CURRICULUM VITAE

SHRIDEEP PALLICKARA
PROFESSOR

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HIGHLIGHTS

Research
- Monfort Professorship
- National Science Foundation CAREER award.
- 6 *Best Paper Awards* at international *IEEE* and *ACM* forums, 1 showcased presentation, and 1 shortlisting for an *ACM DEBS Grand Challenge* award.
- Over 150 peer-reviewed research articles. h-index: 37 and i-10 index: 92
- Over $31 million in research funding from agencies in the United States and United Kingdom.
  - Sponsoring agencies in the United States: NSF, DHS, EPA, NIFA, NEH, and USDA.
  - Sponsoring agencies in the United Kingdom: OMII through the ESPRC's e-Science program.
  - Funding from the National Science Foundation's *Artificial Intelligence (AI) Institutes Program.*
  - Funding from the Department of Homeland Security's prestigious *Long Range Program*.

Teaching
- Recipient of the CSU *Board of Governors'* Award for Excellence in Undergraduate Teaching. 2017.
  - This is the University's highest teaching honor
- Recipient of the OLIE (Online Innovative Educator) Award – highest honor for online instruction. 2018.
- Recipient of the *Faculty Excellence in Undergraduate Teaching Award*. College of Natural Sciences. 2014.
- Recipient of the *Innovative and Effective Teaching Award* from the Computer Science Department. 2012.
- Curriculum Development: Creator of the *Distributed Systems* track at CSU. This includes a 400-level capstone course, a graduate course, and an advanced research seminar course.
- Service on the College of Natural Science's new *Data Science* Major planning committee.

Advising & Mentoring
- Graduations: Supervised 8 Ph.D. dissertations, 12 M.S. theses, and 5 undergraduate honors theses.
- My advisees are recipients of prestigious, competitive awards including the *NSF's CRII Award* {1}, IEEE TCSC *Outstanding Ph.D. Dissertation Award* {1}, Anita Reed Graduate Award {2}, *Best in Show* at the CURC {2}, Facebook Ph.D. Internship {1}, *Best Paper* Awards {5}, and Showcased Presentations {1}.
- Primary advisor for 15 NSF REU (Research Experiences for Undergraduates) students at CSU.
- Service on 27 Ph.D. committees in the U.S. and Australia besides those of my own students.

Professional Service
- Service on several National Science Foundation and NIFA Panels.
- Technical Program Committee of ~50 IEEE and ACM conferences/workshops.
- External examiner for Ph.D. dissertations in Australia; reviewer for the Austrian Science Foundation and the Swiss National Science Foundation.

Outreach
- Directs NSF-funded summer camp (2020-24) for middle school students from the Lincoln Middle School, Fort Collins, CO. Instructional materials, and pedagogy is bilingual (English and Spanish).
- Directed an NSF-funded summer camp (2013-2017) for Native American middle school students from Cortez, CO. The camp focused on improving math skills relevant to being successful in computer science.

1   RESEARCH INTERESTS

Broadly in cloud computing and analytics with a focus on using machine learning, probabilistic, and statistical techniques to address scaling, autonomy, and tractability issues. These efforts target processing, routing, storing, and mining data streams generated by networked sensors, observational equipment, and programs.

2   AWARDS & HONORS

* I am the first recipient of both the Monfort Professorship and the Board of Governors' Award at CSU.

Research Awards
- Monfort Professor [2016-2018]
  The Monfort Professorship is among the highest honors that Colorado State University bestows on faculty for exceptional research and creativity accomplishments. Two faculty are named Monfort Professors every year.
- U.S. National Science Foundation CAREER Award. 2013.
  CISE/CNS/Computer Systems Research. The CAREER is the NSF's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.
- Best Paper Award. *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies* with Menuka Warushavithana, Kassidy Barram, Caleb Carlson, Sudipto Ghosh, Jay Breidt, and Sangmi Lee Pallickara. 2023.
- Best Paper Award. *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies* with Saptashwa Mitra, Matthew Young, and Sangmi Lee Pallickara. 2023.
- Best Paper Award. *IEEE International Conference on Cluster Computing* (CLUSTER) [27% acceptance rate] with Saptashwa Mitra, Paahuni Khandelwal, and Sangmi Lee Pallickara. 2019.
- Shortlisted for the *ACM-DEBS Grand Challenge Award* with Amila Suriarachchi (graduate advisee). 2015.
- Best Paper Award. *IEEE/ACM Conference on Utility and Cloud Computing* [27% acceptance rate] with Matthew Malensek (graduate advisee) and Sangmi Lee Pallickara. 2012.
- Best Student Paper Award at the *IEEE International Conference on Cloud Computing Technology and Science* [24.9% acceptance rate] with Kate Ericson (graduate advisee) and Charles Anderson. 2010.
- One of Six Best Papers at *ACM/IEEE GRID* [18.8% acceptance rate] with Geoffrey Fox and Harshawardhan Gadgil. 2005.

Teaching Awards
- Board of Governors' Excellence in Undergraduate Teaching Award. 2017.
  The Board of Governors' Award is the University's most prestigious teaching award and is awarded to one faculty every year across the entire CSU system.
- *Online Innovative Educator* Award (The OLIE). 2018.
  Colorado State University Online Programs. This is the University's highest honor for online instruction.
- *Faculty Excellence in Undergraduate Teaching Award*. 2014.
  College Of Natural Sciences, Colorado State University.
- *Effective and Innovative Teaching Award*, Dept. of Computer Science, Colorado State University. 2012.

3   PROFESSIONAL EXPERIENCE

July 2018 –	Professor	Department of Computer Science, Colorado State University
October 21 --	Director	Center for eXascale Spatial Data Analytics and Computing (XSD), Computer Science, Colorado State University
July 2016 – 18	Monfort Professor	Colorado State University
July 13 – June 18	Associate Professor	Department of Computer Science, Colorado State University
Aug 09 –June 13	Assistant Professor	Department of Computer Science, Colorado State University
Oct 02 – Aug 09	Research Associate	Community Grids Lab, Indiana University.
Oct 01 – Oct 02	Postdoctoral Fellow	Community Grids Lab, Indiana University.
Jan 99 – Sep 99	Intern	IBM T. J. Watson Research Center, New York.
May 97 –Sep 97	Intern	IBM T. J. Watson Research Center, New York.
May 96 – Jun 01	Research Assistant	Northeast Parallel Architectures Center, Department of Electrical Engineering and Computer Science, Syracuse University
Jan 96 – May 96	Teaching Assistant	Department of Electrical Engineering and Computer Science, Syracuse University
Jun 94 – July 95	Software Analyst	Mahindra- British Telecom Plc, Bombay India.

4   EDUCATION

June 01	*Syracuse University*, Syracuse, New York. Ph.D., Computer Engineering.
December 98	*Syracuse University*, Syracuse, New York. M.S., Computer Engineering.
May 94	*Bombay University*, Bombay, India. Bachelor of Engineering, Electronics & Telecommunications.

5   RESEARCH FUNDING

My research has been funded by agencies in the United States and the United Kingdom. U.S. federal agencies that I have been funded by include the National Science Foundation, the Department of Homeland Security, the Environmental Protection Agency, the National Institute for Food & Agriculture, and the Department of Agriculture. My funding from the U.K. was from the Open Middleware Infrastructure Institute that was funded by the Engineering and Physical Sciences Research Council's (EPSRC) e-Science program.

5.1   Funding from the United States

[F27]   CPS: Medium: Making Every Drop Count: Accounting for Spatiotemporal Variability of Water Needs for Proactive Scheduling of Variable Rate Irrigation Systems. Shrideep Pallickara (**Co-PI**) with Sangmi Pallickara (PI) and Co-PIs: Allan Andales, Jay Breidt, and Jeffrey Niemann. *Cyber Physical Systems* program. National Science Foundation. $1,199,846. 8/2023-8/2026.

[F26]   National Science Foundation AI Institute: AI-CLIMATE (AI Institute for Climate-Land Interactions, Mitigation, Adaptation, Tradeoffs and Economy), PI: Shashi Shekhar. CSU Investigators: Keith Paustain

(Co-PI) with Francesca Cotrufo, Patrick Keys, Nathan Mueller, Stephen Ogle, Sangmi Pallickara, Shrideep Pallickara, and Yao Zhang. NSF and NIFA: $20,000,000. 7/2023-6/2028.

[F25]   *The Green & Gold Initiative.* Shrideep Pallickara (**Co-PI**) with Dan Beachy-Quick(PI) and Kelly Long (Co-PI, Fall 22). Teagle Foundation and the National Endowment for the Humanities (NEH). $350,000. $100K in internal funds. 8/2022-8/2024.

[F24]   *FACT: A Scalable Infrastructure for High-precision Evapotranspiration Estimations and Effective Farm-level Decision Making.* Shrideep Pallickara (**Co-PI**) with Sangmi Pallickara (PI) and Co-PIs: Allan Andales, Gabriel Senay, Jay Breidt, and Darin Schulte. National Institute for Food and Agriculture. *$495,585* 7/2020-7/2023.

