Tushar M. Athawale

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Research Interest

Data visualization, statistical uncertainty 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 (ORNL), Oak Ridge, TN   **Nov 2021 - Present**
Computer Scientist in the visualization group. Research in uncertainty visualization and high performance computing for analysis of large-scale scientific data.
Joint Faculty Assistant Professor in the Department of Electrical Engineering and Computer Science at University of Tennessee, Knoxville, Aug 2023-Present

University of Utah, Salt Lake City, UT   **Oct 2016 - Oct 2021**
Post-Doctoral Fellow in the scientific visualization group supervised by Distinguished Prof. Dr. Chris R. Johnson at the Scientific Computing and Imaging (SCI) Institute. Research in statistical uncertainty quantification and visualization for scientific data with applications ranging from biomedical imaging to large-scale simulations.
Co-Instructor, Scientific Visualization, Spring 2018 and Spring 2019.
Co-Instructor, Decomposition-Based Techniques in Data Analysis, Spring 2017.
Seminar Leader, scheduling weekly SCI Institute *visualization research seminars* for two semesters.

MathWorks, Inc., Natick, MA   **July 2015 - Oct 2016**
Application Support Engineer, resolution of complex technical issues experienced by the MATLAB users. Lead contributor to the design and implementation of the in-built MATLAB function IMROTATE3 introduced in the R2017a MATLAB release for the rotation of 3D volumes. Conducting technical interviews for the Application Support Engineering role.

University of Florida, Gainesville, FL   **May 2011 - May 2015**
Research Assistant in the visualization group led 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 the 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, the study of the screen space ambient occlusion (SSAO) algorithm and embedding of game-specific SSAO profiles into the Nvidia drivers for video games, such as Gears of War.

Education

Doctor of Philosophy (PhD) in Computer and Information Science
and 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 [link]
Advisor: Prof. Alireza Entezari
Graduated with highest distinction, GPA: 3.75/4.00

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

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

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 and Gautam Hari, Indiana University Bloomington
Interns *(Summer, 2023 and 2024)* enrolled in the Summer Undergraduate Laboratory Internship (SULI) program at ORNL. I have mentored Nrushad and Gautam in developing novel uncertainty visualization algorithms for univariate and multivariate data using the VTK-m parallel visualization library. The relevant poster received the **best poster award** at the <u>ORNL Software and Data Expo 2024</u> event, and the relevant paper received the **best paper honorable mention** at the <u>2024 IEEE Uncertainty Visualization Workshop</u>.

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 <u>EnergyVis 2021</u> 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* (<u>CMBBE</u>) journal. This project is about developing uncertainty visualizations for the simulation data generated in the domain of Electrocardiography Imaging (ECGI).

Peer-Reviewed Journal Publications

1. Tark Patel, **Tushar M. Athawale**, Timbwaoga A. J. Ouermi, and Chris R. Johnson, "Fast HARDI Uncertainty Quantification and Visualization with Spherical Sampling". *To Appear in Computer Graphics Forum (CGF)*, Special Issue on 2025 EuroVis Conference (*Luxembourg city, Luxembourg*), 2025. [**Acceptance rate:** 46/167 = **27%**]

2. **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. [<u>doi</u>] [<u>pdf</u>] [<u>code</u>] [**Acceptance rate:** 124/557 = **22.26%**]

3. 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]

4. **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%**]

5. **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%**]

6. 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]

7. **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]

8. **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%**]

9. **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%**]

10. **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]

11. **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%**]

12. **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. 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] [**Acceptance rate:** 102/449 = 22.7%]

2. 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] [**Acceptance rate:** 30/76 = 39.4%]

3. Priyabrata Senapati, Samuel Yen-Chi Chen, Bo Fang, **Tushar M. Athawale**, Ang Li, Weiwen Jiang, Cheng Chang Lu, 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, QC, Canada*, pp. 1413-1424, 2024. [doi] [**Acceptance rate:** 222/460 = 48%]

4. **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, Eurographics Association, Odense, Denmark,* 2024. [doi] [pdf] [**Acceptance rate:** 18/46 = 39%]

5. 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] [* These authors contributed equally to the paper]

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

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

8. Sudhanshu Sane, **Tushar M. Athawale**, and Chris R. Johnson, "Visualization of Uncertain Multivariate Data via Feature Confidence Level-Sets". *In Proceedings of the 23rd Eurographics/IEEE VGTC Conference on Visualization: Short Papers, Eurographics Association, Zurich, Switzerland (Virtual),* 2021. [doi] [pdf] [**Acceptance rate:** 20/45 = 44%]

Workshop Papers/Posters

1. David Pugmire, Kenneth Moreland, **Tushar M. Athawale**, Jian Huang, "Top Research Challenges and Opportunities for Near Real-Time Extreme-Scale Visualization". *2024 IEEE 20th Conference on e-Science, Osaka, Japan,* pp. 1-6, 2024. [doi] [pdf]

2. 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]

3. 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 conference: Posters, St Pete Beach, FL, USA,* 2024.

