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EDUCATION

2017	Ph.D., Informatics, University of Illinois Urbana-Champaign, Urbana, Illinois Thesis: High-Performance Evolutionary Computation for Scalable Spatial Optimization
2002	M.CS, Computer Science, The University of Iowa, Iowa City, Iowa
1998	M.E., Computer Engineering, Wuhan University, Wuhan, China
1995	B.S., Computer Science, Wuhan University, Wuhan, China

PROFESSIONAL APPOINTMENTS

Oak Ridge National Laboratory, Oak Ridge, TN, USA
Computational Science and Engineering Division (CSED)

Senior Computational Scientist, April 2025 – present

Computational Scientist, March 2019 – March 2025

Research and Development: High-Performance Geospatial Software and Data Systems; High-Resolution Continental Flood Inundation Mapping; Deep Learning Solutions to Control Optimization in Transportation Sciences and Building Technologies; Time Series AI Foundation Models for Complex Dynamics Networks; LLM-empowered Knowledge Graphs for Cybersecurity on Power Grid; Data Lakehouse and MLOps for Cybersecurity AI Model Integration on Power Distribution Grid; Cyber-Physical Digital Twin Systems for Hydrological Analysis and Flood Infrastructures

University of Illinois at Urbana-Champaign, Urbana, IL, USA

National Center for Supercomputing Applications (NCSA)

Senior Research Programmer, March 2014 – February 2019

Assistant Research Scientist, September 2007 – February 2014

CyberGIS Center, CyberInfrastructure and Geospatial Information Laboratory (CIGI),

Department of Geography and Geographic Information Science

Research, Development, Management, Consulting: High Performance and Scalable Geocomputational Solutions; CyberGIS Research; CyberGIS Architecture and Software; Scalable Spatial Analysis and Optimization Methods; Cyberinfrastructure and Supercomputing; Extreme-scale Heuristic Algorithms; Scientific Computing; Data-intensive Computing; Microservices; Science Gateways; XSEDE Extended Collaborative Support Services (ECSS)

PUBLICATIONS

Ghimire, Ganesh R., **Yan Liu**, Esther Parish, Sudershan Gangrade, Shih-Chieh Kao, Christopher DeRolph, Karen Maguire, and Henriette Jager. 2025. "Integrated Modeling Quantifies the Economic Benefits of Planting Climate-Resilient Perennial Biomass Crops in Flood-prone Agricultural Landscapes". *Journal of Flood Risk Management* **18**:2 (2025): e70056. doi:[10.1111/jfr3.70056](https://doi.org/10.1111/jfr3.70056)

Yoon, Y., K. Amasyali, Y. Li, P. Im, Y. Bae, **Y. Liu**, H. Zandi, "Energy performance evaluation of the ASHRAE Guideline 36 control and reinforcement learning-based control using field measurements." *Energy and Buildings* **325**:115005. (2024). doi:[10.1016/j.enbuild.2024.115005](https://doi.org/10.1016/j.enbuild.2024.115005)