[F23]   *Leveraging the Google Cloud for Urban Sustainability.* Shrideep Pallickara (**PI**). *Geo For Good* Google Cloud Credits. Google. *$15,000   7/2020-7/2021.*

[F22]   *Frameworks: Collaborative Proposal: Software Infrastructure for Transformative Urban Sustainability Research.* Shrideep Pallickara (**PI**). Co-PIs: Mazdak Arabi, Sangmi Lee Pallickara, Jay Breidt, Sudipto Ghosh, Mikhail Chester (ASU), Amir AghaKouchak (UC-Irvine), and Claire Welty (UMBC). National Science Foundation. $3,081,355. 10/2019–9/2024.

[F21]   REU Supplement: Shrideep Pallickara (**PI**). National Science Foundation.   Co-PIs: Mazdak Arabi, Sangmi Lee Pallickara, Jay Breidt, Sudipto Ghosh $16,000   4/2020–4/2021.

[F20]   REU Supplement: Shrideep Pallickara (**PI**). National Science Foundation.   Co-PIs: Mazdak Arabi, Sangmi Lee Pallickara, Jay Breidt, Sudipto Ghosh $16,000   4/2023–4/2024.

[F19]   *A Digital Learning Initiative for Computer Science.* Shrideep Pallickara (**PI**). Co-PIs: Laura Moreno and Albert Lionelle. Office of the Provost. Colorado State University. $19,936   2019-2020.

[F18]   *Monfort Professorship.* Shrideep Pallickara (**PI**). Monfort Family Foundation and Colorado State University. $150,000   2016–2018.

[F17]   *Assessing Epidemiological and Economic Impacts of Countermeasures and Vaccination Strategies in Disease Outbreaks at the National Scale.* Shrideep Pallickara (**PI**). Co-PIs: Sangmi Lee Pallickara, Jay Breidt, Neil Harvey, Mike Sanderson, and Dustin Pendell. Science and Technology Directorate. Department of Homeland Security. $2,044,978   9/2015–9/2019.

[F16]   *Advancing Math and Computer Science Education for Middle School Students.* Shrideep Pallickara (**PI**). National Science Foundation. $40,000   6/2014 – 6/2018.

[F15]   *Autonomous Scaling of Multitier Soil Erosion Models in IaaS Clouds.* Shrideep Pallickara **(PI).** Amazon Web Services Education Research Grant. $5000   3/2014-3/2015.

[F14]   *Big Data Analytics of Epidemic Outbreaks.* Shrideep Pallickara (**PI**). Co-PIs: Sangmi Lee Pallickara, Neil Harvey, and Jay Breidt. LONG RANGE PROGRAM, Science and Technology Directorate. Department of Homeland Security. $1,176,860   9/2013–6/2017.

[F13]   *Accessible Nutrient Data, Analysis and Modeling Dashboard for the Nation*. Shrideep Pallickara (**Co-PI**), with Mazdak Arabi (PI) and Co-PIs: Jeff Arnold, Richard Alexander, Nathaniel Booth. Part of an EPA Center for Effective Abatement of Nutrients. US Environmental Protection Agency. $256,936 09/2013–08/2017.

[F12]   *CAREER: Robust Processing of Data Streams in Real Time.* Shrideep Pallickara (**PI**). National Science Foundation. CISE/CNS/Computer Systems Research. NSF CNS-1253908. $400,000   3/2013–2/2019.

[F11]   REU Supplement: *Reliable Processing Semantics for Fault Tolerant Stream Processing Computations.* Shrideep Pallickara (**PI**). National Science Foundation. $16,000   7/2016–6/2017.

[F10]   REU Supplement: *Fault Tolerant Processing for Stateless and Stateful Stream Computations.*

Shrideep Pallickara (**PI**). National Science Foundation. $16,000   7/2015–6/2016.

[F9]   REU Supplement: *Predicting Stream Data Arrivals Using Linear and Nonlinear Methods.* Shrideep Pallickara (**PI**). National Science Foundation. $16,000   7/2014–6/2015.

[F8]   REU Supplement: *Simulating Clinical Settings and Fast Data Quality Assertions.* Shrideep Pallickara (**PI**). National Science Foundation. CISE/CNS/Computer Systems Research. $16,000 6/2013–5/2014.

[F7]   *Boosting Tracing and Assimilation of Disease Profiles in the Distributed Orchestration of Epidemiological Simulations.* Shrideep Pallickara (**PI**). Co-PIs: Wim Böhm, Neil Harvey, Sanjay Rajopadhye, and Aaron Reeves. LONG RANGE PROGRAM, Science and Technology Directorate. Department of Homeland Security. $352,713   8/2011–8/2013.

[F6]   *Enabling Scalable and Fault Tolerant Regional Epidemiological Simulations in the Cloud.* Shrideep Pallickara (**PI**). Co-PIs: Wim Böhm, Neil Harvey, Sanjay Rajopadhye, and Aaron Reeves. LONG RANGE PROGRAM, Science and Technology Directorate. Department of Homeland Security. $738,139   8/2010–8/2013.

[F5]   *Evaluating the Computational Soundness and Enabling the Coarse Grained Parallelization of the NAADSM Epidemiological Simulation Model.* Shrideep Pallickara (**PI**). Co-PIs: Wim Böhm and Sanjay Rajopadhye. From the USDA/ Animal and Plant Health Inspection Service (APHIS) through the Department of Homeland Security. $86,952   8/2009–8/2010.

[F4]   *Collaborative Research: Development of Middleware/Software to allow Visualization and Analysis of Large and Complex 4-D Geoscience Data Sets.* Shrideep Pallickara (**PI**). National Science Foundation. EAR-0446610. $199,020   6/2005–5/2009.

[F3]   *Collaborative Research: High-Performance Techniques, Designs and Implementation of Software Infrastructure for Change Detection and Mining.* Shrideep Pallickara: **Co-PI**, with Geoffrey Fox (PI) and Marlon Pierce (Co-PI). National Science Foundation. IIS-0536947. $371,850   9/2004–9/2009.

5.2   Funding from the United Kingdom

[F2]   *FINS –- Support for Web Services based publish/subscribe notifications within Grid Applications.* Shrideep Pallickara: **Co-PI**, with Geoffrey Fox (PI). Open Middleware Infrastructure Institute of the United Kingdom. $307,247 10/2004–1/2006.

[F1]   *FIRMS –- Support for Web Services based reliable messaging within Grid Applications.* Shrideep Pallickara: **Co-PI**, with Geoffrey Fox (PI). Open Middleware Infrastructure Institute of the United Kingdom. $158,570 10/2004– 10/2005.

6   PUBLICATIONS

This section includes rigorously peer-reviewed manuscripts in roughly reverse chronological order. In these listings, I denote my students with an * and my mentees with a ‡. Listings with the symbol § signify publications where I am the primary author of the research manuscript; in some cases, the authors are listed in alphabetical order. PDF versions of all papers are available for download at:

http://www.cs.colostate.edu/~shrideep/publications.html

6.1   Journals

[49]   Amir AghaKouchak, Laurie Huning, Mojtaba Sadegh, Yue Qin, Yannis Markonis, Farshid Vahedifard, Charlotte Love, Ashok Mishra, Ali Mehran, Renee Obringer, Annika Hjelmst, Shrideep Pallickara, Shakil Jiwa, Martin Hanel, Yunxia Zhao, Angeline Pendergrass, Mazdak Arabi, Steven Davis, Philip Ward, Mark Svoboda, Roger Pulwarty, and Heidi Kreibich. Toward impact-based monitoring of drought and its cascading hazards. *Nature Reviews Earth & Environment*. 4 (8), pp 582-595. 2023.

[48]   Sam Armstrong*, Paahuni Khandelwal, Dhruv Padalia, Gabriel Senay, Darin Schultz, Allan Andales, Jay Breidt, Shrideep Pallickara, and Sangmi Lee Pallickara. Attention-Based Convolutional Capsules for Evapotranspiration Estimation at Scale. *Environmental Modeling & Software*. Elsevier. Vol (152). June, 2022.

[J47]   Creating an Earth Archive. Chris Fisher, Stephen Leisz, Diana Wall, Melinda Laituri, Geoffrey Henebry, Damian Evans, Juan Carlos Fernandez- Diaz, Shrideep Pallickara, Sangmi Pallickara, Thomas Garrison, Francisco Estrada-Belli, Eduardo Neves, Kathryn Reese-Taylor, Rachel Opitz, Thomas Lovejoy, William Sarni, Rodrigo Solinis, Grace Ellis. *Proceedings of the National Academy of Sciences*. Vol. 119(11). e2115485119. 2022.

[J46]   Daniel Rammer*, Thilina Buddhika*, Matthew Malensek*, Shrideep Pallickara, and Sangmi Lee Pallickara. Enabling Fast Exploratory Analyses Over Voluminous Spatiotemporal Data Using Analytical Engines. *IEEE Transactions on Big Data*. Vol. 8 (1) pp. 213-228. 2022.

[J45]   Thilina Buddhika*, Matthew Malensek*, Shrideep Pallickara, and Sangmi Lee Pallickara. Living on the Edge: Data Transmission, Storage, and Analytics in Continuous Sensing Environments. *ACM Transactions on Internet of Things*. Vol. 2 (3), pp 1-31. 2021.

