubaru**, G. Kollias, and K. E. Bouchard, 2019.

Patents

[30] *P202502284 - Iterative solution of sparse linear systems on hybrid cloud.*
V. Kalantzis, L. Horesh, **S. Ubaru**, and B. Trager. (filed)

[29] *P202401590 - Machine learning from multi-dimensional data using tensor random forest models.*
S. Ubaru, L. Horesh, K. Clarkson, K. Rhrissorrakrai, A. Saenz, and L. Parida. (filed)

[28] *P202400126 - Extracting nodes via alpha centrality with multiple damping factors.*
V. Kalantzis, L. Horesh, **S. Ubaru**, and G. Kollias. (filed)

[27] *P202203782 - Image compression using mixed-precision matrix sketching.*
V. Kalantzis, T. Gokmen, **S. Ubaru**, and L Horesh. (filed)

[26] *P202202750 - Efficient techniques to identify the most influential nodes in graph structures.*
L Horesh, **S. Ubaru**, V. Kalantzis, and G Kollias. (filed)

[25] *US20250258826A1 - Efficient look-up for vector symbolic architectures (VSA).*
T. Gokmen, V. Kalantzis, P. Ram, C. Wu, K. Clarkson, L Horesh, and **S. Ubaru**. (pending)

[24] *US20250181465A1 - Asynchronous modeled system for fault-tolerant environments.*
L Horesh, V. Kalantzis, G Kollias, **S. Ubaru**, and C. Wu. (pending)

[23] *US20250190602A1- Privacy-preserving graph analytics on hybrid cloud environments.*
V. Kalantzis, L. Horesh, **S. Ubaru**, and G. Kollias. (pending)

[22] *US20250181562A1 - System to update the most influential nodes of dynamic graphs.*
V. Kalantzis, G Kollias, **S. Ubaru**, L Horesh, and N Abe. (pending)

[21] *US20250036987A1 - Quantum Graph Transformers.*
G. Kollias, V. Kalantzis, T. Salonidis, and **S. Ubaru**. (pending)

[20] *US20240370524A1- Aitken acceleration for estimating electronic structures of materials.*
V. Kalantzis, G. Kollias, **S. Ubaru**, and T. Salonidis. (pending)

[19] *US20240320033A1- Processing sparse linear systems using distributed resources.*
V. Kalantzis, **S. Ubaru**, and L. Horesh. (pending)

[18] *US20240176843A1 - Solving systems of linear equations using mixed precision.*
T. Gokmen, V. Kalantzis, **S. Ubaru**, and L. Horesh. (pending)

[17] *US20240135185A1 - High dimensional surrogate modeling for learning uncertainty.*
P. Fink, **S. Ubaru**, H. Avron, V. Kalantzis, and L. Horesh. (pending)

[16] *US20240028939A1 - Linear-depth quantum system for Topological Data Analysis.*
I. Akhalwaya, **S. Ubaru**, K. Clarkson, M. Squillante, V. Kalantzis, and L. Horesh. (pending)

[15] *US20240020565A1 - Quantum circuit for estimating matrix spectral sums.*
S. Ubaru, I. Akhalwaya, K. Clarkson, M. Squillante, V. Kalantzis, and L. Horesh. (pending)

[14] *US20240020564A1 - Quantum circuits for matrix trace estimation.*
S. Ubaru, K. Clarkson, I. Akhalwaya, M. Squillante, V. Kalantzis, and L. Horesh. (pending)

[13] *US20240020563A1 - Quantum circuit for transformation of mixed state vectors.*
I. Akhalwaya, **S. Ubaru**, K. Clarkson, M. Squillante, V. Kalantzis, and L. Horesh. (pending)

[12] *US20240022247A1 - Quantum circuit for pairwise testing.*
S. Ubaru, I. Akhalwaya, K. Clarkson, M. Squillante, V. Kalantzis, and L. Horesh.(pending)

[11] *US20240037304A1 - Quantum circuit for simulating boundary operator.*
I. Akhalwaya, Y. He, L. Horesh, V. Jejalla, W. Kirky, K. Naidoo, and **S. Ubaru** (pending)

[10] *US20230410113A1 - Detecting network patterns using random walks.*
K.P. Onak, **S. Ubaru**, A. Abboud, and T. Suzumura. (pending)

[9] *US20220300575A1 - Determining triangles in graph data structures using crosspoint array.*
V. Kalantzis, **S. Ubaru**, L. Horesh, and H. Avron. (pending)

[8] *US12118059B2 - Projection-based techniques for updating SVD in evolving datasets.*
V. Kalantzis, G. Kollias, **S. Ubaru**, L. Horesh, and K. Clarkson.

[7] *US11907715B2 - Hardware acceleration with preconditioners.*
V. Kalantzis, L. Horesh, and **S. Ubaru**.

[6] *US11500963B2 - Fast PCA of evolving data using analog crossbar array.*
S. Ubaru, V. Kalantzis, L. Horesh, M. Squillante, and H. Avron.