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- Amasyali, Kadir, **Yan Liu**, and Helia Zandi. 2024. "Transfer Learning Strategy for Improving the Scalability of Deep Reinforcement Learning Control in Smart Buildings." *The fifteenth Conference on Innovative Smart Grid Technologies, North America (ISGT NA 2024)*. Washington DC. February 19–22, 2024.
- Lunga, Dalton D., Rahul Ramachandran, Shawn Newsam, Jitendra Kumar, Eric Shook, Dawn King, Lexie Yang, David Page, Katie Schuman, **Yan Liu**, Manil Maskey, Philippe Dias, Carter Christopher, Budhu Bhaduri. 2023. "The 2023 Trillion Pixel GeoAI Challenge Workshop Report - The Way Forward in Scaling Multimodal GeoAI." *Technical report, prepared by Oak Ridge National Laboratory for the U.S. Department of Energy*. Oak Ridge, Tennessee. October 2023.
- Eve Tsybina, Ben Ollis, Femi Omitaomu, Emilio Piescorovsky, Yarom Polsky, Scott DeNeale, Archana Ghodeswar, **Yan Liu**, Edgar Lara-Curzio, Patrick Dobson, Hanna Breunig, Curt Oldenburg, Erika Gasperikova, Sharon Borglin, Margaret Taylor, Preston Jordan, Tim Kneafsey, Yingqi Zhang, Gail Mosey, Wendy Hawthorne, Andrew Walker, Michael Ingram. 2023. "Clean Energy Technology Applications on US Mine Land: Technical Analysis." *ORNL Technical Report ORNL/SPR-2023/2868*.
- Cho, Wendy K Tam and **Yan Y. Liu**. 2023. "A GPU-Accelerated Population Generation and Sorting Kernel for an Optimization-Based Causal Inference Model." In: *proceedings of the 13th International Workshop on Parallel and Distributed Algorithms for Decision Sciences (PDADS 2023)*. Salt Lake City, Utah, USA. August 07, 2023. doi:[10.1145/3605731.3608930](https://doi.org/10.1145/3605731.3608930)
- Kass, Michael, Jim Keiser, **Yan Liu**, Amy Moore, and Yarom Polsky. 2023. "Assessing Compatibility of Natural Gas Pipeline Materials with Hydrogen, CO₂, and Ammonia." *Journal of Pipeline Systems Engineering and Practice* **14**:2, 04023007. doi:[10.1061/JPSEA2.PSENG-1431](https://doi.org/10.1061/JPSEA2.PSENG-1431)
- Liu, Yan Y.** and Melissa Dumas. 2022. "Online Heatmap Generation with Both High and Low Weights." In: *4th ACM SIGSPATIAL International Workshop on Spatial Gems (SpatialGems 2022)*. November 01, 2022. Seattle, Washington, USA. doi:[10.48550/arXiv.2212.07820](https://doi.org/10.48550/arXiv.2212.07820)
— **Best Paper Award**.
- Liu, Yan.** 2022. "AI for Improving Infrastructure Resilience to Flooding Hazards at National Scale." In: *AI@DOE Roundtable Series: Resiliency to and Recovery from Natural & Manmade Disasters*. January 12, 2022.
- Xu, Haowen, Andy Berres, **Yan Liu**, Melissa R. Allen-Dumas, and Jibonananda Sanyal. 2022. "An overview of visualization and visual analytics applications in water resources management." *Environmental Modelling & Software* **153**: 105396. doi:[10.1016/j.envsoft.2022.105396](https://doi.org/10.1016/j.envsoft.2022.105396)
- Li, Wenwen, **Yan Y. Liu**, and Sizhe Wang. 2022. "Real-time GIS Programming and Geocomputation." Book chapter in: *The Geographic Information Science & Technology Body of Knowledge*. (1st Quarter 2022 Edition), John P. Wilson (ed.). doi:[10.22224/gistbok/2022.1.3](https://doi.org/10.22224/gistbok/2022.1.3)
- Cho, Wendy K. Tam and **Yan Y. Liu**. 2021. "A parallel evolutionary multiple-try metropolis Markov chain Monte Carlo algorithm for sampling spatial partitions." *Statistics and Computing* **31**, no. 1 (2021): 1-19. doi:[10.1007/s11222-020-09977-z](https://doi.org/10.1007/s11222-020-09977-z)
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- Cho, Wendy K. Tam and Yan Liu. 2019. "Parallel Hybrid Metaheuristics with Distributed Intensification and Diversification for Large-scale Optimization in Big Data Statistical Analysis." *2019 IEEE International Conference on Big Data (BigData 2019)*: 3312–3320. Los Angeles, CA, USA, December 09–12, 2019. doi:[10.1109/BigData47090.2019.9006045](https://doi.org/10.1109/BigData47090.2019.9006045)
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- Finn, Michael P., Yan Liu, David M. Mattli, Babak Behzad, Kristina H. Yamamoto, Eric Shook, Anand Padmanabhan, Michael Stramel, and Shaowen Wang. 2019. "High-Performance Small-Scale Raster Map Projection Empowered by Cyberinfrastructure." In *CyberGIS for Geospatial Discovery and Innovation*, pp. 171–188. Springer, Dordrecht. doi:[10.1007/978-94-024-1531-5_9](https://doi.org/10.1007/978-94-024-1531-5_9)
- Yin, Dandong, Yan Liu, Hao Hu, Jeff Terstriep, Xingchen Hong, Anand Padmanabhan, and Shaowen Wang. 2019. "CyberGIS-Jupyter for Reproducible and Scalable Geospatial Analytics." *Concurrency and Computation: Practice and Experience* **31** (11): e5040. doi:[10.1002/cpe.5040](https://doi.org/10.1002/cpe.5040)
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— Press coverage by [National Science Foundation](#) (NSF), [ACM Technews](#)
- Zheng, Xing, David R. Maidment, David G. Tarboton, Yan Liu, and Paola Passalacqua. 2018. "GeoFlood: large scale flood inundation mapping based on high resolution terrain analysis." *Water Resources Research* **54** (12): 10,013–10,033. doi:[10.1029/2018WR023457](https://doi.org/10.1029/2018WR023457)
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— **Top Cited Paper 2018–2019**, JAWRA
- Hu, Hao, Dandong Yin, Yan Y. Liu, Jeff Terstriep, Xingchen Hong, Jeff Wendel, and Shaowen Wang. 2018. "TopoLens: Building a CyberGIS Community Data Service for Enhancing the Usability of High-resolution National Topographic Datasets." *Concurrency and Computation: Practice and Experience* **31**: e4682. doi:[10.1002/cpe.4682](https://doi.org/10.1002/cpe.4682)
- Pierce, Marlon, Mark Miller, Emre Brookes, Mona Wong, Yan Liu, Enis Afgan, Sandra Gesing, Maytal Dahan, Suresh Maru and Tony Walker. 2018. "Towards a Science Gateway Reference Architecture." In: *Proceedings of the 10th International Workshop on Science Gateways (IWSG 2018)*. June 13–15. Edinburgh, Scotland.
- Cain, Bruce E., Wendy K. Tam Cho, Yan Y. Liu, and Emily Zhang. 2018. "A Reasonable Bias Method for Redistricting: A New Tool for an Old Problem." *William & Mary Law Review* **59** (5) (April): 1521–1557.