[J44]   Thilina Buddhika*, Sangmi Lee Pallickara, and Shrideep Pallickara. Pebbles: Leveraging Sketches for Processing Voluminous, High Velocity Data Streams. *IEEE Transactions on Parallel and Distributed Systems*. Vol. 32(8): 2005-2020. 2021.

[J43]   Shashi Ilager, Vlado Stankovski, Shrideep Pallickara, and Rajkumar Buyya. Elastic Computing from Edge to the Cloud Environments. *Software: Practice & Experience*. Vol 51 (9). pp 1849-1851. 2021.

[J42]   Matthew Malensek*, Walid Budgaga*, Ryan Stern*, Shrideep Pallickara, and Sangmi Lee Pallickara. Trident: Distributed Storage, Analysis, and Exploration of Multidimensional Phenomena. *IEEE Transactions on Big Data*. Vol. 5 (2) pp 252 265. 2019.

[J41]   Naman Shah, Matthew Malensek*, Harshil Shah*, Shrideep Pallickara, and Sangmi Lee Pallickara. Scalable Network Analytics for Characterization of Outbreak Influence in Voluminous Epidemiology Datasets. *Concurrency and Computation: Practice & Experience*. John-Wiley. Vol. 31(7). 2019.

[J40]   Wes Lloyd*, Shrideep Pallickara, Olaf David, Mazdak Arabi, Tyler Wible, Jeffrey Ditty, and Ken Rojas. Demystifying the Clouds: Harnessing Resource Utilization Models for Cost Effective Infrastructure Alternatives. *IEEE Transactions on Cloud Computing*. Vol. 5(4) pp 667-680. 2017.

[J39]   Thilina Buddhika*, Ryan Stern*, Kira Lindburg*, Kathleen Ericson*, and Shrideep Pallickara. Online Scheduling and Interference Alleviation for Low-latency, High-throughput Processing of Data Streams. *IEEE Transactions on Parallel and Distributed Systems*. Vol. 28(12) pp 3553-3569. 2017.

[J38] Thilina Buddhika*, Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Synopsis: A Distributed Sketch over Voluminous Spatiotemporal Observational Streams. *IEEE Transactions on Knowledge and Data Engineering*. Vol. 29 (11) pp 2552-2566. 2017.

[J37] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Hermes: Federating Fog and Cloud Nodes to Support Query Evaluations in Continuous Sensing Environments. *IEEE Cloud Computing*. Vol. 4 (5) pp 54-62. 2017.

[J36] Walid Budgaga*, Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. A Framework for Scalable Real-Time Anomaly Detection over Voluminous, Geospatial Data Streams. *Concurrency and Computation: Practice & Experience*. Vol. 29(12) pp 1-16. John-Wiley. 2017.

[J35] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Fast, Ad Hoc Query Evaluations over Multidimensional Geospatial Datasets. *IEEE Transactions on Cloud Computing*. Vol. 5(1): 28-42. 2017.

[J34] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Autonomous Data Management and Federation to Support High-throughput Query Evaluations over Voluminous Datasets. *IEEE Cloud Computing*. Special Issue on Autonomic Clouds. Vol. 3 (3). pp 40-49. 2016.

[J33] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Analytic Queries over Geospatial Time-Series Data using Distributed Hash Tables. *IEEE Transactions on Knowledge and Data Engineering*. Vol 28(6) pp 1408-1422. 2016.

[J32] Walid Budgaga*, Matthew Malensek*, Sangmi Lee Pallickara, Neil Harvey, Jay Breidt, and Shrideep Pallickara. Predictive Analytics Using Statistical, Learning, and Ensemble Methods to Support Real-Time Exploration of Discrete Event Simulations. *Future Generation Computer Systems*. Elsevier. Volume 56, March, Pages 360–374. 2016.

[J31] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Minerva: Proactive Disk Scheduling for QoS in Multi-Tier, Multi-Tenant Cloud Environments. *IEEE Internet Computing*. Vol. 20 (3) pp 19-27. 2016.

[J30] Zhiquan Sui*, Matthew Malensek*, Neil Harvey, and Shrideep Pallickara. Autonomous Orchestration of Distributed Discrete Event Simulations in the Presence of Resource Uncertainty. *ACM Transactions on Autonomous and Adaptive Systems*. Vol. 10(3): 18. 2015.

[J29] Kathleen Ericson*, Shrideep Pallickara, and Charles Anderson. Failure-Resilient Real-Time Processing of Health Streams. Vol. 27(7) pp 1695–1717. *Concurrency and Computation: Practice & Experience*. John-Wiley. 2015.

[J28] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Evaluating Geospatial Geometry and Proximity Queries Using Distributed Hash Tables. *IEEE Computing in Science and Engineering* (CiSE). Special Issue on Extreme Data. Vol. 16(4) pp 53-60. 2014.

[J27] Zhiquan Sui*, Neil Harvey, and Shrideep Pallickara. On the Distributed Orchestration of Stochastic Discrete Event Simulations. *Concurrency and Computation: Practice & Experience*. John-Wiley. Vol. 26(11), pp 1889–1907. 2014.

[J26] Wes Lloyd*, Shrideep Pallickara, Olaf David, Jim Lyon, Mazdak Arabi and Ken Rojas. Performance Implications of Multi-Tier Application Deployments on Infrastructure-as-a-Service Clouds: Towards Performance Modeling. *Future Generation Computer Systems*. Vol. 29(5), pp 1254-1264. Elsevier. 2013.

[J25] Matthew Malensek*, Sangmi Lee Pallickara, and Shrideep Pallickara. Exploiting Geospatial and Chronological Characteristics in Data Streams to Enable Efficient Storage and Retrievals. *Future Generation Computer Systems*. Vol. 29(4), pp 1049-1061. Elsevier. 2013.

[J24] Kathleen Ericson* and Shrideep Pallickara. On the Performance of High Dimensional Data Clustering and Classification Algorithms. *Future Generation Computer Systems*. Vol. 29(4), pp 1024-1034. Elsevier. 2013.

[J23] Shrideep Pallickara and Geoffrey Fox. Enabling Hierarchical Dissemination of Streams in Content
§ Distribution Networks. *Concurrency and Computation: Practice & Experience*. Vol. 24 (14), pp. 1594-1606. 2012. John-Wiley.

[J22] Kathleen Ericson* and Shrideep Pallickara. Adaptive Heterogeneous Language Support within a Cloud Runtime. *Future Generation Computer Systems*. Vol. 28(1), pp. 128-135. 2012. Elsevier.

[J21] Sangmi Lee Pallickara, Shrideep Pallickara, and Milija Zupanski. Enabling Efficient Data Subsetting over Large-scale Atmospheric Datasets. *Future Generation Computer Systems*. Vol. 28(1), pp. 112-118. 2012. Elsevier.

[J20] Geoffrey C. Fox, Mehmet S. Aktas, Galip Aydin, Harshawardhan Gadgil[‡], Shrideep Pallickara, Marlon E. Pierce, and Ahmet Sayar. Algorithms and the Grid. Springer *Journal of Computing and Visualization in Science (CVS)*. Vol 12 (3). pp 115-124. 2009. Springer Berlin-Heidelberg.

[J19] Shrideep Pallickara, Geoffrey Fox and Harshawardhan Gadgil[‡]. On the Secure Creation, Organization
§ and Discovery of Topics in Distributed Publish/Subscribe Systems. *International Journal of High Performance Computing and Networking (IJHPCN)*. Vol. 5, No. 3, pp.156–167. 2008.

[J18] Geoffrey Fox, Galip Aydin, Harshawardhan Gadgil[‡], Shrideep Pallickara, Marlon Pierce, and Wenjun Wu. Management of Real-Time Streaming Data Grid Services. *Concurrency and Computation: Practice & Experience*. Volume 19(7) pp 983-998, 2007.

[J17] G. Erlebacher, D. Yuen, Z. Lu, E. Bollig, M. Pierce and Shrideep Pallickara. A Grid Framework for Visualization Services in the Earth Sciences. *Journal of Pure and Applied Geophysics*. Volume 163, Numbers 11-12. pp 2467-2483. Birkhäuser Verlag. 2006.

[J16] Geoffrey Fox, Shrideep Pallickara, Marlon Pierce, Harshawardhan Gadgil[‡]. Building Messaging
§ Substrates for Web and Grid Applications. *Philosophical Transactions of the Royal Society: Mathematical, Physical and Engineering Sciences*. Volume 363, Number 1833, pp 1757-1773. Aug, 2005.

[J15] Geoffrey Fox and Shrideep Pallickara. Deploying the NaradaBrokering Substrate in Aiding Efficient
§ Web & Grid Service Interactions. *Proceedings of the IEEE*. Vol 93, No 3. pp 564-577. March 2005.

[J14] Shrideep Pallickara, Geoffrey Fox, Ahmet Uyar[‡], Hongbin Liu, Xi Rao[‡], David Walker and Beytullah
§ Yildiz[‡]. Performance of a Possible Grid Message Infrastructure. *Concurrency and Computation: Practice & Experience*. Volume 17, Number 2-4. pp 193-214.