[5] *US11790033B2- Accelerated quasi-newton methods on analog crossbar hardware.*
V. Kalantzis, **S. Ubaru**, L. Horesh, H. Avron, and M. Onen.

[4] *US11520855B2 - Matrix sketching using analog crossbar architectures.*
L. Horesh, M. Onen,H. Avron, T. Gokmen, **S. Ubaru**, and V. Kalantzis.

[3] *US11657312B2 - Short-depth quantum amplitude estimation without eigenstate collapse.*
I. Akhalwaya, K. Clarkson, L. Horesh, M. Squillante, **S. Ubaru**, and V. Kalantzis.

[2] *US11379758B2 - Automatic multilabel classification using machine learning.*
S. Ubaru, S. Dash, O. Gunluk, A. Mazumdar and L. Horesh.

[1] *US11386507B2 - Tensor-based predictions from analysis of time-varying graphs.*
O. Malik, **S. Ubaru**, L. Horesh, M. Kilmer, and H. Avron.

Presentations

2025 • *Capacity Analysis of Vector Symbolic Architectures*
 – Computational Biosciences Seminar, Lawrence Berkeley National Laboratory, CA
 • *Career Pathways* Panelist
 – Rising Stars workshop, UT Austin.

2024 • *Quantum Graph Transformers*
   – SIAM Conference on Applied Linear Algebra (LA24), Paris France
   • *Topological data analysis on noisy quantum computers*
   – SIAM Conference on Applied Linear Algebra (LA24), Paris France
   – International Conference on Learning Representations (ICLR), Vienna, Austria
   • *Asynchronous Randomized Trace Estimation*
   – International Conference on Artificial Intelligence and Statistics (AISTATS), Valencia, Spain
   • *Career Pathways* Panelist
   – Rising Stars workshop, UT Austin.

2023 • *Dynamic graph representation learning using tensor algebra*
   – UTD CS Colloquium, University of Texas Dallas
   • *Topological data analysis on noisy quantum computers*
   – QuSoft, CWI, Amsterdam, The Netherlands
   – QIP 2023 conference, Ghent, Belgium
   • *Algorithms for estimating spectral sums for large matrices*
   – Dr. Rachel Ward's group, University of Texas at Austin .

2022 • *Industry Panelist*
   – SIAM Conference on Mathematics of Data Science (MDS22), San Diego
   • *Towards quantum advantage on noisy computers*
   – Google Research, Bengaluru
   • *Dynamic graph representation learning using tensor algebra*
   – Oden Institute Seminar Series, University of Texas at Austin
   – SIAM Conference on Mathematics of Data Science (MDS22), San Diego
   – Data Science group, University of California, San Diego.
   • *Multilabel Classification by Hierarchical Partitioning and Grouping*
   – RISE workshop, Austin, TX
   • *Quantum Topological Data Analysis with Linear Depth and Exponential Speedup*
   – Quantum Information Group, University of Texas at Austin
   – Quantum computing course, Columbia University, New York.

2021 • *Into another dimension - a new tensor algebra for learning on dynamic graphs*
   – Seminar at University of Albany, NY
   • *Algorithms for estimating spectral sums for large matrices*
   – Oden Institute Seminar Series, University of Texas at Austin
   • *Novel Tensor Framework for Data Representation and Compression*
   – SIAM Conference on Computational Science and Engineering (CSE21).

2020 • *Multilabel Classification by Hierarchical Partitioning and Data-dependent Grouping*
   – Neural Information Processing Systems (NeurIPS) Virtually held
   • *Novel tensor framework for model reduction and neural networks*
   – ICERM: Workshop on Algorithms for Dimension and Complexity Reduction, Brown University, RI.

2019 • *Tensor graph neural networks for prediction on time varying graphs*
   – NeurIPS: Workshop on Graph Representation Learning, Vancouver, Canada
   • *Multilabel prediction in log time and data-dependent grouping*
   – NeurIPS: Workshop on Information Theory and Machine Learning, Vancouver, Canada
   • *Spectrum approximation by Lanczos Quadrature and Preconditioned SVRG*
   – 20th International Conference On Preconditioning, Minneapolis, MN, USA
   • *Find the dimension that counts: Fast dimension estimation and Krylov PCA*
   –SIAM International Conference on Data Mining (SDM), Calgary, Canada
   • *Error Correcting Codes for Machine Learning.*
   – CSA Seminar, Indian Institute of Science (IISc), Bengaluru, India.

2018 • *Error Correcting Codes for Machine Learning*
   – Theory Seminar, University of Massachusetts, Amherst, MA
   – IP Seminar, IBM T.J. Watson Research Center, NY.

