Tushar M. Athawale

http://tusharathawale.info | athawaletm@ornl.gov | Google Scholar Profile

Research Interest

Data visualization, statistical uncertainty quantification and visualization, topological data analysis, visualizations for large-scale/high-dimensional data, in situ computing and analysis, data science

Research and Work Experience

Oak Ridge National Laboratory, Oak Ridge, TN **Nov 2021 - Present**
Computer Scientist in visualization group. Research in uncertainty visualization and high performance computing for analysis of large-scale scientific data.

University of Tennessee, Knoxville, TN **Aug 2023 - Present**
Joint Faculty Assistant Professor in the Department of Electrical Engineering and Computer Science (EECS). Writing proposal grants and academic collaboration.

SCI Institute, University of Utah, Salt Lake City, UT **Oct 2016 - Oct 2021**
Postdoctoral Fellow advised by Distinguished Prof. Dr. Chris R. Johnson. Research in statistical uncertainty quantification and visualization for scientific data with applications ranging from biomedical imaging to large-scale simulations.
Co-Instructor for "Scientific Visualization" class in Spring 2018 and Spring 2019.
Co-Instructor for "Decomposition-Based Techniques in Data Analysis" class in Spring 2017.
Seminar Leader for visualization research seminars in two semesters.

MathWorks, Inc., Natick, MA **July 2015 - Oct 2016**
Application Support Engineer in Engineering Development Group (EDG). Technical support for MATLAB software users, lead contributor to software development of the in-built MATLAB function "IMROTATE3" for rotation of 3D volumes, interviewer for EDG applicants.

University of Florida, Gainesville, FL **May 2011 - May 2015**
Research Assistant advised by Prof. Dr. Alireza Entezari in the Department of Computer and Information Science and Engineering (CISE). Research in uncertainty quantification of isosurface visualizations for reliable data representation and analysis.
Teaching Assistant for graduate- and undergraduate-level courses on Computer Graphics, Advanced Data Structures, and Programming Fundamentals for CIS Majors 1.

Nvidia Corporation, Pune, India **Aug 2009 - May 2010**
Software Engineering Intern. Study of the screen space ambient occlusion (SSAO) algorithm and embedding of game-specific SSAO profiles into the Nvidia graphics drivers.

Education

Doctor of Philosophy (PhD) in Computer Engineering **May 2010 - May 2015**
University of Florida, Gainesville, FL
Dissertation: Quantification and visualization of spatial uncertainty in isosurfaces for parametric and nonparametric noise models [Abstract]
Advisor: Prof. Alireza Entezari
GPA: 3.75/4.00 (highest distinction)

Master of Science (MS) in Computer Engineering **May 2010 - May 2014**
University of Florida, Gainesville, FL
Coursework: Analysis of Algorithms, Advanced Data Structures, Computer Graphics, GPU Architecture and Programming, Machine Learning
GPA: 3.75/4.00 (highest distinction)

Bachelor of Engineering (BE) in Computer Engineering **May 2006 - May 2010**
University of Pune, Pune, India
GPA: 8.81/10.00 (highest distinction)

Funded Research

U.S. Department of Energy (DOE) Early Career Award **2025-2030**

PI: Tushar M. Athawale

Award Amount: $2,750,000

Title: *VisTrust: Probabilistic Visualization of Univariate and Multivariate Scalar Data for Trusted Scientific Analysis and Discovery.* [Abstract]

Peer-Reviewed Journal Publications

1. **Tushar M. Athawale**, Kenneth Moreland, David Pugmire, Chris R. Johnson, Paul Rosen, Matthew Norman, Antigoni Georgiadou, and Alireza Entezari, "MAGIC: Marching Cubes Isosurface Uncertainty Visualization for Gaussian Uncertain Data with Spatial Correlation". To Appear in *IEEE Transactions on Visualization and Computer Graphics*, 2026. [doi] [pdf] [code]

2. Xiao Xue, **Tushar M. Athawale**, Jon W. S. McCullough, Sharp C. Y. Lo, Ioannis Zacharoudiou, Bálint Joó, Antigoni Georgiadou, and Peter V. Coveney, "An Uncertainty Visualization Framework for Large-Scale Cardiovascular Flow Simulations: A Case Study on Aortic Stenosis". To Appear in *Journal of Computational Science*, 2026. [pdf]

3. Tark Patel, **Tushar M. Athawale**, Timbwaoga A. J. Ouermi, and Chris R. Johnson, "Fast HARDI Uncertainty Quantification and Visualization with Spherical Sampling". *Computer Graphics Forum (CGF)*, Special Issue on 2025 EuroVis Conference (Luxembourg city, Luxembourg), vol. 44, no. 3, e70138, 2025. [doi] [pdf] [**Acceptance rate:** 46/167 = **27%**]