[J13] Geoffrey Fox, Sang Lim, Shrideep Pallickara and Marlon Pierce. Message-Based Cellular Peer-to-Peer Grids: Foundations for Secure Federation and Autonomic Services. *Future Generation Computer Systems*. Volume 21, Issue 3, pp 401-415. 2005. Elsevier.

[J12] Geoffrey Fox, Shrideep Pallickara and Xi Rao[‡]. Towards Enabling Peer-to-Peer Grids. *Concurrency and*
§ *Computation: Practice & Experience*. Volume 17, Issue 7-8, Pages 1109-1131. 2005.

[J11] Mehmet Aktas, Galip Aydin, Andrea Donnellan, Geoffrey Fox, Robert Granat, Lisa Grant, Greg Lyzenga, Dennis McLeod, Shrideep Pallickara, Jay Parker, Marlon Pierce, John Rundle, Ahmet Sayar, and Terry Tullis. iSERVO: Implementing the International Solid Earth Research Virtual Observatory by Integrating Computational Grid and Geographical Information Web Services. Special Issue of the *Journal of Pure and Applied Geophysics*. Vol. 163(11-12), pp. 2281-2296. Birkhäuser Verlag AG..

[J10] Shrideep Pallickara and Geoffrey Fox. Efficient Matching Of Events in Distributed Middleware
§ Systems. *Journal Of Digital Information Management*. Volume 2(2). pp 79-87. 2004.

[J9] Minjun Wang, Geoffrey Fox and Shrideep Pallickara. Demonstrations of Collaborative Web Services and Peer-to-Peer Grids. *Journal Of Digital Information Management*. Volume 2(2). pp 93-97. 2004.

[J8] Geoffrey Fox, Shrideep Pallickara, Marlon Pierce and David Walker. Towards Dependable Grid and
§ Web Services. *ACM Ubiquity*. Volume 4 Issue 25. August 2003.

[J7] Geoffrey Fox, Wenjun Wu, Ahmet Uyar[‡], Hasan Bulut and Shrideep Pallickara. Global Multimedia

Collaboration System. *Concurrency and Computation: Practice & Experience*. Volume 16(5). pp 441-447. 2004.

[J6] Shrideep Pallickara and Geoffrey Fox. Efficient Support for Sophisticated Interactions between
§ Entities in Distributed Brokering Systems. *ACM Ubiquity* Volume 4 Issue 16. June 2003.

[J5] Geoffrey Fox and Shrideep Pallickara. Support for Peer-to-Peer Interactions in Web Brokering
§ Systems. *ACM Ubiquity*. Volume 3 Issue 15. May 2002.

[J4] Geoffrey Fox and Shrideep Pallickara. An Event Service to Support Grid Computational
§ Environments. *Concurrency and Computation: Practice & Experience*. Special Issue on Grid Computing
Environments. Volume 14(13-15) pp 1097-1129. 2002.

[J3] Geoffrey Fox, Sung Hoon Ko, Marlon E. Pierce, Ozgur Balsoy, Jake Kim, Sangmi Lee, Kang-Seok Kim,
Sangyoon Oh, Xi Rao, Mustafa Varank, Hasan Bulut, Gurhan Gunduz, Xiaohong Qiu, Shrideep
Pallickara, Ahmet Uyar, Choon-Han Youn. Grid Services for Earthquake Science. *Concurrency and
Computation: Practice & Experience*. ACES Computational Environments for Earthquake Science
Special Issue. Volume 14(6-7) pp 371-393. 2002.

[J2] Geoffrey Fox and Shrideep Pallickara. An Approach to High Performance Distributed Web Brokering
§ *ACM Ubiquity* Volume 2 Issue 38. November 2001.

[J1] G. Fox, W. Furmanski, B. Natarajan, H. T. Ozdemir, Z. Odcikin Ozdemir,S. Pallickara and T. Pulikal.
Integrating Web, Desktop, Enterprise and Military Simulation Technologies To Enable World-Wide
Scalable Televirtual (TVR) Environments. *Information & Security-An International Journal*, Volume 3-
1999 : Modeling and Simulation. ISSN 1311-1493.

6.2   Book Chapters

[B9] Zhiquan Sui* and Shrideep Pallickara. A Survey Of Load Balancing Techniques for Data Intensive
Computing. *Handbook of Data Intensive Computing*. Chapter 6, pp 157-168. Springer. 2011. ISBN 978-1-
4614-1415-5.

[B8] Sangmi Lee Pallickara, Matthew Malensek*, and Shrideep Pallickara. On the Processing of Extreme
Scale Datasets in the Geosciences. *Handbook of Data Intensive Computing*. Chapter 20, pp 521-538.
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[B7] Kathleen Ericson* and Shrideep Pallickara. A Survey Of Storage and Fault Tolerance Strategies Used
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§ Geoffrey Fox and Shrideep Pallickara. JMS Compliance in the Narada Event Brokering System. Proceedings of the 2002 *International Conference on Internet Computing* (IC-02). Vol 2 pp 391-397. [30% acceptance rate]

6.4   Refereed Workshop Proceedings

[W7] Menuka Warushavithana*, Saptashwa Mitra, Mazdak Arabi, Jay Breidt, Sangmi Lee Pallickara, and Shrideep Pallickara. Containerization of Model Fitting Workloads over Spatial Datasets. Big Spatial Data at the IEEE Big Data Conference. pp 3770-3779 .2021.

[W6] Kathleen Ericson* and Shrideep Pallickara. Robust Processing of Health Stream Data. *ACM/IEEE Super Computing Conference* (SC). Doctoral Showcase. Denver, USA. 2013.

[W5] Kathleen Ericson*, Shrideep Pallickara, and Charles Anderson. Handwriting Recognition Using a Cloud Runtime. Proceedings of the *Colorado Celebration of Women in Computing* (CCWIC). 2010.
** Selected as one of the 8 *showcased presentations*.

[W4] Harshawardhan Gadgil†, Geoffrey Fox, Shrideep Pallickara, Marlon Pierce. Managing Grid Messaging Middleware. Proceedings of the *IEEE Workshop on Challenges of Large Applications in Distributed Environments (CLADE)*, June 19, 2006, Paris, France. Held in conjunction with the IEEE HPDC 2006 conference.

[W3] Geoffrey Fox, Wenjun Wu, Ahmet Uyar†, Hasan Bulut, Shrideep Pallickara. A Web Services Framework for Collaboration and Videoconferencing. Proceedings of the 3rd Annual *Workshop on Advanced Collaborative Environments co-located with IEEE HPDC-12 & GGF8*. 2003.

[W2] Geoffrey Fox, Wenjun Wu, Ahmet Uyar†, Hasan Bulut and Shrideep Pallickara. Global Multimedia Collaboration System. Proceedings of the 1st International *Workshop on Middleware for Grid Computing. Co-located with ACM/IFIP Middleware Conference*. pp 245-250. 2003.

[W1] Daniel Dias, Geoffrey Fox, Wojtek Furmanski, Vishal Mehra, Balaji Natarajan, H.Timucin Ozdemir, Shrideep Pallickara and Zeynep Ozdemir. Exploring JSDA, CORBA and HLA based MuTechs for Scalable Televirtual (TVR) Environments. *Workshop on Object Orientation and VRML in conjunction with the Virtual Reality Modeling Language Symposium.* Monterey, California 1998

6.5   Ph.D. Dissertation and Masters Thesis

[G2] A Grid Event Service – *Ph.D. Dissertation, June 2001. Syracuse University*. Advisor: Geoffrey Fox
§

[G1]
§ Java Distributed Collaborative Environment (JDCE) – As a Test-bed for Distributed Object Technology *Masters Thesis, Aug'98 Syracuse University*. Advisor: Geoffrey Fox.

6.6 Non-overlapping Technical Reports [NOT PEER REVIEWED]

[R4]   Geoffrey Fox, Harshawardhan Gadgil[‡], Shrideep Pallickara, Marlon Pierce, John Rundle, Andrea Donnellan, Jay Parker, Robert Granat, Greg Lyzenga, Dennis McLeod and Anne Chen. Complexity Computational Environments (CCE) Architecture NASA Technical Report September 2004.

[R3]   Geoffrey Fox Harshawardhan Gadgil[‡], Shrideep Pallickara, Marlon Pierce, Robert L. Grossman, Yunhong Gu, David Hanley, Xinwei Hong . High Performance Data Streaming in Service Architectures. Technical Report Indiana University and University of Illinois at Chicago. July 2004

[R2]   G.C. Fox, W. Furmanski, H. T. Ozdemir, S. Pallickara. New Systems Technologies and Software Products for HPCC: Volume III – High Performance Commodity Computing on the Pragmatic Object Web Management White Paper for Research Consortium Inc (RCI). - Summer '98.

[R1]   Wojtek Furmanski, Daniel Dias, Balaji Natrajan, Vishal Mehra, Shrideep Pallickara. Prototype of a Scalable Tele-Virtual Environment on the Web Using VRML2.0 / JSDA IBM T. J. Watson Research Center, April 1997. Joint Project involving IBM-Watson Research Center & Syracuse University. Principal Investigator: Dr. Wojtek Furmanski.

