Yan Liu
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EDUCATION

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

PROFESSIONAL APPOINTMENTS

Computational Scientist, March 2019–present
Computational Urban Sciences Group (CUSG)
Computational Science and Engineering Division (CSED)
Oak Ridge National Laboratory, Oak Ridge, TN, USA
Research and Development: Scalable High-Performance Geocomputation; GeoAI

Senior Research Programmer, August 2018–February 2019
National Center for Supercomputing Applications (NCSA)
University of Illinois at Urbana-Champaign, Urbana, IL, USA
Research, Development, Consulting: High-Performance and Scalable Geocomputation Solutions to Spatial Optimization and Statistical Sampling

Co-founder, July 2018–February 2019
NSG Solutions, Champaign, IL, USA
Research, Development, Business Solutions: High-Performance and Scalable Spatial Optimization Algorithms, Statistical Sampling Methods, Social Computing Solutions, Zoning Software and Services

Senior Research Programmer, March 2014–June 2018
Assistant Research Scientist, September 2007–March 2014
CyberGIS Center, CyberInfrastructure and Geospatial Information Laboratory (CIGI),
Department of Geography and Geographic Information Science, and
National Center for Supercomputing Applications (NCSA)
University of Illinois at Urbana-Champaign, Urbana, IL, USA
Research, Development, Management, Consulting: 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), Software Engineering; Program Development; Project Management; Grant Proposals; Interdisciplinary Research Collaboration; Education, Outreach and Training

Assistant Research Scientist, February 2007–August 2007

Research Assistant, March 2003–January 2007

Academic Technologies–Research Services, The University of Iowa, Iowa City, IA, USA
Research, Development: Grid computing and Supercomputing; Science Gateway; Spatial Middleware; Data Integration in High-energy Physics

Teaching Assistant, August 2000–December 2002
Department of Computer Science, The University of Iowa, Iowa City, IA, USA
Courses: Programming Languages; Distributed Computing

Network Engineer, October 1998–July 2000
Times Networks Inc., Wuhan, China
Development, Engineering: Telecommunication Networks and Internet for Hubei Province

Research Assistant, September 1995–September 1998
National Engineering Center for Multimedia Software (NERCMS), Wuhan University, Wuhan, China
Development: Distributed Protocols for Cable Network-based Web Content Distribution

PEER-REVIEWED PUBLICATIONS

Li, Wenwen, **Yan Y. Liu**, and Sizhe Wang. 2022. "Real-time GIS and Geocomputation." Book chapter in: *Geographic Information Science & Technology Body of Knowledge*. Accepted.

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

Liu, Yan Y. and Jibonananda Sanyal. 2020. "Scalable Data-Intensive Geocomputation: A Design for Real-Time Continental Flood Inundation Mapping." In: *Smoky Mountains Computational Sciences and Engineering Conference*, pp. 130-144. Springer, Cham, 2020. doi:10.1007/978-3-030-63393-6_9

Yan Y. Liu and Wendy K. Tam Cho. 2020. "A Spatially Explicit Evolutionary Algorithm for the Spatial Partitioning Problem." *Journal of Applied Soft Computing* **90**: 106129 (May). doi:10.1016/j.asoc.2020.106129

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

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

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

Cho, Wendy K. Tam and **Yan Y. Liu**. 2018. "Sampling from Complicated and Unknown Distributions: Monte Carlo and Markov Chain Monte Carlo Methods for Redistricting." *Physica A* **506** (September): 170–178. doi:10.1016/j.physa.2018.03.096

Liu, Yan Y., David R. Maidment, David G. Tarboton, Xing Zheng, and Shaowen Wang. 2018. "A CyberGIS Integration and Computation Framework for High-Resolution Continental-Scale Flood Inundation Mapping." *Journal of the American Water Resources Association* **54** (4) (August): 770–784. doi:10.1111/1752-1688.12660
— 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

Zheng, Xing, David G. Tarboton, David R. Maidment, **Yan Y. Liu**, and Paula Passalacqua. 2018. "River Channel Geometry and Rating Curve Estimation Using Height Above Nearest Drainage." *Journal of the American Water Resources Association (JAWRA)* **54** (4) (August): 785–806. doi:10.1111/1752-1688.12661
— 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.

Pierce, Marlon, Mark Miller, Emre Brookes, Mona Wong, **Yan Liu**, Enis Afgan, Sandra Gesing, Maytal Dahan, Suresh Marru 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.