4. **Tushar M. Athawale**, Zhe Wang, David Pugmire, Kenneth Moreland, Qian Gong, Scott Klasky, Chris R. Johnson, and Paul Rosen, "Uncertainty Visualization of Critical Points of 2D Scalar Fields for Parametric and Nonparametric Probabilistic Models". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2024 IEEE VIS Conference (*Florida, USA*), vol. 31, no. 1, pp. 108-118, 2025. [doi] [pdf] [code] [**Acceptance rate:** 124/557 = **22.26%**]

5. Kenneth Moreland, **Tushar M. Athawale**, Vicente Bolea, Mark Bolstad, Eric Brugger, Hank Childs, Axel Huebl, Li-Ta Lo, Berk Geveci, Nicole Marsaglia, Sujin Philip, David Pugmire, Silvio Rizzi, Zhe Wang, and Abhishek Yenpure, "Visualization at Exascale: Making It All Work with VTK-m". *The International Journal of High Performance Computing Applications,* vol. 38, no. 5, pp. 508-526, 2024. [doi]

6. **Tushar M. Athawale**, Bryan Triana, Tanmay Kotha, David Pugmire, and Paul Rosen, "A Comparative Study of the Perceptual Sensitivity of Topological Visualizations to Feature Variations". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2023 IEEE VIS Conference (Melbourne, Australia), vol. 30, no. 1, pp. 1074-1084, 2024. [doi] [pdf] [**Acceptance rate:** 133/539 = **24.68%**]

7. **Tushar M. Athawale**, Chris R. Johnson, Sudhanshu Sane, and David Pugmire, "Fiber Uncertainty Visualization of Bivariate Data with Parametric and Nonparametric Noise Models". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2022 IEEE VIS Conference (Oklahoma, USA), vol. 29, no. 1, pp. 613-623, 2023. [doi] [pdf] [**Acceptance rate:** 122/460 = **26.5%**]

8. Dennis Njeru, **Tushar M. Athawale,** Jessie France, and Chris R. Johnson, "Quantifying and Visualizing Uncertainty for Source Localization in Electrocardiographic Imaging", *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization,* vol. 11, no. 3, pp. 812-822, 2023. [doi] [pdf]

9. **Tushar M. Athawale**, Dan Maljovec, Lin Yan, Chris R. Johnson, Valerio Pascucci, and Bei Wang, "Uncertainty Visualization of 2D Morse Complex Ensembles Using Statistical Summary Maps". *IEEE Transactions on Visualization and Computer Graphics*, vol. 28, no. 4, pp. 1955-1966, 2022. [doi] [pdf]

10. **Tushar M. Athawale**, Bo Ma, Elham Sakhaee, Chris R. Johnson, and Alireza Entezari, "Direct Volume Rendering with Nonparametric Models of Uncertainty". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2020 IEEE VIS Conference (Virtual), vol. 27, no. 2, pp. 1797-1807, 2021. [doi] [pdf] [**Acceptance rate:** 32/125 = **25.6%**]

11. **Tushar M. Athawale** and Chris R. Johnson, "Probabilistic Asymptotic Decider for Topological Ambiguity Resolution in Level-Set Extraction for Uncertain 2D Data". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2018 IEEE VIS Conference (Berlin, Germany), vol. 25, no. 1, pp. 1163-1172, 2019.[doi] [pdf] [code] [**Acceptance rate:** 32/128 = **25%**]

12. **Tushar M. Athawale**, Kara A. Johnson, Chris R. Butson, and Chris R. Johnson, "A Statistical Framework for Quantification and Visualization of Positional Uncertainty in Deep Brain Stimulation Electrodes". *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization,* vol. 7, no. 4, pp. 438-449, 2019. [doi] [pdf] [code]

13. **Tushar M. Athawale**, Elham Sakhaee, and Alireza Entezari, "Isosurface Visualization of Data with Nonparametric Models for Uncertainty". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2015 IEEE VIS Conference (Chicago, USA), vol. 22, no. 1, pp. 777-786, 2016. [doi] [pdf] [code] [**Acceptance rate:** 33/134 = **24.60%**]

14. **Tushar M. Athawale** and Alireza Entezari, "Uncertainty Quantification in Linear Interpolation for Isosurface Extraction". *IEEE Transactions on Visualization and Computer Graphics*, Special Issue on 2013 IEEE VIS Conference (Atlanta, USA), vol. 19, no. 12, pp. 2723-2732, 2013. [doi] [pdf] [code] [**Acceptance rate:** 34/126 = **27%**]