7   CENTER FOR EXASCALE SPATIAL DATA ANALYTICS AND COMPUTING (XSD)

The Center focuses on issues relating to extreme scale spatial data. Spatial data accounts for the vast majority of data currently being generated. Spatial data encode location information (e.g., <latitude, longitude>) along with the data and observations of interest. The Center's activities have been funded through grants from the NSF, NIFA, and DHS. The overarching goal of the Center is to facilitate cutting-edge artificial intelligence, machine learning, and deep learning methods at scale over high-dimensional spatial datasets.

Our methodological innovations are data format agnostic, and our reference implementations can cope with data stored in over 20 different formats that include inter alia CSV, netCDF, HDF, XML, GRIB, BUFR, DMSP, NEXRAD, SIGMET. These systems have been deployed in urban sustainability, epidemiology, ecological monitoring, methane gas leak detections, and atmospheric sciences.

Key features
- Reconcile spatial observations encoded as multivariate vectors, shape files, data sketches, and hyperspectral imagery.
- The ability to manage trillions of small files with quadrillion observations.
- Support for building deep learning models at scale. Deep networks that we work with include foundational models, capsule networks, and LSTM/GRU based recurrent deep networks.
- Interactive visualizations over spatiotemporal datasets.
- Support for over 20 scientific data formats netCDF, HDF, XML, CSV, GRIB, BUFR, DMSP, NEXRAD, and SIGMET.
- Approximate queries, fuzzy queries, and probabilistic queries
- Hypothesis testing, significance evaluations, and kernel density estimations.

The Center performs foundational algorithmic work in spatiotemporal imputations, sketching, outlier detection, and trajectories.

8   PROJECTS

My research has led to projects in the area of large-scale distributed systems. All systems-software, produced as part of these projects, is in the open-source domain. The code-bases for these systems are large involving hundreds of classes and packages. The system software is robust and has been deployed in academic, commercial, and defense domains such as earthquake science, high-energy physics, epidemic modeling, environmental and ecological monitoring, atmospheric sciences, internet-scale conferencing systems, and brain computer interfaces.

8.1   Sustain

The United States is highly urbanized with more than 80% of the population residing in cities. Cities draw from and impact natural resources and ecosystems while utilizing vast, expensive infrastructures to meet economic, social, and environmental needs. The NSF has invested in several strategic research efforts in the area of urban sustainability, all of which generate, collect, and manage large volumes of spatiotemporal data. Voluminous datasets are also made available by governmental agencies and NGOs in domains such as climate, ecology, health, and census. These data can spur exploration of new questions and hypotheses, particularly across

traditionally disparate disciplines, and offer unprecedented opportunities for discovery and innovation. However, the data are encoded in diverse formats and managed using a multiplicity of data management frameworks   all contributing to a Balkanization of the observational space that inhibits discovery. A scientist must reconcile not only the encoding and storage frameworks, but also negotiate authorizations to access the data. A consequence is that data are locked in institutional silos, each of which represents only a sliver of the observational space. This project, SUSTAIN (Software for Urban Sustainability to Tailor Analyses over Interconnected Networks), facilitates and accelerates discovery by significantly alleviating data-induced inefficiencies. This effort has deep, far-reaching impact. It transforms urban sustainability science by establishing a community of interdisciplinary researchers and catalyzing their collaborative capacity. SUSTAIN accomplishes these interconnected goals by enabling holistic visibility of the observational space, interactive visualizations of multidimensional information spaces using overlays, fast evaluation of expressive queries tailored to the needs of the discovery process, generation of custom exploratory datasets, and interoperation with diverse analyses software frameworks -- all leading to better science.
URL: http://urban-sustain.org

8.2   Granules

Granules supports the processing of data streams over a distributed collection of processing elements. Such streams can be generated in settings involving observational and monitoring equipment, simulations, and computational workflows. In Granules these computations can be long running, with multiple rounds of execution, with the ability to retain state across successive rounds. Granules allows a collection of related computations to be expressed as directed graphs that have cycles in them, and orchestrates the completion of such distributed processing. Granules manages the lifecycle and finite state machine associated with computations. The system can orchestrate such stream processing computations within traditional clusters, collection of desktops, or IaaS VM-based settings. The processing encapsulated within these computations can be arbitrary, and encoded in C, C++, C#, Java, R and Python. Granules also incorporates support for variants of the MapReduce paradigm that make it amenable for scientific applications. By abstracting the complexities of doing I/O and the vagaries of execution in distributed settings, Granules allows a domain scientist to focus on the problem on at hand and not on the artifacts related to deployments in large-scale distributed systems. A broad class of compute and data intensive applications can benefit from the capabilities available in Granules. Some of the application domains that Granules is currently deployed in include brain computer interfaces, epidemiological modeling, handwriting recognition, data clustering algorithms, and bio-informatics (mRNA sequencing). Granules is funded by the Department of Homeland Security and the US National Science Foundation.

Granules includes subprojects, Neptune and Forager. Neptune is an effort that targets high-throughput stream processing in continuous sensing environments and Internet-of-Things settings. Forager is a framework for harvesting CPU cycles and memory for computationally-intensive, iterative task-based systems such as stochastic discrete event simulations, and learning and analytic algorithms.
URL: http://granules.cs.colostate.edu

8.3   Galileo

Time-series data occurs in settings such as observations initiated by radars and satellites, checkpointing data representing state of the system at regular intervals, and analytics representing the evolution of extracted knowledge over time. Galileo is a demonstrably scalable storage framework for managing such time-series data. The distributed storage system is incrementally scalable with the ability to assimilate new storage nodes

as they become available. How data is stored and dispersed impacts the efficiency of subsequent retrievals. The data dispersion algorithm in Galileo stores similar data items in network proximity without introducing storage imbalances at individual storage nodes. This allows for a significant reduction in the search space for queries that may be performed on the stored data. Galileo is funded by the Department of Homeland Security and the Environmental Protection Agency.
URL: http://galileo.cs.colostate.edu [Joint effort with the Big Data group at CSU]

8.4 Glean

The Glean project focuses on performing analytics at scale over Big Data. The datasets we consider are in the order of Petabytes and encompass billions of files representing trillions of observations, measurements, or simulation datapoints. Glean achieves this by combing innovations in large-scale storage systems, cloud computing, machine learning, and statistics. A particular focus of this effort is to perform analytics in real-time over streaming data representing time-series observations. The effort makes use of machine learning, statistical techniques, Bayesian networks, and ensemble methods to achieve this.
URL: http://glean.cs.colostate.edu [Joint effort with the Big Data group at CSU]

8.5 Spindle

The Spindle effort focuses on issues in migration of applications to Infrastructure-as-a-Service clouds. We construct performance models for applications based on profiling their constituent components during execution. We extract several features relating to CPU processing, memory consumption, and I/O. We then use these performance models to inform our VM placement and composition decisions while also reducing economic costs. These performance models are continually updated to reflect the application's performance under conditions of varying load.
URL: http://spindle.cs.colostate.edu

8.6 NaradaBrokering

NaradaBrokering is an infrastructure for managing voluminous data streams being produced concurrently, at high rates, by a very large number of entities. The infrastructure allows entities to precisely specify constraints on portions of the streams that they are interested in consuming. By preferentially deploying links during disseminations, the routing solution ensures that underlying network is optimally utilized. NaradaBrokering provisions a rich set of easy-to-use capabilities. Since the provisioned capabilities-stack is mutable, scientists can instrument, permute and combine different capabilities to compose streaming systems. NaradaBrokering has been deployed in a diverse set of domains such as earthquake science, particle physics, ecological/environmental monitoring, geosciences, GIS systems, defense applications, and commercial internet conferencing systems. Research in NaradaBrokering has been funded through two grants from the National Science Foundation, two grants from the United Kingdom's Open Middleware Infrastructure Institute and an STTR grant from the Department of Energy.
URL: http://www.naradabrokering.org

9   TEACHING

Teaching is often the easy part – knowing what the students don't know is the hard part. I rely on micro-surveys at the end of every lecture to identify concepts that students grasped and those that they had problems with. Comprehension problems often stem from gaps in the student's knowledge; I have found that addressing such gaps helps students grasp and retain concepts better. These micro-surveys ask students to list concepts that they understood and concepts that they don't. I find that micro-surveys in *Computer Science* are particularly amenable to gap analysis, and I have used them to identify the deeper reasons why students don't understand a particular concept – this is akin to treating the cause rather than the symptom. In courses that I have taught multiple times, I have found that retaining micro-surveys from the past help me perform a time-series analysis to:

(1) Subtly adjust explanation of difficult concepts. This has been very helpful in continually making targeted and incremental adjustments to my teaching materials.
(2) Pose questions in class based on the misunderstandings that students have had in the past. These questions help anchor discussions that students are often reluctant to initiate.

Finally, I feel that to truly assimilate knowledge one must be able to build on it; my courses generally involve several programming assignments that are geared towards reinforcing concepts covered in class.

9.1   InfoSpaces: A Picture is Worth a Thousand Words, How About Them Videos?

Upper-division computer science courses often expect proficiency in certain software constructs and tools. Students are expected to acquire these skills on their own. Choices for accomplishing this exist online, but the information is often fragmented, stale, and conflicting. Faced with this bewildering set of choices, students procrastinate, which hinders achievement. I have also been observing for a while now, that how students learn continually evolves and videos are now a big component of how they learn. The hypothesis I wanted to test was that if I met students where they were, they would be more receptive to learning.

