SCIENTIFIC COMPUTING AND IMAGING INSTITUTE

30
SCI
1994 - 2024

30 Years of SCI

The Responsible AI Initiative

Democratizing Access to Science Data

The Future of CHPC

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Scientific Computing and Imaging Institute
at the University of Utah

FRESH TRACKS ™

From the Director

I welcome you to this Spring 2024 issue of FreshTracks, which highlights our celebrations of the 30th anniversary of the Scientific Computing and Imaging (SCI) Institute at the University of Utah. Building of 3 decades of marking three decades of multidisciplinary research, innovation, partnerships, and impacts. SCI continues to advance its mission to transform science and society through translational research and innovation in computer and computational and data sciences, including machine learning and artificial intelligence. So far, 2024 has been an exciting year marked by new hires, awards and recognitions, grants, publications, software deployments, and other accomplishments, all with tremendous impact. We are delighted to share some of these accomplishments with you in this issue.

One highlight of 2024 is SCI's leadership of the One-U Responsible AI initiative (One-U RAI). The One-U RAI aims to catalyze transdisciplinary excellence in responsible AI at the University of Utah by bringing together the use-inspired/applied AI research and technological expertise, advanced cyberinfrastructure, and translational workforce needed to position the U as a regional and national leader. The One-U RAI is a university-wide initiative. The past few months have focused on the conceptualization and execution of this initiative including establishing a university-wide executive committee and working groups, building up a dedicated program office at SCI, standing up an external advisory committee, and many outreach activities including an exciting partnership with the Leonardo on the "Into the Mind of Artificial Intelligence" exhibit.

SCI also continues to act on its an ambitious goal of hiring multiple new faculty members over the next three years with specialties that integrate computational science, data science, and science and engineering broadly (including social sciences). Our goal remains to expand the core research expertise at SCI, further enhance its outstanding research portfolio, and continue to broaden the diversity of faculty, students, and staff. Specifically, we have ongoing faculty searches in computational oncology (in partnership with the Huntsman Cancer Institute), biomedical informatics (in partnership with the Department of Biomedical Informatics), visualization and imaging, and software systems for future computing. The initiative has already resulted in six outstanding faculty at SCI. And we plan to continue this growth in the coming years.

SCI also continues to advance its initiatives such as (1) the Cyberinfrastructure Professionals Cooperative (CIP-Co-Op) that aims to foster a vibrant and sustainable CIP community, along with models and structures for training, professional development, and sustainability at SCI and the U; and (2) the SCI-HUM initiative, in partnership with the College of Humanities, that brings together inspired technology-driven humanities research ideas with the technological innovation and research at SCI to catalyze, nurture, and advance transdisciplinary research partnerships.

This year promises to continue to exciting and eventful. Later this month, on April 24th and 25th, SCI will celebrate its 30th anniversary. I do hope you will be able to join us in this two-day celebration where we will showcase groundbreaking research and will celebrate SCI's past, present and future.