Conference/Symposium Publications

1. Shanu Saklani, **Tushar M. Athawale**, Nairita Pal, David Pugmire, Chris R. Johnson, and Soumya Dutta, "REV-INR: Regularized Evidential Implicit Neural Representation for Uncertainty-Aware Volume Visualization". To appear in *IEEE PacificVis 2026,* Sydney, Australia, 2026. [pdf]

2. Qian Gong, Mark Ainsworth, Jieyang Chen, Xin Liang, Liangji Zhu, Ethan Klasky, **Tushar M. Athawale**, Qing Liu, Anand Rangarajan, Sanjay Ranka, and Scott Klasky, "Stability-Preserving Lossy Compression for Large-Scale Partial Differential Equations". *Supercomputing Conference 2025,* Saint Louis, USA, 2025. [doi] [pdf] [**Acceptance rate:** 136/640 = **21.2%**]

3. Daoce Wang, Pascal Grosset, Jesus Pulido, Jiannan Tian, **Tushar M. Athawale**, Jinda Jia, Baixi Sun, Boyuan Zhang, Sian Jin, Kai Zhao, James Ahrens, and Fengguang Song, "STZ: A High Quality and High Speed Streaming Lossy Compression Framework for Scientific Data". *Supercomputing Conference 2025,* Saint Louis, USA, 2025. [doi] [pdf] [code] [**Acceptance rate:** 136/640 = **21.2%**]

4. Priyabrata Senapati, Qiang Guan, David Pugmire, Cheng-Chang Lu, and **Tushar M. Athawale**, "Visualization of Noisy and Less Noisy Computational Basis States in Quantum Computing". *IEEE QSW 2025,* Helsinki, Finland, pp. 12-21, 2025. [doi] [pdf] [code] [**Acceptance rate:** 16/70 = **22.86%**]

5. Daoce Wang, Pascal Grosset, Jesus Pulido, **Tushar M. Athawale**, Jiannan Tian, Kai Zhao, Zarija Lukić, Axel Huebl, Zhe Wang, James Ahrens, and Dingwen Tao, "A High-Quality Workflow for Multi-Resolution Scientific Data Reduction and Visualization". *Supercomputing Conference 2024,* Atlanta, USA, pp. 1-18, 2024. [doi] [pdf] [code] [**Acceptance rate:** 102/449 = **22.7%**]

6. Qian Gong, Zhe Wang, Viktor Reshniak, Xin Liang, Jieyang Chen, Qian Liu, **Tushar M. Athawale**, Yi Ju, Anand Rangarajan, Sanjay Ranka, Rick Archibald, and Scott Klasky, "A General Framework for Error-Controlled Unstructured Scientific Data Compression". *IEEE International Conference on e-Science*, Osaka, Japan, pp. 1-10, 2024. [doi] [pdf] [code] [**Acceptance rate:** 30/76 = **39.4%**]

7. Priyabrata Senapati, Samuel Yen-Chi Chen, Bo Fang, **Tushar M. Athawale**, Ang Li, Weiwen Jiang, Cheng-Chang Lu, and Qiang Guan, "PQML: Enabling the Predictive Reproducibility on NISQ Machines for Quantum ML Applications," *2024 IEEE International Conference on Quantum Computing and Engineering (QCE)*, Montreal, Canada, pp. 1413-1424, 2024. [doi] [**Acceptance rate:** 222/460 = **48%**]

8. **Tushar M. Athawale**, Zhe Wang, Chris R. Johnson, and David Pugmire, "Data-Driven Computation of Probabilistic Marching Cubes for Efficient Uncertainty Visualization of Level-Sets". *EuroVis 2024: Short Papers,* Odense, Denmark, 2024. [doi] [pdf] [code] [**Acceptance rate:** 18/46 = **39%**]

9. Zhe Wang*, **Tushar M. Athawale***, Kenneth Moreland*, Jieyang Chen, Chris R. Johnson, and David Pugmire, "FunMC^2: A Filter for Uncertainty Visualization of Marching Cubes on Multi-Core Devices". *In Eurographics Symposium on Parallel Graphics and Visualization (EGPGV) co-held with EuroVis 2023,* Leipzig, Germany, 2023. [doi] [pdf] [code] [* These authors contributed equally to the paper]

10. Mengjiao Han, **Tushar M. Athawale**, David Pugmire, and Chris R. Johnson, "Accelerated Probabilistic Marching Cubes by Deep Learning for Time-Varying Scalar Ensembles". *IEEE VIS 2022: Short Papers,* Oklahoma City, USA, pp. 155-159, 2022. [doi] [pdf] [code] [**Acceptance rate:** 33/104 = **32%**]