I created and piloted INFOSPACES (**http://infospaces.cs.colostate.edu**) in my capstone undergraduate course, CS455. The project produced 20 segmented, focused, short videos. The videos were segmented to manage cognitive overload. In particular, the videos weeded out extraneous information to keep the videos short. Notably, none of the videos exceeded 2 minutes. These videos included a mix of modalities such as slides, computer screen captures, and a speaker to deliver the information. It takes a total of 3 hours to produce one of these short videos.

How did this little experiment pan out? Students overwhelmingly found them helpful. Because they were able to get up to speed quickly, students could instead focus on design and problem-solving. As a result, their engagement and quality of work improved. Furthermore, interactions with students and lab sessions were much more productive because they were focused on design issues and not minutiae about setups, etc.

I have been working to get this pilot project broadly deployed within the computer science department. The videos are now curated and managed as part of an ecosystem of learning videos. The system is backed by a database to maintain metadata of these videos, including keywords, a short description, and the courses that the videos apply to. Notably, the University has recognized the value of these videos. A Digital Learning Initiative Proposal that I led with 2 colleagues was accepted for funding by the Provost.

9.2   Ask Not What Bad Poetry Can Do for You, But What it Can Do for the Students

I am often a little early to class, as are several students. Here's what previously happened when I got to class – I put up my title slide, the students glanced at it, and they continued sitting patiently for class to begin. Could this time be used better? To perhaps plant a seed? To have them reflect on the class *before* it starts?

I decided to write a short poem on each title slide that conveyed the key takeaway message from the entire lecture. At first it was daunting and involved a potent mix of emasculation and embarrassment. Students would intently read the poems as they walked in to class. It felt like they could not look away from my stunning display of ineptitude. Given that *no one* writes poems about computer science concepts, students quickly figured out that I was writing to them.

Two splendid things happened. Students began to arrive a little earlier to class. Perhaps, they were eagerly anticipating the latest drivel I was serving up. But, the students also started to think about the topics that I would be covering in class. They were also connecting the poem back to the previous class. Students have told me that the poems served as a mind-map for the lecture; they could see how the topics I was covering during class were connected and related to the central theme for the lecture.

After a few weeks, I got over my anxiety about my poorly written poems. When I put up a new poem, I felt reassured by simply telling myself – "I have written worse!"

The Receiver's Buffer
Small it may be
  But throttle the mightiest sender
    It can
Not just the *how* much
  But also the *when*
    Or *if* at all

The House of Heap and Stacks
Stacks clean up after themselves
  But over deep recursions they fret
The cheerful heap has nary a care
  Harboring memory leaks, hurtling to a crash

Threads have you in a bind?
With Objects and Concurrency at play
  Are nerves about to fray?
Here's something to have those worries abate
  It's just about access to shared, mutable state

9.3   Curriculum Development

I created the track on *Distributed Systems* in the Computer Science curriculum at CSU. This involved the development of 3 new computer science courses: CS455, CS555, and CS655. CS455 is designated as a *capstone course* and is targeted at senior undergraduate students. First year graduate students take CS555, while CS655 is an advanced research seminar course typically taken by PhD students. The primary objective of these courses is for students to gain a deeper understanding of the algorithms, frameworks, and strategies that underpin complex, large-scale distributed systems. The x55 series of courses entail extensive programming and substantive systems building assignments in addition to a writing component that is generally split into deliverables to allow critical feedback on the content and organization of ideas.

In Fall 2022, I have been involved in the creation of 200-level course from the ground-up: Foundations of Computer Systems. My goal is to give students a holistic systems view of the foundational constructs that underpin learning. I feel that systems thinking and viewing problems from multiple vantage points is the antidote to wishing thinking, poor design, and wild goose chases.

9.4   Courses taught at Colorado State University

TERM	COURSE	ENROLLMENT	AUDIENCE
Spring 2024	*CSx55: Distributed Systems*	110	Graduate/senior-undergraduate course
Spring 2024	*CS250: Foundations of Computer Systems*	225	Core undergraduate Course
Fall 2023	*CS370: Operating Systems* [On-campus (112) and Online (42)]	154	Core undergraduate Course
Spring 2023	*CS370: Operating Systems* [On-campus (142) and Online (43)]	185	Core undergraduate Course
Spring 2023	*CS250: Foundations of Computer Systems* [On-campus (90) and Online (18)]	108	Core undergraduate Course
Fall 2022	*CS250: Foundations of Computer Systems* [On-campus (33) and Online (18)]	51	Core undergraduate Course
Spring 2022	*CS455: Introduction to Distributed Systems* [On-campus (43) and Online (6)]	49	Undergraduate CAPSTONE COURSE
Fall 2021	*CS555: Distributed Systems* [On-campus (5) and Online (6)]	11	Graduate Course
Spring 2021	*CS455: Introduction to Distributed Systems* [On-campus (38) and Online (6)]	44	Undergraduate CAPSTONE COURSE
Fall 2020	*CS370: Operating Systems* [On-campus and Online]	145	Core undergraduate Course
Spring 2020	*CS455: Introduction to Distributed Systems* [On-campus (44) and Online (4)]	48	Undergraduate CAPSTONE COURSE
Fall 2019	*CS555: Distributed Systems* [On-campus (19) and Online (11)]	30	Graduate Course
Spring 2019	*CS455: Introduction to Distributed Systems* [On-campus (36) and Online (8)]	44	Undergraduate CAPSTONE COURSE
Fall 2018	*CS370: Operating Systems* [On-campus (105) and Online (9)]	114	Core undergraduate Course
Spring 2018	*CS455: Introduction to Distributed Systems* [On-campus (42) and Online (10)]	52	Undergraduate CAPSTONE COURSE
Fall 2017	*CS555: Distributed Systems* [On-campus (7) and Online (8)]	15	Graduate Course
Spring 2017	*CS455: Introduction to Distributed Systems* [On-campus (42) and Online (17)]	59	Undergraduate CAPSTONE COURSE
Spring 2017	*CS370: Operating Systems*	123	Core undergraduate Course
Spring 2016	*CS370: Operating Systems*	102	Core undergraduate Course
Fall 2015	*CS555: Distributed Systems*	15	Graduate Course
Spring 2015	*CS455: Introduction to Distributed Systems*	52	Undergraduate CAPSTONE COURSE
Fall 2014	*CS 370: System Architecture and Software*	68	Core undergraduate Course
Spring 2014	*CS455: Introduction to Distributed Systems*	46	Undergraduate CAPSTONE COURSE
Fall 2013	*CS655: Advanced Topics in Distributed Systems*	4	Graduate Seminar Course
Spring 2013	*CS455: Introduction to Distributed Systems*	30	Undergraduate CAPSTONE COURSE
Fall 2012	*CS555: Distributed Systems*	13	Graduate Course
Fall 2012	*CS370: System Architecture and Software*	44	Core undergraduate Course
Spring 2012	*CS455: Introduction to Distributed Systems.*	41	Undergraduate CAPSTONE COURSE

Spring 2012	CS 370: System Architecture and Software	45	Core undergraduate Course
Fall 2011	CS655: Advanced Topics in Distributed Systems	7	Graduate Seminar Course
Spring 2011	CS 370: System Architecture and Software	55	Core undergraduate Course
Fall 2010	CS555: Distributed Systems	18	Graduate Course
Spring 2010	CS451: Operating Systems	28	Senior undergraduate Course
Fall 2009	CS670: Special Topics in Architecture/Systems {Distributed Systems}	10	Graduate Course

9.5 Lincoln Middle School, Fort Collins, Colorado

A new 5-year successor to MACS (Middle School Adventures in Computer Science) has resumed. As part of this effort, we are working with Lincoln IB Middle School in Fort Collins, Colorado. in 2022, we had 22 middle school students and 2 middle school teachers participated in the camp. The camp was bilingual and all instruction and materials were in Spanish and English. All instructional materials are now available for download.