- Dr. Manish Parashar
  Director, Scientific Computing and Imaging Institute
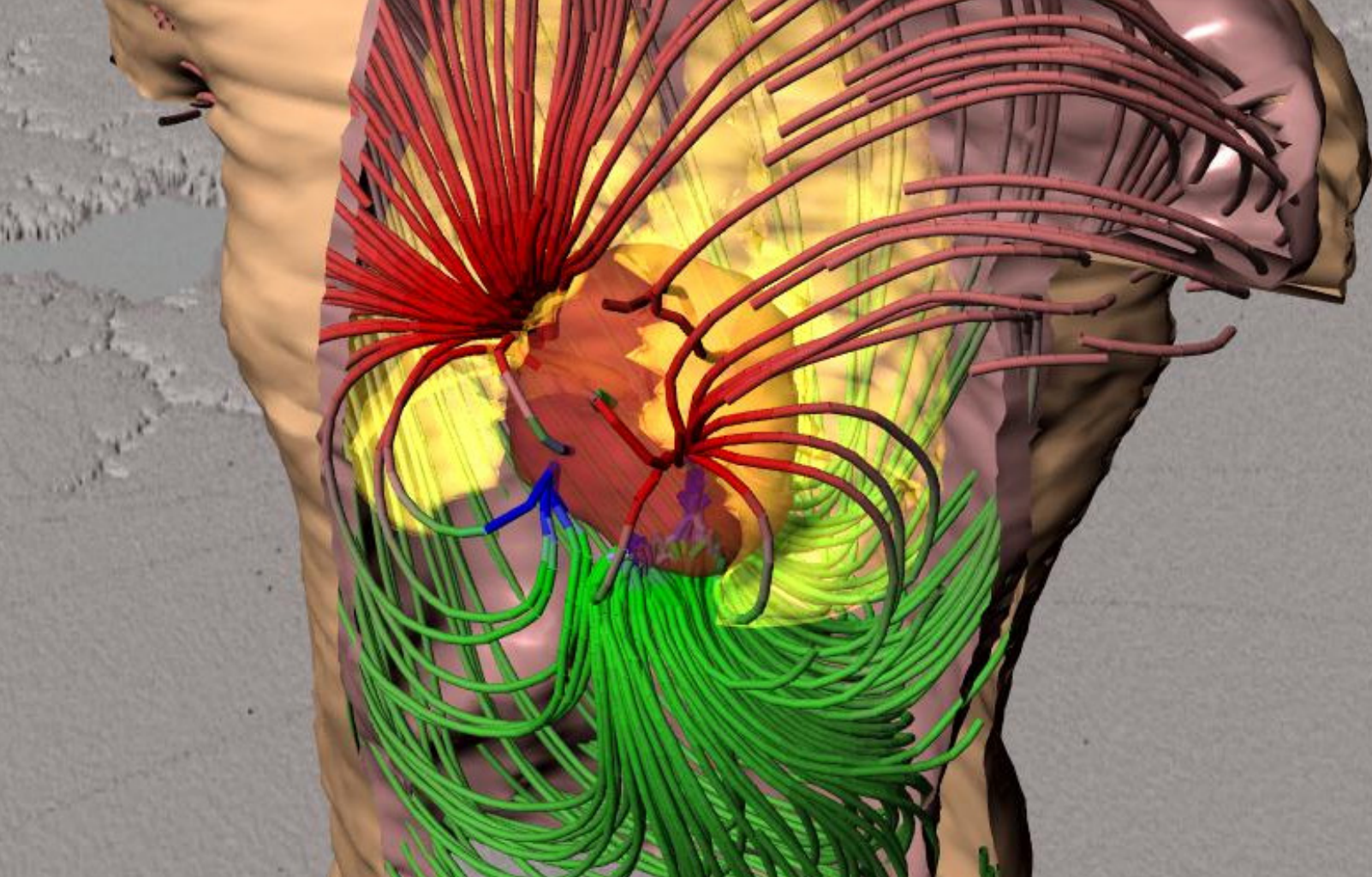
In This Issue

30 Years of SCI

In 1990, then University of Utah Cardiovascular Research and Training Institute researchers Chris Johnson and Rob MacLeod set out to computationally model the heart's electrical activity in the body. They pored over MRI scans and wrote their own modeling, simulation, and visualization software to pioneer a realistic human computer model.

"None of this had been done before, and there was no one area of expertise that would have trained you to do all of it," Johnson said. The duo's work spanned computer science, biomedical engineering, physics, math, and more. "We were learning all these different areas and pulling from image analysis, scientific computing, and the very, very new field of scientific visualization. Back then, it hadn't even been called a field yet."

Above: The first project on which Chris Johnson and Rob MacLeod worked together: a computer simulation of the electricity in the body due to the heart's electrical activity. At the time, it was the most sophisticated computer model of the heart's electrical activity within a human torso. Discover magazine in 1993 published an article on the work and featured this image in the article. It is now called the Utah Torso Model and has been used by many researchers to do bioelectric field simulation.