11. **Tushar M. Athawale**, Sudhanshu Sane, and Chris R. Johnson, "Uncertainty Visualization of the Marching Square and Marching Cubes Topology Cases". *IEEE VIS 2021,* New Orleans, LA, USA (Virtual), pp. 106-110, 2021. [doi] [pdf] [code] [**Acceptance rate:** 41/142 = **29%**]

12. Sudhanshu Sane, **Tushar M. Athawale**, and Chris R. Johnson, "Visualization of Uncertain Multivariate Data via Feature Confidence Level-Sets". *EuroVis 2021: Short Papers,* Eurographics Association, Zurich, Switzerland (Virtual), 2021. [doi] [pdf] [**Acceptance rate:** 20/45 = **44%**]

Workshop Papers/Posters

1. Kenneth Moreland, Jefferson Amstutz, **Tushar M. Athawale**, Vicente Bolea, Mark Bolstad, Hank Childs, Berk Geveci, Cyrus Harrison, Matthew Larsen, Li-Ta Lo, Nicole Marsaglia, Manish Mathai, David Pugmire, Silvio Rizzi, Spiros Tsalikis, and Gunther H. Weber, "Viskores: Integrating Parallel Scientific Visualization Research into Applications". To Appear in *VisGap 2026 - The Gap between Visualization Research and Visualization Software,* Nottingham, UK, 2026. [pdf] [code]

2. Timbwaoga A. J. Ouermi, Eric Li, Kenneth Moreland, David Pugmire, Chris R. Johnson, and **Tushar M. Athawale**, "Efficient Probabilistic Visualization of Local Divergence of 2D Vector Fields with Independent Gaussian Uncertainty". *2025 IEEE Workshop on Uncertainty Visualization: Unraveling Relationships of Uncertainty, AI, and Decision-Making,* Vienna, Austria, pp. 12-16, 2025.
[doi] [pdf] [code] [**Best Paper Award]**

3. Sefat Rahman, **Tushar M. Athawale**, and Paul Rosen, "GASP: Gradient-Aware Shortest Path Algorithm for Boundary-Confined 3D Reeb Graph Visualization". *2025 IEEE Workshop on Topological Data Analysis and Visualization (TopoInVis),* Vienna, Austria, 2025. [doi] [pdf] [code]

4. David Pugmire, Kenneth Moreland, and **Tushar M. Athawale**, Jian Huang, "Top Research Challenges and Opportunities for Near Real-Time Extreme-Scale Visualization". *The 1st International Workshop on Near Real-Time Data Processing for Interconnected Scientific Instruments in Conjuction with 2024 IEEE 20th Conference on e-Science,* Osaka, Japan, pp. 1-6, 2024. [doi] [pdf]

5. Antigoni Georgiadou, Henry Monge-Camacho, Tanvir Sohail, Swarnava Ghosh, Arjun Valiya Parambathu, Dilipkumar Asthagiri, Dmytro Bykov, **Tushar M. Athawale**, and Thomas Beck "Ensemble Simulations on Leadership Computing Systems". *Second Workshop on Enabling Predictive Science With Optimization and Uncertainty Quantification in HPC co-held with Supercomputing Conference 2024,* Atlanta, USA, pp. 394-401, 2024. [doi]

6. Sefat Rahman, **Tushar M. Athawale**, and Paul Rosen, "GASP: A Gradient-Aware Shortest Path Algorithm for Boundary-Confined Visualization of 3D Reeb Graphs". *IEEE VIS 2024: Posters,* St Pete Beach, FL, USA, 2024.

7. Gautam Hari, Nrushad Joshi, Zhe Wang, David Pugmire, Kenneth Moreland, Chris R. Johnson, and **Tushar M. Athawale**, "Developing Efficient Multivariate Surface Uncertainty Visualization Algorithms Using VTK-m Software", *2024 ORNL Software and Data Expo*, Oak Ridge, TN, USA, 2024.
[**Best Poster Award** among 36 posters]

8. Gautam Hari, Nrushad Joshi, Zhe Wang, Qian Gong, David Pugmire, Kenneth Moreland, Chris R. Johnson, Scott Klasky, Norbert Podhorszki, and **Tushar M. Athawale**, "FunM²C: A Filter for Uncertainty Visualization of Multivariate Data on Multi-Core Devices". *2024 IEEE Workshop on Uncertainty Visualization: Applications, Techniques, Software, and Decision Frameworks,* St. Pete Beach, FL, USA, pp. 43-47, 2024. [doi] [pdf] [**Best Paper Honorable Mention]**

9. Mengjiao Han, **Tushar M. Athawale**, Jixian Li, Chris R. Johnson, "Accelerated Depth Computation for Surface Boxplots with Deep Learning". *2024 IEEE Workshop on Uncertainty Visualization: Applications, Techniques, Software, and Decision Frameworks,* St. Pete Beach, FL, USA, pp. 38-42, 2024. [doi] [pdf] [code] [**Best Paper Honorable Mention]**