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- Stanislawski, Larry, Kornelijus Survila, Jeff Wendal, **Yan Liu**, and Barbara P. Battenfield. 2017. "An Open Source High Performance Solution to Extract Surface Water Drainage Networks from Diverse Terrain Conditions." *Cartography and Geographic Information Science* **45** (4) 319–328. doi:[10.1080/15230406.2017.1337524](https://doi.org/10.1080/15230406.2017.1337524)
- Yin, Dandong, **Yan Liu**, Anand Padmanabhan, Jeff Terstriep, Johnathan Rush, and Shaowen Wang. 2017. "A CyberGIS-Jupyter Framework for Geospatial Analytics at Scale". In: *Proceedings of the 2017 Practice & Experience in Advanced Research Computing (PEARC'17)*. July 9–13. New Orleans, LA. doi:[10.1145/3093338.3093378](https://doi.org/10.1145/3093338.3093378)
- Cho, Wendy K. Tam and **Yan Y. Liu**. 2017. "Massively Parallel Evolutionary Computation for Empowering Electoral Reform: Quantifying Gerrymandering via Multi-objective Optimization and Statistical Analysis," *SC17: The International Conference for High Performance Computing, Networking, Storage and Analysis*. November 12–17. Denver, CO.
- Yildirim, Ahmet A., David G. Tarboton, **Yan Liu**, Nazmus S. Sazib, and Shaowen Wang. 2016. "Accelerating TauDEM for Extracting Hydrology Information from National-Scale High Resolution Topographic Dataset." In *Proceedings of the 2016 Annual Conference on Extreme Science and Engineering Discovery Environment (XSEDE'16)*. July 17–21. Miami, Florida. doi:[10.1145/2949550.2949582](https://doi.org/10.1145/2949550.2949582)
- Cho, Wendy K. Tam and **Yan Y. Liu**. 2016. "Toward a Talismanic Redistricting Tool: A Computational Method for Identifying Extreme Redistricting Plans." *Election Law Journal* **15** (4) (December): 351–366. doi:[10.1089/elj.2016.0384](https://doi.org/10.1089/elj.2016.0384)
 — **First Place Winner** of the 2016 Common Cause "Gerrymander Standard" writing competition.
 — Press coverage by [Cray Inc.](#), the [National Center for Supercomputing Applications](#), [Science Node](#), [Chicago Inno](#), [Vox](#), [Quanta Magazine](#), [HPC Wire](#), [Top 500](#), [WIRED](#), [EdgyLabs](#), [Admin Magazine](#), [Primeur Magazine](#), [Salon](#), [Communications of the ACM](#), the [Blue Waters Annual Report](#), [Nature](#), [Big Think](#), [Reason](#), [The Washington Post](#), [NPR](#), [NOVA PBS](#), [eWeek](#), [Communications of the ACM](#), [Medium](#), [Dziennikz Zwiazkowy Polish Daily News](#), [Siam News](#), [UI News Bureau](#), [News-Gazette](#), [Agence Science-Presse](#), [Tech-net.cz](#), the [Mathematical Association of America](#), [Akron Beacon Journal](#), [Cincinnati.com](#), [NCSA](#), [R&D Magazine](#), and [HPC Wire](#).
- Liu, Yan Y.**, Wendy K. Tam Cho, and Shaowen Wang. 2016. "PEAR: A Massively Parallel Evolutionary Computation Approach for Political Redistricting Optimization and Analysis." *Swarm and Evolutionary Computation* **30** (October): 78–92. doi:[10.1016/j.swevo.2016.04.004](https://doi.org/10.1016/j.swevo.2016.04.004)
- Liu, Yan Y.**, David R. Maidment, David G. Tarboton, Xing Zheng, Ahmet A. Yildirim, Nazmus Sazib, and Shaowen Wang. 2016. "A CyberGIS Approach to Generating High-resolution Height Above Nearest Drainage (HAND) Raster for National Flood Mapping." *The Third International Conference on CyberGIS and Geospatial Data Science*. July 26–28, 2016, Urbana, Illinois. doi:[10.13140/RG.2.2.24234.41925/1](https://doi.org/10.13140/RG.2.2.24234.41925/1)
- Cho, Wendy K. Tam and **Yan Y. Liu** 2016. "A Parallel Evolutionary Algorithm for Subset Selection in Causal Inference Models." In *Proceedings of the XSEDE16 Conference on Diversity, Big Data, and Science at Scale (XSEDE16)*. July 17–22, 2016. Miami, Florida, USA. doi:[10.1145/2949550.2949568](https://doi.org/10.1145/2949550.2949568)
- Survila, Kornelijus, Ahmet A. Yildirim, Ting Li, **Yan Y. Liu**, David G. Tarboton, and Shaowen Wang. 2016. "A Scalable High-performance Topographic Flow Direction Algorithm for Hydrological Information Analysis." In *Proceedings of the 2016 Annual Conference on Extreme Science and Engineering Discovery Environment (XSEDE'16)*. July 17–21. Miami, Florida. doi:[10.1145/2949550.2949571](https://doi.org/10.1145/2949550.2949571)