4. 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*, 2024. [**Best Poster Award** among 36 posters]

5. Gautam Hari, Nrushad Joshi, Zhe Wang, Qian Gong, David Pugmire, Kenneth Moreland, Chris R. Johnson, Scott Klasky, Norbert Podhorszki, and **Tushar M. Athawale**, "FunM^{2}C: 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**]

6. 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] [**Best Paper Honorable Mention**]

7. 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]

8. 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]

9. 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]

10. **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". *In the U.S. Department of Energy's ASCR Workshop on Energy-Efficient Computing for Science, Bethesda, MD, USA,* 2024. [pdf]

11. 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]

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

13. Priyabrata Senapati, **Tushar M. Athawale**, David Pugmire, and Qiang Guan, "Advancing Comprehension of Quantum Application Outputs: A Visualization Technique". *In QCCC-23: The Second International Workshop on Quantum Classical Cooperative Computing co-held with ACM HPDC 2023: The 32nd International Symposium on High-Performance Parallel and Distributed Computing, Orlando, USA,* pp. 25-28, 2023. [doi] [pdf]

14. **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". *In ASCR Workshop on Visualization for Scientific Discovery, Decision-Making, & Communication (Virtual),* 2022. [doi] [pdf]

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

16. 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 Scientific Visualization Contest Finalist**]

17. **Tushar M. Athawale***, Brooke Stanislawski*, Sudhanshu Sane, and Chris R. Johnson, "Visualizing Interactions Between Solar Photovoltaic Farms and the Atmospheric Boundary Layer". *In 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]

18. **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]**

19. **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]

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. **2024 Special Award** from Oak Ridge National Laboratory's Computational Science and Mathematics Division (CSMD) for the two first-authored IEEE TVCG 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*".

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

3. **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*".

Presentations and Seminars

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 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]

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 <u>QCCC 2023</u>, Orlando, FL, USA   **June 2023**
Advancing Comprehension of Quantum Application Outputs: A Visualization
Technique [slides]

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

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

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

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

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

Technical talk at <u>Dagstuhl Seminar</u> 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 <u>IEEE VIS 2021</u>, New Orleans, LA, USA (Virtual)   **Oct 2021**
Uncertainty Visualization of Marching Squares and Marching Cubes Topology
Cases [slides] [video]

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

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

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

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

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

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

Paper presentation at <u>IEEE VIS 2020</u>, 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 <u>IEEE SciVis Contest 2020</u>, Salt Lake City, UT (Virtual) **Oct 2020**
Statistical Rendering for Visualization of Red Sea Eddy Simulation Data
[<u>slides</u>] [<u>video</u>] [<u>poster</u>]

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

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

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

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

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

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

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

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

Professional Activities

- **Associate Editor** for the <u>IEEE Transactions on Visualizationa and Computer Graphics (TVCG)</u> journal
- **Program chair** for the <u>IEEE VIS conference</u> (2025-2027)
- **Chair** of the "<u>2024 IEEE Workshop on Uncertainty Visualization</u>: Applications, Techniques, Software, and Decision Frameworks" co-held with the <u>IEEE VIS 2024 conference</u>
- **Organizer** of the tutorial on "VTK-m - A ToolKit for Scientific Visualization on Many-Core Processors" held at the <u>IEEE VIS 2022 tutorial track</u>
- Member of a **program committee** for the EuroVis <u>2023</u>, <u>2024</u>, 2025 posters and <u>2025</u> short papers.
- Member of a **program committee** for the IEEE VIS <u>2020</u>, <u>2021</u>, <u>2022</u>, <u>2024</u> short papers
- Member of a **program committee** for the IEEE <u>TopoInVis 2022</u> workshop
- **Reviewer for** the IEEE VIS (2013, 2017-2024), EuroVis (2017-2019, 2021-2023), PacificVis (2023-2024), and China Visualization (2020) conferences
- **Reviewer for journal papers**: 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, and Journal of Big Data
- **Poster reviewer** for undergraduate student posters presented at the <u>Undergraduate Research Symposium</u> in 2018 and 2019
- **Student volunteer** at the <u>IEEE VIS 2013 conference</u>