10. Shanu Saklani, Chitwan Goel, Shrey Bansal, Zhe Wang, Soumya Dutta, **Tushar M. Athawale**, David Pugmire, and Chris R. Johnson, "Uncertainty-Informed Volume Visualization using Implicit Neural Representation". *2024 IEEE Workshop on Uncertainty Visualization: Applications, Techniques, Software, and Decision Frameworks,* St. Pete Beach, FL, USA, pp. 62-72, 2024. [doi] [pdf]

11. Timbwaoga A. J. Ouermi, Jixian Li, **Tushar M. Athawale**, Chris R. Johnson, "Estimation and Visualization of Uncertainty from Linear and High-Order Interpolation Methods". *2024 IEEE Workshop on Uncertainty Visualization: Applications, Techniques, Software, and Decision Frameworks,* St. Pete Beach, FL, USA, pp. 51-61, 2024. [doi] [pdf]

12. Robert Sisneros, **Tushar M. Athawale**, David Pugmire, and Kenneth Moreland, "An Entropy-Based Test and Development Framework for Uncertainty Modeling in Level-Set Visualizations". *2024 IEEE Workshop on Uncertainty Visualization: Applications, Techniques, Software, and Decision Frameworks,* St. Pete Beach, FL, USA, pp. 78-83, 2024. [doi] [pdf]

13. **Tushar M. Athawale**, David Pugmire, Chris R. Johnson, Kenneth Moreland, Paul Rosen, Antigoni Georgiadou, and Tom Beck, "Uncertainty-Informed Approximate Computing for Energy-Efficient Visualization of Large Data". *U.S. DOE ASCR Workshop on Energy-Efficient Computing for Science,* Bethesda, MD, USA, 2024. [pdf]

14. David Pugmire, Jong Y. Choi, Scott Klasky, Kenneth Moreland, Eric Suchyta, **Tushar M. Athawale**, Zhe Wang, Choongseok Chang, Seung-Hoe Ku, and Robert Hager, "Performance Improvements of Poincaré Analysis for Exascale Fusion Simulations". *VisGap - The Gap between Visualization Research and Visualization Software, Eurographics Association,* Odense, Denmark, 2024. [doi] [pdf]

15. Priyabrata Senapati, **Tushar M. Athawale**, David Pugmire, and Qiang Guan, "Scalable Visualization of Noisy and Non-Noisy Basis States in Quantum Computing". *U.S. DOE ASCR Workshop on Basic Research Needs on Quantum Computing and Networking,* Gaithersburg, USA, 2023. [pdf]

16. Priyabrata Senapati, **Tushar M. Athawale**, David Pugmire, and Qiang Guan, "Advancing Comprehension of Quantum Application Outputs: A Visualization Technique". *QCCC-23: The Second International Workshop on Quantum Classical Cooperative Computing co-held with ACM HPDC 2023,* Orlando, USA, pp. 25-28, 2023. [doi] [pdf]

17. **Tushar M. Athawale**, David Pugmire, Chris R. Johnson, Kenneth Moreland, Dan Lu, Jieyang Chen, James Kress, Scott Klasky, and Manish Parashar, "Uncertainty-Aware Scientific Data Visualization for Trusted Decision-Making". *U.S. DOE ASCR Workshop on Visualization for Scientific Discovery, Decision-Making, & Communication* (Virtual), 2022. [doi] [pdf]

18. David Pugmire, Kenneth Moreland, James Kress, Jieyang Chen, **Tushar M. Athawale**, Scott Klasky, and Hank Childs, "Efficient Visualization on Complex Distributed Resources". *U.S. DOE ASCR Workshop on Visualization for Scientific Discovery, Decision-Making, & Communication* (Virtual), 2022. [doi] [pdf]

19. Sudhanshu Sane, **Tushar M. Athawale**, and Chris R. Johnson, Investigating Multivariate, Vector, and "Topological Data Analysis Techniques for Mantle Flow Pattern Visualization". *2021 IEEE SciVis Contest,* New Orleans, USA (Virtual), 2021. [pdf] **[IEEE VIS 2021 SciVis Contest Finalist]**

20. **Tushar M. Athawale***, Brooke Stanislawski*, Sudhanshu Sane, and Chris R. Johnson, "Visualizing Interactions Between Solar Photovoltaic Farms and the Atmospheric Boundary Layer". *e-Energy'21:*

Proceedings of the Twelfth International Conference on Future Energy Systems, Torino, Italy (Virtual). ACM, New York, USA, pp. 377-381, 2021. [doi] [pdf] [**Acceptance rate:** 14/18 = **77.7%**] [* The authors contributed equally to the paper]