- Hu, Hao, Xingchen Hong, Jeff Terstriep, **Yan Y. Liu**, Michael P. Finn, Johnathan F. Rush, Jeff Wendel, and Shaowen Wang. 2016. "TopoLens: Building A CyberGIS Community Data Service for Enhancing the Usability of High-resolution National Topographic Datasets." In *Proceedings of the 2016 Annual Conference on Extreme Science and Engineering Discovery Environment (XSEDE'16)*. July 17–21. Miami, Florida. doi:[10.1145/2949550.2949652](https://doi.org/10.1145/2949550.2949652)
— **Best Paper Award** in the Software and Software Environment Track
- Swetnam, Tyson L., Jon D. Pelletier, Craig Rasmussen, Nicholas R. Callahan, Nirav Merchant, Eric Lyons, Matts Rynge, **Yan Liu**, Viswanath Nandigam, and Christopher Crosby. 2016. "Scaling GIS analysis tasks from the desktop to the cloud utilizing contemporary distributed computing and data management approaches: A case study of project-based learning and cyberinfrastructure concepts." In *Proceedings of the XSEDE16 Conference on Diversity, Big Data, and Science at Scale (XSEDE16)*. July 17–22, 2016. Miami, Florida, USA. doi:[10.1145/2949550.2949573](https://doi.org/10.1145/2949550.2949573)
- Casler, Nathan P., Kiumars Soltani, Hao Hu, Bingxian Lu, Dandong Yin, **Yan Liu**, and Shaowen Wang. 2016. "Multigrid Framework for Large Scale Global Raster Analytics." *The Third International Conference on CyberGIS and Geospatial Data Science*. July 26–28, 2016. Urbana, Illinois.
- Soltani, Kiumars, Anand Padmanabhan, **Yan Liu**, and Shaowen Wang. 2016. "Fast Indexing of Spatial Objects Using GeoHash." *The Third International Conference on CyberGIS and Geospatial Data Science*. July 26–28, 2016. Urbana, Illinois.
- Liu, Yan Y.**, Wendy K. Tam Cho, and Shaowen Wang. 2015. "A Scalable Computational Approach to Political Redistricting Optimization." In *Proceedings of the 2015 Annual Conference on Extreme Science and Engineering Discovery Environment (XSEDE'15)*, July 26–30. St Louis, Missouri. doi:[10.1145/2792745.2792751](https://doi.org/10.1145/2792745.2792751)
- Wang, Shaowen, **Yan Liu**, and Anand Padmanabhan. 2015. "Open CyberGIS Software for Geospatial Research and Education in the Big Data Era." *SoftwareX*, 5:1–5. doi:[10.1016/j.softx.2015.10.003](https://doi.org/10.1016/j.softx.2015.10.003)
- Hu, Hao, Tao Lin, **Yan Y. Liu**, Shaowen Wang, and Luis F. Rodriguez. 2015. "CyberGIS-BioScope: A Cyberinfrastructure-based Spatial Decision-Making Environment for Biomass-to-Biofuel Supply Chain Optimization." *Concurrency and Computation: Practice and Experience* 27 (16) (November): 4437–4450. doi:[10.1002/cpe.3535](https://doi.org/10.1002/cpe.3535)
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- Liu, Yan**, Anand Padmanabhan, and Shaowen Wang. 2015. "CyberGIS Gateway for Enabling Data-Rich Geospatial Research and Education." *Concurrency and Computation: Practice and Experience* 27 (2) (February): 395–407. doi:[10.1002/cpe.3256](https://doi.org/10.1002/cpe.3256)
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- Wendel, Jeff, Michael P. Finn, John Kosovich, Jeff Falgout, and **Yan Liu**. 2015. "A solution for processing large files in the LASer (LAS) format using the message passing interface (MPI) and parallel file systems." In *Proceedings of a pre-conference workshop of the 27th International Cartographic Conference: Spatial data infrastructures, standards, open source and open data for geospatial (SDI-Open 2015)*, August 20–21, 2015. Brazilian Institute of Geography and Statistics (IBGE), Rio de Janeiro, Brazil.
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- Riteau, Pierre, Myunghwa Hwang, Anand Padmanabhan, Yizhao Gao, **Yan Y. Liu**, Kate Keahey, and Shaowen Wang. 2014. "A Cloud Computing Approach to On-Demand and Scalable CyberGIS Analytics." In *Science Cloud'14: Proceedings of the 5th ACM Workshop on Scientific Cloud Computing*: pp. 17–24. June 23, 2014, Vancouver, BC, Canada. doi:[10.1145/2608029.2608032](https://doi.org/10.1145/2608029.2608032)
- Hu, Hao, Tao Lin, **Yan Liu**, Shaowen Wang, and Luis F. Rodriguez. 2014. "CyberGIS-BioScope: A Cyberinfrastructure-based Spatial Decision-Making Environment for Biomass-to-Biofuel Supply Chain Optimization." In *Proceedings of the 2014 ACM workshop on Gateway computing environments (GCE'14)*: pp. 34–37. Nov. 21, 2014. New Orleans, LA, USA. doi:[10.1109/GCE.2014.9](https://doi.org/10.1109/GCE.2014.9)
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- Padmanabhan, Anand, Choonhan Youn, Myunghwa Hwang, **Yan Liu**, Shaowen Wang, Nancy Wilkins-Diehr, and Christopher Crosby. 2013. "Integration of Science Gateways: A Case Study with CyberGIS and OpenTopography." In *Proceedings of XSEDE 2013: Extreme Science and Engineering Discovery Environment: Gateway to Discovery*. July 22–25, 2013, San Diego, CA, USA. doi:[10.1145/2484762.2484808](https://doi.org/10.1145/2484762.2484808)
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- Behzad, Babak, Anand Padmanabhan, **Yan Liu**, and Shaowen Wang. 2011. "Integrating CyberGIS Gateway with Windows Azure: A Case Study on MODFLOW Groundwater Simulation." In *Proceedings of the 2nd ACM SIGSPATIAL International Workshop on High Performance and Distributed Geographic Information Systems (ACM HPDGIS 2011)*: pp. 26–29. November 01, 2011. Chicago, Illinois, USA. doi:[10.1145/2070770.2070774](https://doi.org/10.1145/2070770.2070774)
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- Liu, Yan** and Shaowen Wang. 2010. "Asynchronous Implementation of A Parallel Genetic Algorithm for the Generalized Assignment Problem." (abstract). In *Proceedings of TeraGrid 2010 conference*. August 1-5, 2010. Pittsburgh, PA, USA
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- Liu, Yan**, Shaowen Wang, and Nancy Wilkins-Diehr. 2009. "SimpleGrid 2.0: A Learning and Development Toolkit for Building Highly Usable TeraGrid Science Gateways." In *Proceedings of the 5th Grid Computing Environments Workshop*: pp. 1-7. November 20, 2009. Portland, Oregon, USA. doi:[10.1145/1658260.1658272](https://doi.org/10.1145/1658260.1658272)
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- Wang, Shaowen, **Yan Liu**, Nancy Wilkins-Diehr, and Stuart Martin. 2009. "SimpleGrid Toolkit: Enabling Geosciences Gateways to Cyberinfrastructure." *Journal of Computers and Geosciences* **35** (12): 2283-2294. doi:[10.1016/j.cageo.2009.05.002](https://doi.org/10.1016/j.cageo.2009.05.002)
- Fleury, Terry, **Yan Liu**, Tom Scavo, Von Welch, and Nancy Wilkins-Diehr. 2009. "A Web Browser SSO Model for Science Gateways." In *Proceedings of the 3rd NSF TeraGrid 2009 Annual Conference*, June 22-25, 2009, Arlington, Virginia, USA.
- Tang Wenwu, Shaowen Wang, David A. Bennett, and **Yan Liu**. 2008. "Design and implementation of a service-oriented agent-based simulation architecture." In *Workshop of the Design of Service-Oriented Architecture (SOA) for Geospatial Science for 5th International Conference on Geographic Information Science*. September 2008. Park City, UT, USA.
- Wang, Shaowen, **Yan Liu**, Nancy Wilkins-Diehr, and Stuart Martin. 2007. "SimpleGrid Toolkit: Enabling Efficient Learning and Development of TeraGrid Science Gateway." In *Proceedings of Grid Computing Environments (GCE) 2007 Workshop*. December 11-12, 2007. Reno, NV, USA.
- Liu, Yan**, Alberto M. Segre, and Shaowen Wang. 2006. "A High Throughput Approach to Combinatorial Search on Grids." In *Proceedings of the 15th IEEE International Conference on High Performance Distributed Computing (HPDC-15)*: pp. 351-352. IEEE Computer Society. June 12-23, 2006. Paris, France. doi:[10.1109/HPDC.2006.1652179](https://doi.org/10.1109/HPDC.2006.1652179)

Wang, Shaowen, Marc P. Armstrong, Jun Ni, **Yan Liu**. 2005. "GISolve: A Grid-based Problem Solving Environment for Computationally Intensive Geographic Information Analysis." In *Proceedings of the 14th International Symposium on High Performance Distributed Computing (HPDC 14) "Challenges of Large Applications in Distributed Environments (CLADE) Workshop*. IEEE Press. pp. 3–12. July 24, 2005. Research Triangle Park, North Carolina, USA. doi:[10.1109/CLADE.2005.1520892](https://doi.org/10.1109/CLADE.2005.1520892)

Wang, Shaowen, Anand Padmanabhan, **Yan Liu**, Ransom Briggs, Jun Ni, Boyd M. Knosp, and Yasar Onel. 2003. "A Multi-agent System Framework for End-user Level Grid Monitoring Using Geographical Information Systems (MAGGIS): Architecture and Implementation." In *Proceedings of The Second International Workshop on Grid and Cooperative Computing*, GCC 2003. December 7–10, 2003. Shanghai, China

WORKING PAPERS

Tam, Wendy K. and **Yan Liu**. "A GPU-accelerated Generative Adversarial Model for Causal Inference." *Journal of Concurrency and Computation: Practice and Experience*. Under Review.