9.6 Cortez Middle School, Montezuma-Cortez School District Cortez, Colorado

From 2013-2017, I directed an NSF-funded summer camp, *Math in Action in Computer Science*, targeted at 6th and 7th graders from the Cortez Middle School. The camp involves Native American students who travel to Fort Collins; each student receives a stipend along with room-and-board. The weeklong camp focuses on reinforcing fundamental mathematical concepts alongside their applications in computer science. The CAMP includes sessions on applying for college and scholarship opportunities. The camp focuses on experiential learning and involves hands-on activities involving computer programming, individual, and group activities. Several of these students typically have limited access to computers at home and school. This is a five-year effort. http://macs.cs.colostate.edu

10 ACADEMIC ADVISING

Current Graduate Advisees

Samuel Armstrong, Ph.D. candidate   [Sangmi Pallickara, Advisor]
Kassidy Barram, M.S.
Paige Hansen, M.S.
Abdul Matin, Ph.D. candidate   [Sangmi Pallickara, Advisor]
Menuka Warushavithana, Ph.D. candidate
Matt Young, M.S. student
Freddy Larrieu, M.S. student
Tyson O'Leary, M.S. student

Current Undergraduate Advisees

Emile Beck
JT Higgins
Lucy Lewark
Everett Lewark
Nathan Orwick
David Riva

Jackson Volesky
Marlow Lankford
Max Young
Brenna Wolfe

Supervised Graduate Degrees

Doctoral Degree   Daniel Rammer (Ph.D. 2021)   [Co-advised with Sangmi Lee Pallickara]
Dissertation: *Harnessing Spatiotemporal Data Characteristics to Facilitate Large-Scale Analytics Over Voluminous, High-Dimensional, Observational Datasets*
<u>Now</u>: Union.AI

Thilina Buddhika (Ph.D. 2020)
Dissertation: *Near Real-time Processing of Voluminous, High-velocity Data Streams for Continuous Sensing Environments*
<u>Now</u>: Facebook

Walid Budgaga (Ph.D. 2020)   [Co-advised with Sangmi Lee Pallickara]
Dissertation: *Leveraging Ensembles: Balancing Timeliness and Accuracy for Model Training Over Voluminous Datasets*
<u>Now</u>: CSU IS

Ryan Stern (Ph.D. 2018)
Dissertation: *Scalable Visual Analytics Over Voluminous Spatiotemporal Data*
<u>Now</u>: HP Enterprise, Inc.

Matthew Malensek (Ph.D., 2017)   [Co-advised with Sangmi Lee Pallickara]
Dissertation: *Low-latency, Query-Driven Analytics over Voluminous Multidimensional, Spatiotemporal Datasets*
** *Recipient of the 2018 IEEE TCSC* OUTSTANDING PH.D. DISSERTATION AWARD
<u>Now</u>: Assistant Professor, Computer Science – University of San Francisco

Wesley Lloyd (Ph.D., 2014)
Dissertation: *Autonomous Management of Cost, Performance, and Resource Uncertainty for Migration Of Applications to Infrastructure-as-a-Service (IaaS) Clouds*
<u>Now</u>: Assistant Professor, *Computer Science & Systems* – University of Washington, Tacoma.

Zhiquan Sui (Ph.D., 2014)
Dissertation: *Distributed Algorithms for the Orchestration of Stochastic Discrete Event Simulations.*
<u>Now</u>: Software Engineer, *ThoughtSpot Inc*, Sunnyvale CA.

Kathleen Ericson (Ph.D., 2014)
Dissertation: *Robust Health Stream Processing*
<u>Now</u>: Assistant Professor, *Computer Science* – University of Tennessee, Martin.

M.S. (Thesis)   Caleb Carlson (M.S., 2022) [Co-advised with Sangmi Lee Pallickara]

Thesis: *A Framework for Resource Efficient Profiling of Spatial Model Performance.*

Menuka Warushavithana (M.S., 2021)
Thesis: Containerization of Model Fitting Workloads over Spatial Datasets

Kevin Bruhwiler (M.S., 2020)
Thesis: *Aperture: A System for Interactive Visualization of Voluminous Geospatial Data*

Sitakanta Mishra (M.S., 2018)
Thesis: *Leveraging Stream Processing Engines in Support of Physiological Data Processing*

Sudalaikkan Leo Vigneshwaran (M.S., 2016)
Thesis: *Preservation of Low Latency Service Request Processing in Dockerized Microservice Architectures*

Harshil Shah (M.S., 2016) [Co-advised with Sangmi Lee Pallickara]
Thesis: Identification and Characterization of Super-spreaders from Voluminous Epidemiology Data

Mante Luo (M.S., 2016)
Thesis: *Horizontal Scaling of Video Conferencing Applications in Virtualized Environments*

Thilina Buddhika (M.S., 2015)
Thesis: *Real Time Stream Processing for Internet of Things and Sensing Environments*

Hanisha Koneru (M.S., 2015)
Thesis: *Implications of Storage Subsystem Interactions on Processing Efficiency in Data Intensive Computing*

Amila Suirarchchi (M.S., 2015)
Thesis: *Achieving High-Throughput Distributed, Graph-based Multi-stage Stream Processing*

Ryan Stern (M.S., 2014)
Thesis: *On the Role of Topology in Autonomously Coping with Failures in Content Dissemination Systems*

Walid Budgaga (M.S., 2014) [Co-advised with Sangmi Pallickara]
Thesis: *A Framework for Real-time, Autonomous Anomaly Detection over Voluminous Time-Series Geospatial Data Streams*

Matthew Malensek (M.S., 2012)
Thesis: *On the Evaluation of Exact-Match and Range Queries over Multidimensional Data in Distributed Hash Tables*

Kathleen Ericson (M.S., 2010)
Thesis: *On the Support for Heterogeneous Languages in Cloud Runtimes*

Masters Projects
Miller Ridgeway

Supervised Undergraduate Honors Theses
Adam Briles (May 2020)
Cassidy Skorczewski (Dec 2019)
Amanda Carbonari (Dec 2015)
Kevin Kowalski (Dec 2012)
Hamilton Reed (Dec 2012)

Past Undergraduate Advisees

NSF REU	Kira Lindberg , Sahan Jayasumana, Marion Watts, Amanda Carbonari, Lauren Bay, Owen Davis, Sarah Orrico, Gerhard Van Andel, Kevin Bruhwiler, Daniel Reynolds, Kegan Strawn, Keegan Millard, Nathan Orwick, Everett Lewark, Tyson O'Leary
Undergraduate researchers	Kassidy Barram, Kiera Jost, Marlowe Lankford, Everett Lewark, Freddy Larrieu, Tyson O'Leary, Nathan Orwick, Daniel Reynolds, David Riva, JeanMarc Ruffalo-Burgat, Pierce Smith, Abigail Williams, Brenna Wolf, Matt Young, Max Young.
MACS: Math in Action in Computer Science	Ian Bertolacci, Paul Bivrell, Conrad Christensen, Tanner Evans, Gareth Halladay, Samuel Haynes, Zaneb Mazeh, Michael McCaffery, Shannon McPherson, Kegan Strawn, Marion Watts,
MACS: Middle School Adventures in Computer Science	Pierce Smith, Kassidy Barram, Freddy Larrieu, Arysa Flores, Illiana Catillon, Sofia Catalan, Regan Williams, Oswaldo Ramos Garcia, Joel Perez
Sites-Regelson Fellow	Jordan Messac
Monfort Foundation	Kegan Strawn, Paul Bivrell, Kevin Bruhwiler
DHS	Conrad Christensen

Ph.D. Committee Memberships
Department of Computer Science, Colorado State University [**10**]
   Stephanie DiBenedetto, Dr. Chengyu Fan, Kaustubh Gadhkari, Paahuni Khandelwal, Dr. Saptashwa Mitra, Dr. Susmit Shannigrahi,   Dr. Anant Shah, Dr. Andrew Stone, Dr. He Yan, and Dr. Han Zhang

Department of Civil & Environmental Engineering, Colorado State University [**1**]
   Dr. André Dozier

Department of Chemistry, Colorado State University [**1**]
   Sabari Kumar

Department of Electrical Engineering & Computer Engineering, Colorado State University [**2**]
   Ali Fatih Boud and Dr. Saideep Tiku

Department of Electrical Engineering & Computer Science, Syracuse University [**2**]
   Dr. Gurhan Gunduz and Dr. Ahmet Uyar

Department of Mathematics, Colorado State University [**1**]
   Amie Bray

Department of Systems Engineering, Colorado State University [1]
    Roy Kin-Chung Tsui

Ph.D. External Examiner
Department of Computing & Information Systems, University of Melbourne, Australia. [4]
    Dr. Sachini Jayasekara, Dr. Amanda Jayanetti, Dr. Sara Kardani Moghaddam, Dr. Xunyun Liu, and Dr. William Voorsluys

Faculty of Information Technology, Monash University, Australia [2]
    Dr. Hasanul Ferdaus, Dr. Joarder Kamal

Masters Thesis Committee Memberships
Department of Computer Science, Colorado State University [11]
    Internal Committee Member: Charlie Johnson Arulswamy, Kiril Beyalev, Chuanqi Huang, Paahuni Khandelwal, Kartik Khurana, Jared Koontz, Saptashwa Mitra, Aaron Pariera, Peter Qiu, Max Roselius, Naman Shah, Tarun Sai Kumar

Department of Civil & Environmental Engineering, Colorado State University [1]
    Outside Committee Member: Elizabeth Mahon

11   ACADEMIC SERVICE

Editorial Boards
Journal of Big Data. Publisher: Springer New York/Heidelberg, Germany.
Member of Editorial Board (2013 – 2023)

International Journal of Autonomic Computing. Publisher: Inderscience, Geneva, Switzerland.
Member of Editorial Board (2008 – 2015)

Panels
NSF Panels 2010-2023
NIFA Review Panels 2022, 2023
co-Chair for the Panel on *Network Measurements* at the 35th Annual *IEEE Conference on Local Computer Networks* (LCN) in Denver. 2010.
Panel on the FUTURE OF CLOUD COMPUTING at the *IEEE/ACM International Conference on Utility & Cloud Computing* in Chicago. 2012.