21. **Tushar M. Athawale**, Alireza Entezari, Bei Wang, and Chris R. Johnson, Statistical Rendering for Visualization of Red Sea Eddy Simulation Data. *2020 IEEE SciVis Contest*, Salt Lake City, USA (Virtual) Oct 2020. [pdf] **[IEEE VIS 2020 Scientific Visualization Contest Finalist]**

22. **Tushar M. Athawale**, Kara A. Johnson, Chris R. Butson, and Chris R. Johnson, "A Statistical Framework for Visualization of Positional Uncertainty in Deep Brain Stimulation Electrodes". *2019 IEEE Workshop on Visual Analytics in Healthcare (VAHC)*, Vancouver, Canada, pp. 54-55, Oct 2019. [doi] [pdf] [code]

Published Books

1. Debabala Swain, Prasant Kumar Pattnaik, and **Tushar M. Athawale** (Eds.), "Machine Learning and Information Processing, Proceedings of ICMLIP 2020". *Advances in Intelligent Systems and Computing 1311, Springer Singapore*, 2021. [doi]

Awards

1. **Best Paper Award** at 2025 IEEE Uncertainty Visualization Workshop for paper "*Efficient Probabilistic Visualization of Local Divergence of 2D Vector Fields with Independent Gaussian Uncertainty*".

2. **2024 Special Award** from Oak Ridge National Laboratory's Computational Science and Mathematics Division (CSMD) for two first-authored journal papers, "*A Comparative Study of Perceptual Sensitivity of Topological Visualizations to Feature Variations*" and "*Uncertainty Visualization of Critical Points of 2D Scalar Fields for Parametric and Nonparametric Probabilistic Models*", published in *IEEE Transactions on Visualization and Computer Graphics*.

3. **Best Poster Award** at the ORNL Software and Data Expo (OSDX) 2024 for poster "Developing Efficient Multivariate Surface Uncertainty Visualization Algorithms Using VTK-m Software".

4. **Best Paper Honorable Mention** at 2024 IEEE Uncertainty Visualization Workshop for papers "*Accelerated Depth Computation for Surface Boxplots with Deep Learning*" and "*FunM2C: A Filter for Uncertainty Visualization of Multivariate Data on Multi-Core Devices*".

Professional Services and Leadership

- **Associate Editor** for the IEEE Transactions on Visualization and Computer Graphics (TVCG) journal
- **Program Chair** for the IEEE VIS conference (2025-2026)
- **General Chair** for 2024, 2025, and 2026 IEEE Uncertainty Visualization workshops
- **Co-Chair** of the "Workshop on Enabling Predictive Science with Optimization and UQ in HPC" co-held with HPCAsia 2026
- **Organizer** of the tutorial on "VTK-m - A ToolKit for Scientific Visualization on Many-Core Processors" held at the IEEE VIS 2022 tutorial track
- **Program Committee** member for EuroVis 2023, 2024, 2025 posters and 2025, 2026 short papers
- **Program Committee** member for IEEE VIS 2025, 2026 full and 2020, 2021, 2022, 2024 short papers
- **Program Committee** member for Eurographics 2026 short papers
- **Program Committee** member the IEEE TopoInVis 2022 and 2026 workshops
- **Dissertation Committee** member for a Ph.D. candidate, Sefat Rahman, at the University of Utah
- **Reviewer** for IEEE VIS (2013, 2017-2024), EuroVis (2017-2019, 2021-2023), PacificVis (2023-2024), China Visualization (2020), and e-Science (2025) conferences
- **Reviewer** for IEEE Transactions on Visualization and Computer Graphics (TVCG), Computer Graphics Forum (CGF), Computers & Graphics (C&G), Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualizations (CMBBE), Computer Graphics & Applications (CG&A), Displays, Journal of Big Data, and Visual Computer
- **Poster reviewer** for undergraduate student posters presented at the Undergraduate Research Symposium in 2018 and 2019
- **Student volunteer** at the IEEE VIS 2013 conference

Teaching

CS6635/5635 - Visualization for Scientific Data, University of Utah **2018, 2019**
Co-instructor with Distinguished Prof. Dr. Chris R. Johnson. Conducting graduate-level lectures on data visualization, ParaView software, and uncertainty visualization. Development and grading of course assignments and projects. Helping students successfully meet their project milestones.

CS6962 - Decomposition Techniques for Computational Data-Enabled Science and Engineering, University of Utah **2017**
Co-instructor with Distinguished Prof. Dr. Chris R. Johnson. Conducting graduate-level lectures on data decomposition techniques, such as principal component analysis and singular value decomposition. Development and grading of course assignments and projects. Helping students successfully meet their project milestones.