Stanislawski, Larry, Kornelijus Survila, Jeff Wendal, **Yan Liu**, and Barbara P. Buttenfield. 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

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

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
— *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*, *Technet.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

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

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

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

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
— *Winner of Best Paper in 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

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.

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

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

Lin, Tao, Shaowen Wang, Luis F. Rodriguez, Hao Hu, and **Yan Liu**. 2015. "CyberGIS-Enabled Decision Support Platform for Biomass Supply Chain Optimization." *Environmental Modelling & Software* **70** (August): 138–148. doi:10.1016/j.envsoft.2015.03.018

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

Liu, Yan Y. and Shaowen Wang. 2015. "A Scalable Parallel Genetic Algorithm for the Generalized Assignment Problem." *Parallel Computing* **46** (July): 98–119. doi:10.1016/j.parco.2014.04.008

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.

Wang, Shaowen, Hao Hu, Tao Lin, **Yan Liu**, Anand Padmanabhan, and Kiumars Soltani. 2014. "CyberGIS for Data-Intensive Knowledge Discovery." *ACM SIGSPATIAL Newsletter* **6** (2) (July): 26–33. doi:10.1145/2744700.2744704

Padmanabhan, Anand, Shaowen Wang, Guofeng Cao, Myunghwa Hwang, Zhenhua Zhang, Yizhao Gao, Kiumars Soltani, and **Yan Liu** 2014. "FluMapper: A CyberGIS Application for Interactive Analysis of Massive Location-based Social Media." *Concurrency and Computation: Practice and Experience* **26** (13) (September): 2253–2265. doi:10.1002/cpe.3287

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

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

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

Liu, Yan, Anand Padmanabhan, and Shaowen Wang. 2013. "CyberGIS Gateway for enabling data-rich geospatial research and education," In *IEEE International Conference on Cluster Computing, CLUSTER*: pp. 1–3. Sept. 23–27, 2013, Indianapolis, Indiana, USA. doi:10.1109/CLUSTER.2013.6702694

Wang, Shaowen, Luc Anselin, Budhendra Bhaduri, Christopher Crosby, Michael F. Goodchild, **Yan Liu**, and Timothy L. Nyerges. 2013. "CyberGIS Software: A Synthetic Review and Integration Roadmap." *International Journal of Geographical Information Science* **27** (11) (April): 2122–2145. doi:10.1080/13658816.2013.776049

Tang, Wenwu, Shaowen Wang, David A. Bennett, and **Yan Liu** 2011. "Agent-based Modeling within a Cyberinfrastructure Environment: A Service-Oriented Computing Approach." *International Journal of Geographical Information Science* **25** (9) (October): 1323–1346. doi:10.1080/13658816.2011.585342

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

Guo, Zhenhua, Raminderjeet Singh, Marlon Pierce, and **Yan Liu**. 2011. "Investigating the Use of Gadgets, Widgets, and OpenSocial to Build Science Gateways," *2011 IEEE Seventh International Conference on eScience* : pp. 31-38. December 5-8, 2011. Stockholm, Sweden. doi:10.1109/eScience.2011.13

Ye, Fei, Xuan Shi, Shaowen Wang, **Yan Liu**, and Su Yeon Han. 2011. "Spherical interpolation over graphic processing units." In *Proceedings of the ACM SIGSPATIAL Second International Workshop on High Performance and Distributed Geographic Information Systems*: pp. 38-41. November 01, 2011. Chicago, Illinois, USA. doi:10.1145/2070770.2070777

Liu, Yan, Kaichao Wu, Shaowen Wang, Yanli Zhao, and Qian Huang. 2010. "A MapReduce Approach to $Gi^*(d)$ Spatial Statistic." In *Proceedings of the ACM SIGSPATIAL International Workshop on High Performance and Distributed Geographic Information Systems (ACM HPDGIS 2010)*: pp. 11-18. November 2, 2010. San Jose, CA, USA. doi:10.1145/1869692.1869695

Padmanabhan, Anand, Eric Shook, **Yan Liu**, and Shaowen Wang. 2010. "An Interoperable Information Service Solution for Grids." In *Cyberinfrastructure Technologies and Applications*, edited by J. Cao, Nova Science Publishers, Inc., Chapter 3, pp. 45–62.