Liu, Yan, Yeobeom Yoon, Kadir Amasyali, Massimiliano Lupo Pasini, Robert Smith, Piljae Im, and Helia Zandi. "A Transfer Learning Approach to Energy-Efficient Control of Small and Medium-Sized Commercial Buildings." *Applied Energy*. Under Preparation.

SCIENTIFIC DATA AND VISUALIZATION

Yan Liu, David Maidment, Andy Carter, and Timothy Whiteaker. 2025. "The Road Elevation Model Dataset for Texas." First official release on June 19, 2025. [Download Link](#).

Yan Liu, David Maidment, Andy Carter, and Timothy Whiteaker. 2024. "Road Lidar Dataset for the TxDOT Austin District." Released on October 30, 2024 by the *Oak Ridge Leadership Computing Facility (OLCF)*. doi:[10.13139/ORNLNCCS/2472925](https://doi.org/10.13139/ORNLNCCS/2472925). [Download Link](#).

Liu, Yan, David Maidment, Andy Carter, Paola Passalacqua, and Tim Whiteaker. 2023. "Height Above Nearest Drainage (HAND) at Three-Meter Resolution for the State of Texas." United States: N. p., 2023. Web. doi:[10.13139/ORNLNCCS/2204010](https://doi.org/10.13139/ORNLNCCS/2204010). For: *Pin2Flood - Real-Time Flood Mapping for First Responders*. URL: *HAND for Texas*.
— News coverage: [Pin2Flood Public Release at the 2023 Texas Emergency Management Conference](#)

Liu, Yan Y., David G. Tarboton, and David R. Maidment. 2020. "Height Above Nearest Drainage (HAND) and Hydraulic Property Table for CONUS - Version 0.2.0. (20200301)." *Oak Ridge Leadership Computing Facility*. doi:[10.13139/ORNLNCCS/1608331](https://doi.org/10.13139/ORNLNCCS/1608331)

The Great Flood. Technical lead. Contributed geospatial data retrieval and analysis in collaboration with NCSA's Advanced Visualization Laboratory for the creation of *The Great Flood*, a 75-minute data-driven documentary visualization of the Mississippi River Valley showing the extent of the 1927 destructive floodwaters. The work features Grammy Award-winning guitarist and composer, Bill Frisell, performing original music with accompanying film and staging by Obie-winning experimental filmmaker, Bill Morrison. It premiered September 2011 at the University of Illinois Krannert Center for the Performing Arts.

SCIENTIFIC SOFTWARE

REM: Road Elevation Model. 2025. Lead developer of a GPU-accelerated lidar data processing toolkit for generating road lidar points and digital surface models (DSMs) at large scale. Software was built for processing 50TB TxGIO lidar data collections and building REMs for the entire state of Texas, i.e., 25 TxDOT districts.

SMCBAI: A Modular Software Framework for Reinforcement Learning-based Building Control. Lead developer of a modular RL- and rule-based building control software framework for both simulated and physical control environment. With Yeobeom Yeon, Massimiliano Lupo Pasini, Robert Smith, Piljae Im, and Helia Zandi.

Lag-Llama Fewshot Forecast in Distributed Energy Resources Environment. Lead developer of the LagLlama fewshot experiments for time series foundation model development. [Code Repository](#).

Evolutionary Markov Chain Monte Carlo (EMCMC). Lead developer of a parallel MCMC software for statistical sampling of spatially constrained solution space. This software provides a high-performance solver for large spatial partitioning applications.

Spatially Explicit Evolutionary Computation (SEEC). Lead developer of an extreme-scale parallel evolutionary algorithm solver for spatial partitioning problems in large-scale spatial optimization.

Flood Inundation Mapping Version 1 (FIM1). Lead developer of a scalable continental flood inundation mapping software framework using high-performance computing, an interdisciplinary collaboration among UT Austin, Utah State University, NOAA, CUAHSI, USGS, and RENCi. Produced the first 10m resolution Hand Above Nearest Drainage (HAND) dataset for the continental U.S.

Parallel Genetic Algorithm for Solving the Generalized Assignment Problem (PGAP). Created a highly scalable parallel genetic algorithm library that employs non-blocking Message Passing Interface (MPI) and scales up to 262,000 processor cores on the Blue Waters supercomputer.

Hilomap. Lead developer of a web GIS tool for online heatmap generation from GIS data with both high and low extremes. <https://github.com/hohe12ly/hilomap>.

CyberGIS Gateway. Lead developer of this cyberinfrastructure-enabled high performance, distributed, and collaborative GIScience online problem-solving environment.

GISolve Toolkit. Co-created this cyberinfrastructure-based GIS software. Technical lead for the software. For more than six years, GISolve has been deployed within multiple national and international cyberinfrastructure environments and used by numerous users from a broad range of fields (e.g., biology, computer science, geography, linguistics, public health, and statistics) for a variety of research and education purposes.

RESEARCH GRANTS

Co-Investigator (April 2025 – March 2028). The US Department of Energy, Grid Deployment Office (GDO). “Fast Recovery and Sustained Resilience in Post-Helene Restoration in North Carolina.” Development of high-resolution hydrological terrain and synthetic river geometry for flood impact and risk assessment of Hurricane Helene-affected areas in North Carolina.

Principal Investigator (December 2024 – May 2026). Strategic Partner Project with the University of Texas at Austin. “High-Performance Road Elevation Model Computation for Flood Infrastructure Assessment.” Development of high-performance computing software, data and workflow solutions to GPU-accelerated road elevation models using massive lidar point cloud collections in Texas.

Co-Investigator (October 2024 – September 2027). DOE Vehicle Technologies Office. “Demonstrating Rapidly Deployable Artificial Intelligence (AI) Based Adaptive Signal Timing Optimization to Urban Areas.” With Ross Wang (PI) and Wan Li.

Co-Investigator (May 2024 – February 2025). Oak Ridge National Laboratory (ORNL), Laboratory Directed Research and Development (LDRD) Program. “ARMADA: Scalable Multi-Sector Analysis Platform for the Energy Transition.” Role: generate flood risk and inundation maps for the assessment of environmental security of clean energy siting in TVA service area. PI: David McCollum.