CAP 4730, CAP 5705 - Computer Graphics, University of Florida **2012, 2014**
Teaching Assistant for Prof. Dr. Alireza Entezari. Graduate- and undergraduate-level class. Grading of lab assignments and projects. Helping students in problem solving.

COP 5536 - Advanced Data Structures, University of Florida **2011, 2015**
Teaching Assistant for Distinguished Prof. Dr. Sartaj Sahni. Graduate-level class. Grading of lab assignments and projects. Helping students in problem solving.

COP 3502 - Programming Fundamentals for CIS Majors 1, University of Florida **2013**
Teaching Assistant for Dr. Peter J. Dobbins. Undergraduate-level class. Conducting student labs on Java programming language and grading lab assignments.

Mentored Students

Nrushad Joshi, Gautam Hari, and Eric Li, Indiana University Bloomington
Interns *(Summer, 2023-2025)* enrolled in the Summer Undergraduate Laboratory Internship (SULI) program at ORNL. I have mentored interns in creating innovative uncertainty visualization algorithms for scalar and vector field data using the Viskores (previously known as VTK-m) parallel visualization library. The relevant poster received the **best poster award** at the *ORNL Software and Data Expo 2024* event, and the relevant papers received the **best paper award** at the *2025 IEEE Uncertainty Visualization Workshop* and **best paper honorable mention** at the *2024 IEEE Uncertainty Visualization Workshop*.

Brooke Stanislawski, Wind, Energy & Turbulence Lab, University of Utah
A student in my *Visualization for Scientific Data (Spring, 2019)* class. I have mentored Brooke to get her class project published in the *EnergyVis 2021* conference. This project is about developing 3D visualizations for the simulation data modeling interactions between solar photovoltaic farms and atmospheric boundary layer.

Dennis Njeru, SCI Institute, University of Utah
A student in my *Visualization for Scientific Data (Spring, 2019)* class. I have mentored Dennis with Dr. Johnson to help him get his research published in the *Computer Methods in Biomechanics and Biomedical Engineering: Imaging and Visualization* (*CMBBE*) journal. This project is about developing uncertainty visualizations for the simulation data generated in the domain of Electrocardiography Imaging (ECGI).

Research Presentations

Paper presentation at Supercomputing 2025, St. Louis, MO, USA **Nov 2025**
Stability-Preserving Lossy Compression for Large-Scale Partial Differential Equations [slides]

Paper presentation at Supercomputing 2025, St. Louis, MO, USA **Nov 2025**
STZ: A High-Quality and High-Speed Streaming Lossy Compression Framework for Scientific Data [slides]

Paper presentation at 2025 IEEE Uncertainty Visualization, Vienna, Austria **Nov 2025**
Efficient Probabilistic Visualization of Local Divergence of 2D Vector Fields with Independent Gaussian Uncertainty [slides]

Paper presentation at 2025 IEEE TopoInVis, Vienna, Austria **Nov 2025**
GASP: Gradient-Aware Shortest Path Algorithm for Boundary-Confined 3D Reeb Graph Visualization [slides]

Paper presentation at EuroVis 2025, Luxembourg City, Luxembourg **June 2025**
Fast HARDI Uncertainty Quantification and Visualization with Spherical Sampling [slides]

Invited talk at University of Oklahoma, Norman, OK, USA (Virtual) **Feb 2025**
Uncertainty Visualization of 2D/3D Scientific Data for Trusted Analysis and Decision-Making [slides]

Paper presentation at Supercomputing 2024, Atlanta, GA, USA **Nov 2024**
A High-Quality Workflow for Multi-Resolution Scientific Data Reduction and Visualization. [slides]

Paper presentation at IEEE VIS 2024, St. Pete Beach, FL, USA **Oct 2024**
Uncertainty Visualization of Critical Points of 2D Scalar Fields for Parametric and Nonparametric Probabilistic Models. [slides]

Paper presentation at 2024 IEEE Uncertainty Visualization, St. Pete Beach, FL, USA **Oct 2024**
FunM^{2}C: A Filter for Uncertainty Visualization of Multivariate Data on Multi-Core Devices [slides]

Invited talk at Indian Institute of Technology, Kanpur, India **Aug 2024**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides]

Technical talk at DOE CGF, Savannah, GA, USA **Apr 2024**
Uncertainty Visualization of 2D/3D Scientific Data for Trusted Analysis and Decision-Making [slides]

Technical talk at RAPIDS2 SciDAC Institute, Virtual **Jan 2024**
A Comparative Study of the Perceptual Sensitivity of Topological Visualizations to Feature Variations. [slides]

Paper presentation at IEEE VIS 2023, Melbourne, Australia **Oct 2023**
A Comparative Study of the Perceptual Sensitivity of Topological Visualizations to Feature Variations. [slides]