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

Wang, Shaowen and **Yan Liu**. 2009. "TeraGrid GIScience Gateway: Bridging Cyberinfrastructure and GIScience." *International Journal of Geographical Information Science* **23** (5): 631–656. doi:10.1080/13658810902754977

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

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

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

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

SELECTED GRANTS AWARDED BY U.S. FEDERAL AGENCIES

Co-Investigator. FEMA Hazard Mitigation Grants Program (HMGP) (CFDA 97.039). 2021-2023. "Mobile Flood Data Collection for Mitigation and Emergency Response," with PI David Maidment (UT-Austin) for the Texas Division of Emergency Management (TDEM).

Principal Investigator. Oak Ridge National Laboratory (ORNL), Laboratory Directed Research and Development (LDRD) Program. 2019-2021. "Building High-Performance Scalable Geocomputation Capabilities for Global and High-Resolution Geospatial Studies"

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

COMPUTING AWARDS

Principal Investigator. High-Performance Causal Inference for COVID-19 Mitigation and Response. COVID-19 HPC Consortium and NSF XSEDE Allocation Award. 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. 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. 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. 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.

SELECTED SCIENTIFIC SOFTWARE

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). Created an extreme-scale parallel evolutionary algorithm solver for spatial partitioning problems in large-scale spatial optimization.

Continental Flood Inundation Mapping (CFIM). Lead developer of a scalable high-performance hydrological information analysis software for national flood inundation mapping. Coordinator and computational scientist for methodology research collaboration among UT Austin, Utah State University, NOAA, CUAHSI, USGS, and RENCI. Produced the first 10m resolution Hand Above Nearest Drainage (HAND) for conterminous U.S. CFIM was used for Hurricane Harvey relief and recovery in August 2017 for the state of Texas.

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.

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.

SimpleGrid Toolkit. Created this software for learning and prototyping science and engineering gateways to cyberinfrastructure. Led research and development of the software, and taught tutorials for hundreds of users at a variety of prominent conferences and workshops (e.g., the DOE Scientific Discovery through Advanced Computing Annual Conferences, NSF TeraGrid/XSEDE Annual Conferences, and Supercomputing Conference Series).

VISUALIZATION

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.

SELECTED CONFERENCE ABSTRACTS

Cho, Wendy K. Tam Cho and **Yan Y. Liu**. 2018. "A Massively Parallel Evolutionary Markov Chain Monte Carlo Algorithm for Sampling Complicated Multimodal State Spaces." *SC18: The International Conference for High Performance Computing, Networking, Storage and Analysis*. November 11–16. Dallas, TX.

Liu, Yan Y. and Wendy K. Tam Cho. 2018. "A High-Performance Evolutionary Computation Framework for Scalable Spatial Optimization." ICCS 2018. *International Conference on Computational Science: Science at the Intersection of Data, Modelling and Computation*. June 11–13. Wuxi, China.

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

Stanislawski, Larry, Kornelijus Survila, Jeff Wendel, **Yan Liu**, and Barbara Buttenfield. 2016. "An Open Source Solution to High Performance Processing for Extracting Drainage Channels from Diverse Terrain Conditions." *AutoCarto* 2016. September 14–16, 2016. Albuquerque, New Mexico.

Stanislawski, Larry, **Yan Liu**, Barbara Buttenfield, Kornelijus Survila, and Jeff Wendel. 2016. "High Performance Computing to Support Multiscale Representation of Hydrography for the Conterminous United States." *19th ICA Workshop on Generalisation and Multiple Representation*. 14th June 2016. Helsinki, Finland.

Liu, Yan Y., Cho, Wendy K. Tam, 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

Fan, Ye, **Yan Y. Liu**, Shaowen Wang, David G. Tarboton, Ahmet A. Yildirim, and Nancy Wilkins-Diehr. 2014. "Accelerating TauDEM as a Scalable Hydrological Terrain Analysis Service on XSEDE." XSEDE 2014 Conference: Extreme Science and Engineering Discovery Environment. July 13–18, Atlanta, GA. doi:10.1145/2616498.2616510

Liu, Yan Y., Mengyu Guo, and Shaowen Wang. 2013. "Large-scale Land Use Optimization by Enhancing a Scalable Parallel Genetic Algorithm Library." In *Proceedings of XSEDE 2013: Extreme Science and Engineering Discovery Environment: Gateway to Discovery*, July 22–25 2013, San Diego, CA, USA. doi:10.1145/2484762.2484824

Hu, Hao, Shaowen Wang, Tao Lin, **Yan Liu**, and Luis F. Rodriguez. 2013. "Assessing Uncertainties in CyberGIS-Based Spatial Decision Making: A Spatial Optimization Case Study." The Association of American Geographers 109th Annual Meeting, April 9–13, 2013, Los Angeles, CA, USA