Principal Investigator (June 2022 – September 2023). Oak Ridge National Laboratory (ORNL), Laboratory Directed Research and Development (LDRD) Program – AI Initiative – AI for Robust Engineering and Sciences (AIRES). 2021–2023. “Graph-based Machine Learning for Large-scale Complex Networks,” with David Womble, Jibonananda Sanyal, Seher Acer, Wan Li, and Chen Zhang.

Co-Investigator (2023–2025). National Oceanic and Atmospheric Administration (NOAA). “Cooperative Institute for Research to Operations in Hydrology (CIROH),” with PI Steven J. Burian (The University of Alabama) and ORNL PI: Eric Pierce. Scope of work: Flood Inundation Modeling and Mapping.

Principal Investigator (2021–2023). Strategic Partnership Project with the University of Texas at Austin. “Mobile Flood Data Collection for Mitigation and Emergency Response,” with David Maidment (UT-Austin) for the Texas Division of Emergency Management (TDEM) in the FEMA Hazard Mitigation Grants Program (HMGP) (CFDA 97.039).

Principal Investigator (2019–2021). Oak Ridge National Laboratory (ORNL), Laboratory Directed Research and Development (LDRD) Strategic Hire Program. “Building High-Performance Scalable Geocomputation Capabilities for Global and High-Resolution Geospatial Studies.” \$750k

Co-Principal Investigator. National Science Foundation (NSF), Social, Behavioral, and Economic Sciences. Political Science Program. 2017–2020. “[Collaborative Research: High-Performance Computational Standards for Redistricting](#),” with PI Wendy K. Tam Cho and Co-PI Bruce Cain. Grant No. SES-1725418/1728902. \$453,476

Co-Investigator. NASA, Advancing Collaborative Connections for Earth System Science (ACCESS) Program. 2016–2018. “[ACCESS to Terra Data Fusion Products](#),” with PI Larry Di Girolamo, Co-I Guangyu Zhao, John Towns, Shaowen Wang, and Muqun Yang. \$1 million

Senior Personnel. U.S. Geological Survey (USGS), Center of Excellence for Geospatial Information Science (CEGIS). 2014–2019. “CyberGIS Capabilities for the National Map,” with PI Shaowen Wang. \$632,148

Senior Personnel. NSF, Office of Advanced Cyberinfrastructure (OAC). 2017–2018. “[SI2-S2I2 Conceptualization: Geospatial Software Institute](#),” with PI Shaowen Wang and Co-PI Donna Cox, Daniel Katz, Paul Morin, and Margaret Palmer. \$500,000

Senior Personnel. NSF, Office of Advanced Cyberinfrastructure (OAC). 2014–2017. “[MRI: Acquisition of a National CyberGIS Facility for Computing and Data-Intensive Geospatial Research and Education](#),” with PI Shaowen Wang and Co-PI Praveen Kumar, Carole Palmer, Robert Pennington, and E. Lynn Usery. \$2.56 million

Senior Personnel. NSF, Office of Advanced Cyberinfrastructure (OAC). 2010–2014. “[SDCI: Open Gateway Computing Environments – Tools for Cyberinfrastructure-Enabled Science and Education](#),” with PI Marlon Pierce and Co-PI Sudhakar Pamidighantam and Shaowen Wang. \$225,000

SUPERCOMPUTING GRANTS

Principal Investigator. GPU-Accelerated Geocomputation for Large-Scale Lidar-derived Road Elevation Models. NSF [ACCESS](#) Allocation Award #EES250019. 380k ACCESS Credits. 02/10/2025–02/09/2026.

Co-Investigator. Foundations of Artificial Intelligence for Robust Engineering and Science. DOE OLCF Director’s Discretion Project Allocation #LRN051. 20k node hours on the Frontier supercomputer. February 2024–February 2025. With PI Pradeep Ramuhalli.

Principal Investigator. Building End-to-End Computational Capabilities for Scalable High-Resolution Flood Inundation Mapping. NSF [ACCESS](#) Allocation Award #EES220036. 25k core hours on PSC Bridges-2, 800 hours on SDSC Expanse GPU, and 1.6k node hours on TACC Stampede2. 2022–2023.

Principal Investigator. High-Performance Causal Inference for COVID-19 Mitigation and Response. COVID-19 HPC Consortium and NSF [XSEDE](#) Allocation Award #CIS200013. 50k CPU hours and 3000 GPU hours on PSC Bridges, 1000 node hours on Stampede2, with co-PIs Wendy K. Tam Cho and David Hwang. 2020–2022.

Co-Principal Investigator. Parallel Hybrid Metaheuristics with Distributed Intensification and Diversification for Large-scale Optimization in Statistical Analysis. [NCSA Blue Waters](#) Allocation Award. 50k node hours, approximately 0.8 million normalized computing hours, with PI Wendy K. Tam Cho. 2019–2020.

Principal Investigator. GPU-Accelerated GeoAI and High-End Data Analytics for High-Performance Continental Flood Inundation Mapping. NSF [XSEDE](#) Allocation Award #EAR190025. 50k CPU hours, 2500 GPU hours, with co-PIs David Maidment and David Tarboton. 2019–2020.

Co-Principal Investigator. Extreme-Scale Computing for Large Spatial Optimization and Sampling. NSF [XSEDE](#) Allocation Award #ASC190040. 1000 GPU hours, 1600 node hours, with PI Wendy K. Tam Cho. 2019–2020.

Co-Principal Investigator. Massively Parallel Evolutionary Markov Chain Monte Carlo for Sampling Complicated Multimodal State Spaces. [NSF Blue Waters Allocation Award](#). 100K node hours, with PI Wendy K. Tam Cho and Co-PI Simon Rubinstein-Salzedo. 2018–2019.

Co-Principal Investigator. Enabling Redistricting Reform: A Computational Study of Zoning Optimization. NSF [Blue Waters](#) Allocation Award. 400k node hours, approximately 6.4 million normalized computing hours, with PI Wendy K. Tam Cho and Co-PI Bruce Cain. 2017–2018.

Co-Principal Investigator. Computational Model for Causal Inference. NSF [Blue Waters](#) Allocation Award (ILL_jtt). 50K node hours, with PI Wendy K. Tam Cho. 2015–2016.