2017 • *$UoI\text{-}NMF_{cluster}$: Robust Nonnegative Matrix Factorization Algorithm for Noisy Data*
   – International Conference on Machine Learning and Applications (ICMLA), Cancun, Mexico
   • *Multilabel Classification with Group Testing and Codes*
   – Neural Systems and Engineering Labs, Lawrence Berkeley National Laboratory, CA
   – International Conference on Machine Learning (ICML), Sydney, Australia
   • *Error Correcting Codes for Machine Learning*
   – The University of Melbourne, Melbourne, Australia
   • *UoI-NMFcluster and UoI-CUR: Union of Intersections methods for matrix approximations*
   – Neural Systems and Engineering Labs, Lawrence Berkeley National Laboratory, CA.

2016 • *Error correcting codes for low rank approximation and group testing*
   – BLISS Seminar, University of California, Berkeley, CA
• *Fast methods for estimating the Numerical rank of large matrices*
   – International Conference on Machine Learning (ICML), New York, NY.

2015 • *Low rank approximation using error correcting coding matrices*
   – International Conference on Machine Learning (ICML), Lille, France.

Awards

2023 **Master Inventor Award**, IBM Research (3-year term)

2023 **Outstanding Technical Achievement Award**, IBM Research

2022 *IBM Research Accomplishment Award*

2022 **Outstanding Innovation Award**, IBM Research

2021 *IBM Research Accomplishment Award*

2019 *UMN Best Dissertation Award*, Computer Science Department nominee

2018 **Herman Goldstine Fellowship**, IBM Research

2017 **Best Paper Award**, International Conference on Machine Learning and Applications (ICMLA)

2011 *Visiting Research Student Program*, Raman Research Institute

Teaching

University of Texas, Austin, *Instructor*

Spring 2025   CSE 392/CS 395T/M 397C: Matrix and Tensor Algorithms for Data

Spring 2024   CSE 392: Matrix and Tensor Algorithms for Data

IBM Research, *Co-instructor*

Summer 2023   Mathematics of Big Data: Sketching and (Multi-) Linear Algebra, Organized at IBM, Almaden

Summer 2021   Mathematics of Big Data: Sketching and (Multi-) Linear Algebra at MSRI Berkeley

University of Minnesota, *Teaching Assistant*

Spring 2018   CSci 2033, Elementary Computational Linear Algebra, *Recitation Instructor*

Fall 2017   CSci 5304, Computational Aspects of Matrix Theory, *Teaching Assistant*

Spring 2017   CSci 8314, Sparse Matrix Computations, *Temporary Instructor*

Mentoring

IBM Research - Interns

2025   Ramón Nartallo-Kaluarachchi (PhD Student - Oxford)

2024, 25   Paulina Hoyos (PhD Student - UT Austin)

2023   Arpan Mukerjee (PhD Student - RPI)

2022   Elizabeth Yang (PhD Student - UC, Berkeley)

2021   Paz F. Sustin (PhD Student - Tel Aviv University)

2021   Lucky Yerimah (PhD Student - RPI)

2021   Emily Thompson (REU Student via. DIMACS)

2020   Dong Hu (PhD Student - RPI)

2019   Osman Malik (PhD Student - U of Colorado, Boulder)

PhD Thesis committee

2024   Dong Hu (PhD Student - RPI)

Services

Organizer: SIAM MDS 2024 - Member of organizing committee.

SIAM LA 2024 - Minisymposium on Quantum Numerical Linear Algebra

SIAM CSE 2023 - Minisymposium on Randomized Algorithms for Matrix and Tensor Analysis

IEEE ICMLA Challenge 2018 - Parts based decomposition of noisy data.

Reviewer: National Science Foundation (NSF) grant proposals, 2023.

Conferences: Neural Information Processing Systems (NeurIPS) 2016, 2019 - 25; International Conference on Machine Learning (ICML) 2018 - 25; International Conference on Learning Representations (ICLR) 2021-26; Artificial Intelligence and Statistics (AISTATS) 2024 - 26; AAAI conference on Artificial Intelligence 2020 - 22 ; Conference on Uncertainty in Artificial Intelligence (UAI) 2019 - 25; ACM-SIAM Symposium on Discrete Algorithms (SODA) 2021, 25; IEEE International Conference On Machine Learning And Applications 2018 - 19; IEEE International Symposium on Information Theory (ISIT) 2017.

Journals: SIAM Journal on Scientific Computing (SISC); SIAM Journal on Matrix Analysis and Applications (SIMAX); Acta Materialia; PLOS One; Journal of Machine Learning Research; IEEE Transactions on Signal Processing; IEEE Transactions on Image Porcessing; Signal Processing Letters, IEEE Transactions on Information Theory; Electronic Transactions on Numerical Analysis ; IEEE Transactions on Signal and Information Processing over Networks; BIT Numerical Mathematics; Linear Algebra and Its Applications; Journal of Mathematics and Applications, Mathematical Modeling and Analysis; Journal of Imaging.

Programming skills

Python, Pytorch, Matlab, C, C++, LATEX, Basic web programming.