Paper presentation at QCCC 2023, Orlando, FL, USA **June 2023**
Advancing Comprehension of Quantum Application Outputs: A Visualization Technique [slides]

Paper presentation at EGPGV 2023, Leipzig, Germany **June 2023**
FunMC^2: A Filter for Uncertainty Visualization of Marching Cubes on Multi-Core Devices [slides]

Paper presentation at IEEE VIS 2022, Oklahoma City, OK, USA (Hybrid) **Oct 2022**
Fiber Uncertainty Visualization for Bivariate Data With Parametric and Nonparametric Noise Models [slides]

Paper presentation at IEEE VIS 2022, Oklahoma City, OK, USA (Hybrid) **Oct 2022**
Accelerated Probabilistic Marching Cubes by Deep Learning for Time-Varying Ensembles [slides]

Technical talk at IU PTI-ORNL Joint Symposium, Bloomington, IN, USA — **Sept 2022**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides]

Technical talk at DOE CGF, Eugene, OR, USA (Virtual) — **Aug 2022**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides]

Technical talk at Dagstuhl Seminar on Visualization and Decision Making Design Under Uncertainty, Dagstuhl, Germany (Virtual) — **Aug 2022**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides]

Invited talk at IEEE VIS 2021, New Orleans, LA, USA (Virtual) — **Oct 2021**
Uncertainty Visualization of Marching Squares and Marching Cubes Topology Cases [slides] [video]

Invited talk at IEEE VIS 2021 Application Spotlights, New Orleans, LA, USA (Virtual) — **Oct 2021**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides] [video]

Paper presentation at EuroVis 2021, Zurich, Switzerland (Virtual) — **June 2021**
Visualization of Uncertain Multivariate Data via Feature Confidence Level-Sets [slides]

Paper presentation at EnergyVis 2021, Torino, Italy (Virtual) — **June 2021**
Visualizing Interactions Between Solar Photovoltaic Farms and the Atmospheric Boundary Layer [slides]

Invited talk at University of South Florida (USF), Tampa, FL, USA (Virtual) — **June 2021**
Statistical Analysis for Uncertainty Quantification and Visualization of Ensemble/ Large-Scale Data [slides]

Invited talk at ICMLIP 2020, Hyderabad, India (Virtual) — **Nov 2020**
Applications of Uncertainty Visualization for Analysis of Scientific Data [slides]

Paper presentation at IEEE VIS 2020, Salt Lake City, UT (Virtual) — **Oct 2020**
Direct Volume Rendering with Nonparametric Models of Uncertainty [slides] [video]

Paper presentation at IEEE VIS 2020, Salt Lake City, UT (Virtual) — **Oct 2020**
Uncertainty Visualization of 2D Morse Complex Ensembles Using Statistical Summary Maps [slides] [video]

Paper and poster presentations at IEEE SciVis Contest 2020, Salt Lake City, UT (Virtual) — **Oct 2020**
Statistical Rendering for Visualization of Red Sea Eddy Simulation Data [slides] [video] [poster]

Keynote speaker at ICMLIP 2019, Pune, India — **Dec 2019**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides]

Invited talk at Indian Institute of Science (IISc), Bengaluru, India — **Nov 2019**
Statistical Analysis for Uncertainty Quantification and Visualization of Scientific Data [slides]

Invited talk on a poster at 2019 IEEE Workshop on Visual Analytics in Healthcare (VAHC), Vancouver, BC, Canada — **Oct 2019**
A Statistical Framework for Visualization of Positional Uncertainty in Deep Brain Stimulation Electrodes [poster]

Invited talk at Oak Ridge National Laboratory (ORNL), Oak Ridge, TN, USA **May 2019**
Statistical Analysis for Uncertainty Quantification and Visualization of Ensemble/ Large-Scale Data [slides]

Invited talk at Los Alamos National Laboratory (LANL), Los Alamos, NM, USA **Dec 2018**
Statistical Analysis for Quantification and Visualization of Spatial Variability in Features of Uncertain Data [slides]

Paper presentation at IEEE SciVis 2018, Berlin, Germany **Oct 2018**
Probabilistic Asymptotic Decider for Topological Ambiguity Resolution in Level-Set Extraction for Uncertain 2D Data [slides] [video]

Paper presentation at IEEE SciVis 2015, Chicago, IL, USA **Oct 2015**
Isosurface Visualization of Data with Nonparametric Models for Uncertainty [slides]

Paper presentation at IEEE SciVis 2013, Atlanta, GA, USA **Oct 2013**
Uncertainty Quantification in Linear Interpolation for Isosurface Extraction [slides]