Co-Principal Investigator. An Extreme-Scale Computational Approach to Redistricting Optimization. NSF [Blue Waters](#) Allocation Award (ILL_jp5). 600K node hours, approximately 9.8 million normalized computing hours, with PI Shaowen Wang and Co-PI Wendy K. Tam Cho. 2013–2015.

Co-Principal Investigator. Extending the CyberGIS Discovery Environment (9.35 million SUs (Service Units)—one service unit equivalent to one normalized computing hour) on [XSEDE](#), with PI Shaowen Wang and Co-PIs Anand Padmanabhan and Wenwu Tang. 2013–2014.

Co-Principal Investigator. Extending the CyberGIS Discovery Environment (5.58 million SUs) on [XSEDE](#), with PI Shaowen Wang and Co-PIs Anand Padmanabhan and Wenwu Tang. 2012–2013.

Co-Principal Investigator. Establishing the CyberGIS Gateway (3.1 million SUs) on [TeraGrid](#), with PI Shaowen Wang and Co-PIs Anand Padmanabhan and Wenwu Tang. 2011–2012.

Co-Principal Investigator. Expanding the TeraGrid GIScience Gateway (1.2 million SUs) on [TeraGrid](#), with PI Shaowen Wang and Co-PIs Anand Padmanabhan and Wenwu Tang. 2010–2011.

Co-Principal Investigator. Extending the TeraGrid GIScience Gateway (625,500 SUs) on [TeraGrid](#), with PI Shaowen Wang and Co-PI Wenwu Tang. 2009–2010.

HONORS AND AWARDS

2023 Scientific Data Contribution to the Development of the Pin2Flood Application, Computational Sciences and Engineering Division, Oak Ridge National Laboratory.

2022 Best Paper Award, The Fourth ACM SIGSPATIAL International Workshop on Spatial Gems ([SpatialGems 2022](#)). November 01, 2022. Seattle, Washington, USA.

- 2019 [HPC Innovation Excellence Award](#) by HPC User Forum at [ISC19](#) for “Massively Parallel Evolutionary Computation for Empowering Electoral Reform: Quantifying Gerrymandering via Multi-objective Optimization and Statistical Analysis”, with Wendy K. Tam Cho. June 18. Frankfurt, Germany.
- 2019 Distinguished Team Contribution, Computational Sciences and Engineering Division, Oak Ridge National Laboratory.
- 2016 First Place Winner in the 2016 Common Cause “Gerrymander Standard” writing competition for the article, “Toward a Talismanic Redistricting Tool: A Fully Balanced Computational Method for Identifying Extreme Redistricting Plans,” with Wendy K. Tam Cho.
- 2016 Best Paper Award in the Software and Software Environment Track at the 2016 Annual Conference on Extreme Science and Engineering Discovery Environment (XSEDE’16), “TopoLens: Building A CyberGIS Community Data Service for Enhancing the Usability of High-resolution National Topographic Datasets,” with Hu, H. (the leading author), Hong, X., Terstriep, J., Finn, M., Rush, J., Wendel, J., and Wang, S. July 21. Miami, Florida, USA.
- 2016 University Participant Award in the 2016 [Disparate Data Challenge](#) organized by the National Geospatial-Intelligence Agency (NGA). With students Soltani, K. (student lead), Hu, H., Gao, Y., and Yin, D. and colleagues Casler, N. and Wang, S. October 21-22. Arlington, Virginia, USA.
- 2011 Best Research Poster Award, with Yanli Zhao (Lead Author), Shaowen Wang, and Anand Padmanabhan, at the 5th National Science Foundation (NSF) TeraGrid Annual Conference. July 21. Salt Lake City, Utah, USA.
- 2006 Travel grant for the High Performance Distributed Computing (HPDC) 2006 conference. June 19-23. Paris, France.
- 1997 Huaruan outstanding graduate student award
- 1994 First-class award in the Campus Contest of Academic Research and Innovation

TEACHING AND TRAINING (SELECTED)

- Liu, Yan.** 2018. “High-Performance and Data-Intensive Computing.” 6-day summer course for the School of Computer Science and the High-Performance Computing Center of Wuhan University. Wuhan, China. July 9–14.
- Liu, Yan.** 2018. “XSEDE High-Performance Computing Training Series.” Hands-on Training for the CyberGIS Center at the University of Illinois at Urbana-Champaign (5 sessions). Spring 2018.
- Zheng Xing, **Yan Liu**, David G. Tarboton, and Dandong Yin. 2017. “Flood Inundation Mapping and Emergency Response.” Lecture, hands-on tutorial, and open challenge in [UCGIS Summer School 2017](#). May 15-20, 2017. Urbana, IL, USA.
- Liu, Yan**, 2014. “Introduction to Geospatial Data and Analytics on CyberGIS.” 2014. Hands-on Tutorial at Arizona State University and University of California at San Bernardino, [XSEDE campus education program](#). April 1–3, 2014.
- Liu, Yan**, Shaowen Wang, Raminderjeet Singh, Suresh Marru, Marlon Pierce, and Nancy Wilkins-Diehr. 2012. “Building Science Gateway Applications on CyberInfrastructure.” Hands-on Tutorial at the XSEDE 2012 Conference, July 16, 2012, Chicago, IL, USA
- Liu, Yan**, Shaowen Wang, Raminderjeet Singh, Suresh Marru, Marlon Pierce, and Nancy Wilkins-Diehr. 2011. “Building Cyberinfrastructure-Enabled and Community-Centric Science Gateway Applications.” Hands-on Tutorial at the TeraGrid 2011 Conference, July 18, 2011, Salt Lake City, UT, USA