Liu, Yan, Michael P. Finn, Babak Behzad, and Eric Shook. 2013. "High-Resolution National Elevation Dataset: Opportunities and Challenges for High-Performance Spatial Analytics." American Society for Photogrammetry and Remotes Sensing Annual Conference 2013. March 24–28, 2013, Baltimore, MD, USA

Finn, Michael P., **Yan Liu**, David P. Mattli, Qingfeng Guan, Kristina H. Yamamoto, Eric Shook, and Babak Behzad. 2012. "pRasterBlaster: High-Performance Small-Scale Raster Map Projection Transformation Using the Extreme Science and Engineering Discovery Environment." The XXII International Society for Photogrammetry & Remote Sensing Congress, Aug 25–Sept 1, 2012, Melbourne, Australia

Behzad, Babak, **Yan Liu**, Eric Shook, Michael P. Finn, David P. Mattli, and Shaowen Wang. 2012. "A Performance Profiling Strategy for High-Performance Map Re-Projection of Coarse-Scale Spatial Raster Data." The 2012 Auto-Carto International Symposium on Automated Cartography, September 16–18, 2012, Columbus, OH, USA

Zhao, Yanli, Anand Padmanabhan, Shaowen Wang, and **Yan Liu**. 2011. "GPGPU-Based Parallel Viewshed Analysis on CyberGIS Gateway." In *Proceedings of the 5th NSF TeraGrid 2011 Annual Conference*, July 18–21, 2011, Salt Lake City, UT, USA

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

Wang, Shaowen and **Yan Liu**. 2010. "GISolve 2.0: Geospatial Problem Solving Environment Based on Synthesizing Cyberinfrastructure and Web 2.0" (abstract). In *Proceedings of TeraGrid 2010 conference*. August 1–5, 2010. Pittsburgh, PA, USA

Wang, Shaowen and **Yan Liu**. 2010. "Simplifying Access to Cyberinfrastructure: A SimpleGrid Approach." The Association of American Geographers 106th Annual Meeting, April 14–18, 2010, Washington, DC, USA

Shook, Eric, **Yan Liu**, and Shaowen Wang. 2008. "A Publish/Subscribe Model for Integration of Cyberinfrastructure-Enabled Geospatial Services." The Association of American Geographers 104th Annual Meeting, April 15–19, 2008, Boston, MA, USA

Shook, Eric, Shaowen Wang, Xingguang Zhu, and **Yan Liu**. 2007. "Synthesizing Spatial-Temporal Data to Enable Geospatial Analysis of Biomass-Based Bioenergy." AAG Westlake Annual Meeting, November 8–10, 2007, Urbana, IL, USA

Wang, Shaowen, Marc P. Armstrong, Jun Ni, and **Yan Liu**. 2005. "GISolve: A Grid-based Problem Solving Environment for Computationally Intensive Geographic Information Analysis." The Association of American Geographers 101st Annual Meeting, April 5–9, 2005, Denver, CO, USA

Liu, Yan and Shaowen Wang. 2004. "Grid Analysis Environment—A User Portal (GAE-UP)." The CMS UIowa Tier-2 Workshop, July 22, 2004, Iowa City, IA, USA

SELECTED TEACHING AND TRAINING

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

HONORS AND AWARDS

2019 HPC Innovation Excellence Award by HPC User Forum at ISC19 for "Massively Parallel Evolutionary Computation for Empowering Electoral Reform: Quantifying Gerrymandering via Multiobjective Optimization and Statistical Analysis", with Wendy K. Tam Cho. June 18. Frankfurt, Germany.

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 Winner of Best Paper in 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

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
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 Supercomputing
SoftwareX
Transactions in GIS
The Platform for Advanced Scientific Computing Conference 2022 (PASC22)

Gateways 2016–2021

The 1st International Workshop on Searching and Mining Large Collections of Geospatial Data (GEOSEARCH21), collocated with ACM SIGSPATIAL GIS 2021

PEARC Conference 2018

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

Selected Conferences and Workshops

2022 **Paper Program Domain Chair (Humanities and Social Sciences)**, The Platform for Advanced Scientific Computing Conference 2022 (PASC22)

2021 **Program Committee**, Gateways 2021

2021 **Paper Program Domain Chair (Emerging Application Domains)**, The Platform for Advanced Scientific Computing Conference 2021 (PASC21)

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)