Conferences
Program Committee: IEEE International Conference on Cloud Computing. Shenzhen, China. 2024.

Program Committee: Ph.D. Forum, *IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing* (CCGrid). Ph.D. forum. Philadelphia, PA. 2024.

Program Committee: Ph.D. Forum, *IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing* (CCGrid). Philadelphia, PA. 2024.

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Taormina (Messina), Italy. *2023.*

Program Committee: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Taormina (Messina), Italy. *2023.*

Program Committee:: IEEE International Conference on Cloud Computing. Chicago, IL. USA. 2023.

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Portland, Oregon. USA. *2022.*

Program Committee: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Portland, Oregon. USA. *2022.*

Program Committee: Ph.D. Forum, *IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing* (CCGrid). Taormina (Messina), Italy. 2022.

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Leicester, United Kingdom. *2021.*

Program Committee: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Leicester, United Kingdom. *2021.*

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Leicester, United Kingdom. *2020.*

Program Committee: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Leicester, United Kingdom. *2020.*

Program Committee: Workshop on Streaming Systems and Realtime Machine Learning (STREAM-ML). In conjunction with the IEEE International Conference on Big Data. 2019

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Auckland, New Zealand. *2019.*

Program Committee: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Auckland, New Zealand. *2019.*

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Zurich, Switzerland. *2018.*

Program Committee: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Zurich, Switzerland. 2018.

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Austin, Texas. *2017.*

Program Committee CO-CHAIR: *IEEE/ACM International Conference on Big Data Computing, Applications and Technologies.* Austin, Texas. 2017.

Steering Committee: NSF/DOE STREAM (Indianapolis, 2015) and (Washington, D.C. 2016).

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Shanghai, China. *2016.*

Program Committee: *IEEE International Conference on Big Data and Cloud Computing,* Atlanta GA. 2016.

Program Committee: *IEEE International Conference on Parallel Processing* (ICPP). Beijing, China. 2016.

Program Committee: *IEEE International Conference on Data Science and Data Intensive Systems,* Sydney, Australia, 2015.

Program Committee: *IEEE/ACM International Conference on Utility and Cloud Computing,* Cyprus, *2015.*

Program Committee: Autonomic Computing, Datacenters, and Advanced Cyberinfrastructure Track of the *IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing* (CCGrid). Shenzhen, China. 2015.

Program Committee: *IEEE International Conference on Cloud Engineering* (IC2E). Tempe, AZ. USA. 2015.

Program Committee: IEEE International Conference on Computer Communications and Networks (ICCCN). USA. 2015.

Program Committee: IEEE International Conference on Big Data and Cloud Computing, China. 2015.

Program Committee Co-Chair: *IEEE/ACM International Conference on Utility and Cloud Computing* London, UK. 2014.

Program Committee: *IEEE International Workshop on Big Data in Computational Epidemiology*. Washington DC. USA. 2014.

Program Committee: IEEE International Conference on Big Data and Cloud Computing, Sydney, Australia. 2014.

Program Committee, International Workshop on *Model-Driven Engineering for High Performance and Cloud computing*, Miami, USA. Co-Located with the 16th ACM/IEEE Conference on Model Driven Engineering Languages & Systems (MODELS) 2013

Program Committee; Workshops Co-Chair: *IEEE/ACM International Conference on Utility and Cloud Computing* Dresden, Germany. 2013.

Program Committee, *International Workshop on Resource Management of Cloud Computing.* Collocated with the IEEE International Conference on Distributed Computing Systems (ICDCS). Philadelphia, USA. 2013.

Program Committee. The 10th *IEEE International Symposium on Parallel and Distributed Processing with Applications*. Madrid, Spain. 2012.

Program Committee. The 14th *IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing*. Ottawa, Canada. 2012.

Program Committee, Workshops-Chair. : *IEEE/ACM International Conference on Utility and Cloud Computing* Chicago, USA. 2012.

Program Committee, International Workshop on *Model-Driven Engineering for High Performance and Cloud computing*, Innsbruck Austria. Co-Located with the 15th ACM/IEEE Conference on Model Driven Engineering Languages & Systems (MODELS) 2012.

Program Committee Co-Chair: *IEEE/ACM International Conference on Utility and Cloud Computing*. Melbourne, Australia. 2011.

Program Committee, The 36th *IEEE Conference on Local Computer Networks (LCN)* 2011. Bonn, Germany.

Publicity Co-Chair. The 18th *IEEE International Conference on High Performance Computing* (HiPC 2011). Bangalore, India.

Program Committee, The *IEEE International Conference on Cloud and Green Computing*, 2011. Melbourne Australia.

Publicity co-Chair; Program Committee. *IEEE International Conference on. Utility and Cloud Computing* (UCC 2010). Chennai, India.

Program Committee. The 12th IEEE *International Conference on High Performance Computing and Communications* (HPCC-10). 2010. Melbourne, Australia For the research track on Web Services and Internet Computing.

Program Committee, The 11th IEEE *International Conference on High Performance Computing and Communications* (HPCC-09). Seoul, Korea,. 2009. For the research track on Web Services and Internet Computing.

Program Committee, The 14th IEEE *International Conference on Parallel and Distributed Systems* (ICPADS'08). Melbourne, Australia. For the track on Web and Peer-to-Peer Systems.

Program Committee, The 10th IEEE *International Conference on High Performance Computing and Communications* (HPCC-08). DaLian, China. For the research track on Web Services and Internet Computing.

University Service

CSU ACADEMIC MASTER PLAN appointed by the Provost as part of the University Strategic Transformation Plan (2021 – 2022)

> The Academic Master Plan's focus is on exploring academic directions for CSU in particular the growth of our academic programs. research, and engagement activities 5-10 years into the future.

CSU THINK TANK appointed by the Provost and Vice-Provost (2019 –)

> The THINK TANK examines the general education Core Curriculum at CSU with the key objective of making our curriculum relevant and current for all our students. This includes (1) developing the interest areas or meta-major constructs for the AUCC, (2) Identifying (or suggesting for development) AUCC courses, (3) organizing our AUCC and upper division courses around these shared meta-major themes, (4) developing First Year Seminar offerings, each of which articulates to a meta-major theme, and (5) addressing over-arching implementation details to reach as many students as possible.

Vice President for Research's Faculty Advisory Committee (VPAC) (2019 –)

> The VPAC provides a vehicle for greater faculty input into the operations of the Office of the Vice President for Research. The committee engages with various stakeholders around campus on issues relating funding levels and sustainability mechanisms.

ISTeC Research Advisory Committee (2013 –)

> The University's Information Science & Technology Center (ISTeC) is a university-wide organization for enhancing CSU's research, education, and outreach activities pertaining to the design and innovative application of computer, communication, and information systems.

College Service

Data Science Major Committee, College of Natural Sciences (2016 –2018)

> The College of Natural Sciences is in the process of offering a Bachelors in Data Science. Unlike majors that are at the department level, the Data Science major is at the college-level and spans the departments of Computer Science, Mathematics, and Statistics. This major will start admitting its first students in Fall 2018. Work on this committee has involved identification of learning objectives, design of new courses, streamlining course offerings with AUCC requirements so that students graduate in a timely fashion.

Teaching Awards Committee, College of Natural Sciences (2016)

> The College of Natural Sciences solicits nominations annually for Teaching and Mentoring awards for faculty, post docs, and graduate students. Service on this committee involves perusing nomination packets for different categories across departments within the college and meeting to rank and make

award recommendations to the Dean.

Departmental Service

Executive Committee, Computer Science Department (2013 –2016, 2017-2020)
> Represents the interests of the Faculty and provides advice and assistance to the Department Chair in the administration of the Department

Code Committee, Computer Science Department (2015–2016, 2017–2020)

Online Committee, Chair, Computer Science Department (2023-)

Undergraduate Committee, Computer Science Department (2013–2015, 2016–)
> Administrative procedures relating to the undergraduate: curriculum and redesign, degree requirements, recruitment, adoption of textbooks, and consistency of core courses.

Graduate Recruitment Committee, Computer Science Department (2011– 2013)
> Every year the department receives about 400 applications for admission into the Ph.D. and Masters program.

Strategic Planning Committee, Computer Science Department Spring 2013

Operations Committee, Computer Science Department (2010 – 2011)
> Reviewing and finalization of scholarships and awards for undergraduate and graduate students. These included the *Patricia Mohilner Memorial* Scholarship and *Thomas J. Heidenfelder* Scholarship for undergraduate students and the *Anita Read Graduate Award*.
> Approvals for use of the student tech fees for computer and networking equipment purchases within the various labs in the department.

Reviewing for Funding Agencies in Europe

Reviewer, Austria Science Fund (FWF Der Wissenschaftsfonds): 2011, 2012, 2013

Reviewer, Swiss National Science Foundation: 2022

Other Reviewing Activities

I also regularly review manuscripts for Journals including – *ACM Transactions on Autonomous and Adaptive Systems, Concurrency and Computation: Practice & Experience, Future Generation Computer Systems, , IEEE Computing in Science and Engineering, IEEE Transactions on Cloud Computing, IEEE Transactions on Computers, IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Services Computing, Journal of Parallel and Distributed Computing, and the Journal of Supercomputing.*