- Liu, Yan**, Shaowen Wang, and Nancy Wilkins-Diehr. 2010. "Building Cyberinfrastructure-Enabled and Community-Centric Science Gateway Applications." Hands-on Tutorial at the TeraGrid 2010 Conference, August 2, 2010, Pittsburgh, PA, USA
- Liu, Yan** and Shaowen Wang. 2010. "Building Blocks for a Simple TeraGrid Science Gateway." Hands-on Tutorial at the [SciDAC 2010 Conference](#), July 15, 2010, Chattanooga, TN, USA
- Liu, Yan** and Shaowen Wang. 2009. "Building Blocks for a Simple TeraGrid Science Gateway." Hands-on Tutorial for Building TeraGrid Science Gateways at the SciDAC 2009 Conference, June 19, 2009, San Diego, CA, USA
- Liu, Yan**. 2009. "GISolve: TeraGrid GIScience Gateway for Large-scale Spatial Analysis and Modeling." Hands-on Tutorial at the TeraGrid 2009 Conference, June 22, 2009, Washington DC, USA
- Liu, Yan** and Shaowen Wang. 2008. "SimpleGrid: Build Science Gateways to Cyberinfrastructure." Hands-on Tutorial at the Workshop for High Performance Computing in the Humanities, Arts, and Social Sciences: Information-Rich Environments for Research and Teaching. July 28, 2008, Urbana, IL, USA
- Liu, Yan** and Shaowen Wang. 2007. "Building Blocks for TeraGrid Science Gateways." Hands-on Tutorial for Building TeraGrid Science Gateways at the TeraGrid 2007 Conference, June 7, 2007, Madison, WI, USA

PROFESSIONAL SERVICE

Proposal Panelist and Reviewer

2017–2018, 2021 **Site Visit Team and Proposal Reviewer, NSF Directorate for Engineering**

Proposal Reviewer

2020 **Review Committee: Mitigation of COVID-19 and Future Pandemics, C3.ai Digital Transformation Institute**

2015–2017 **NSF XSEDE XRAS Research Computing Allocation Committee**

Journal and Conference Paper Reviewer

4OR: A Quarterly Journal of Operations Research
Computers and Geosciences
Computers and Operations Research
Concurrency and Computation: Practice and Experience (CCPE)
Election Law Journal
Expert Systems
Frontiers in Sustainable Cities
Future Generation Computer Systems
GeoInformatica
INFORMS Journal on Data Science
International Journal of Geographical Information Science
International Journal of High Performance Computing Applications
Journal of American Water Research Association (JAWRA)
Journal of Combinatorial Optimization
Journal of Natural Hazards
Journal of Remote Sensing Applications: Society and Environment

Journal of Parallel and Distributed Computing (JPDC)

Journal of Supercomputing

Natural Resource Modeling

SoftwareX

Transactions in GIS

The 2025 GeoSearch Workshop in Junction with ACM SIGSPATIAL 2025

The INFORMS 2025 Winter Simulation Conference

The Platform for Advanced Scientific Computing Conference (PASC22–25)

[Gateways](#) 2016–2023

The Practice and Experience in Advanced Research Computing Conference ([PEARC](#)) 2018, 2022–2023

The 5th ACM SIGSPATIAL Workshop on Advances on Resilient and Intelligent Cities ([ARIC 2022](#))

[Minigateways](#) 2022

The 1st ACM SIGSPATIAL International Workshop on Searching and Mining Large Collections of Geospatial Data ([GeoSearch21](#))

NSF XSEDE Conference 2013–2016

eScience Conference 2012

XHPC 2012

NSF TeraGrid Conference 2009–2011

Euro-Par 2010

ACM SIGSPATIAL International Workshop on High Performance and Distributed Geographic Information Systems (ACM HPDGIS) 2010

The 17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL GIS) 2009

Grid Computing Environment (GCE) Workshop 2008–2011, 2014

The 2006 International Workshop on Web-based Internet Computing for Science and Engineering, January 17, 2006, Harbin, P. R. China

Conferences and Workshops (Selected)

2024 **Program Chair**, [The 4th International Workshop on Parallel and Distributed Algorithms for Decision Sciences \(PDADS\) 2024](#). August 12, 2024. Gotland, Sweden.

2023 **Co-Chair**, [The First ACM SIGSPATIAL International Workshop on Advances in Urban-AI \(UrbanAI 2023\)](#). November 13, 2023. Hamburg, Germany.

2023 **Program Co-chair**, [The 3rd International Workshop on Parallel and Distributed Algorithms for Decision Sciences \(PDADS\) 2023](#). August 10, 2023. Salt Lake City, Utah, USA.

2023 **Session Co-Chair**, Geospatial Data Infrastructure, [Trillion-Pixel GeoAI Challenges Workshop](#). June 21–23, 2023. Oak Ridge, Tennessee, USA.

2022 **Paper Program Domain Chair (Humanities and Social Sciences)**, [The Platform for Advanced Scientific Computing Conference 2022 \(PASC22\)](#). June 27–29, 2022. Basel, Switzerland.

2022 **Publicity Chair & Paper Session Chair**, [The 2nd International Workshop on Parallel and Distributed Algorithms for Decision Sciences \(PDADS\) 2022](#). August 29, 2022. Bordeaux, France.

2021 **Program Committee**, [Gateways 2021](#)

2021 **Paper Program Domain Chair (Emerging Application Domains)**, [The Platform for Advanced Scientific Computing Conference 2021 \(PASC21\)](#). July 05–09, 2021. Virtual.

- 2019 **Organizing Committee & Panel Co-chair**, [The Trillion Pixel GeoAI Challenge Workshop](#)
- 2019 **Program Committee**, [Gateways 2019](#)
- 2018 **Program Committee (Co-chair for the demo track)**, [Gateways 2018](#)
- 2016 **Organizing Committee**, The Third International Conference on CyberGIS and Geospatial Data Science (CyberGIS'16). July 26-28, 2016. Urbana, Illinois
- 2014 **Technical Program Committee (Chair for the Software and Software Environment Track)**, [The NSF XSEDE Conference](#)
- 2014 **Technical and Program Committee**, [The 9th Grid Computing Environment \(GCE\) Workshop](#)
- 2014 **Organizing Committee**, The Second International Conference on CyberGIS and Geodesign (CyberGIS'14). August 19-21, 2014. Redlands, California
- 2012 **Local Arrangement Committee**, The First International Conference on Space, Time, and CyberGIS (CyberGIS'12). August 6-9, 2012. Urbana, Illinois
- 2011 **Program Committee (Gateway Track)**, The NSF TeraGrid Conference
- 2011 **Program Committee**, The 3rd American-Chinese Cyberinfrastructure and E-Science Workshop (ACCESS)
- 2010 **Technical and Program Committee**, [The 2010 Grid Computing Environment \(GCE\) Workshop](#)
- 2010 **Local Arrangement Committee**, The 2nd American-Chinese Cyberinfrastructure and E-Science Workshop (ACCESS)