In 1992 Johnson would join the Department of Computer Science and in 1993, MacLeod would join the Department of Bioengineering. Over the next decade, Johnson and MacLeod's interdisciplinary efforts to solve real-world problems evolved into the Scientific Computing and Imaging (SCI) Institute, now celebrating its 30th anniversary. What started in 1994 as a research group of seven people in one room of the Joseph F. Merrill Merrill Engineering Building now boasts over 200 students, staff, and faculty, and twice as many alumni. The institute has one of the highest levels of funding per faculty member at the university, and a top global ranking in visualization and high-performance computing. And its research products—including software systems and datasets—are used broadly, from health care to manufacturing to arts and entertainment. "We still can't quite believe that it has become what it's become," MacLeod said. "Never in our wildest dreams did we picture something this big ever emerging."

SCI expects alumni from around the country, U. faculty and administration, in addition to industry and government leaders to attend its 30th anniversary celebration on campus at the University of Utah April 24–25. On the first day, guests can explore SCI's latest cutting-edge work. "We'll have

posters and demonstrations by our faculty, staff, and graduate students about what we're doing to change the world," Johnson said. The following day includes panel discussions and keynote speeches, including from Pat Hanrahan, winner of the 2019 Turing Award for his work on 3D computer graphics.

One of three event panels will feature a climate scientist, an artificial intelligence (AI) expert, and a state commerce official discussing opportunities and challenges at the intersection of AI and society. It's a topic launching SCI into its next decade of impact: the university announced last year that the institute would lead a campus-wide $100 million Responsible AI initiative. Manish Parashar, SCI's director since 2021, is especially well-suited to helm the initiative. His past roles include co-chair of the White House's National Artificial Intelligence Research Resource Task Force and director of the National Science Foundation's Office of Advanced Cyberinfrastructure.

AI has emerged as a transformative technology, Parashar said—one that can have negative social, environmental, and economic consequences. "We'll aim to advance AI and its applications in a way that achieves societal good, protects privacy, civil rights, and civil liberties, and promotes principles of fairness, accountability, and transparency." To start, the initiative will tap into some of the university's strongest research areas: environmental science, health care, societal wellness, public services, and the future of teaching and learning.
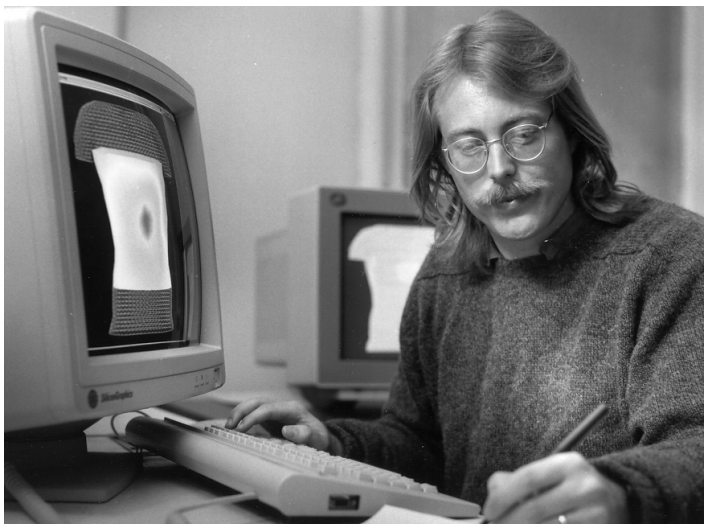
SCI's structure makes it a natural fit for the Responsible AI Initiative, MacLeod said. "There's no place better suited to exploring the impact of AI than an interdisciplinary institute. The real excitement is not necessarily in the latest algorithm alone, but in how that algorithm is applied in a responsible way. And I think that's our strength."

SCI co-founder Rob MacLeod posing at the CVRTI circa 1999

SCI co-founder Chris Johnson working with the Utah Torso model circa 1990

Since its founding, SCI members have broken down barriers between disciplines for shared causes. "It's really important that we have computer scientists sitting next to biomedical scientists sitting next to mechanical engineers sitting next to mathematicians, and that we enable them to get to know each other," MacLeod said. "You need investigators who are confident enough and curious enough to want to explore these other application spaces."

That culture has helped SCI become what past university president Dave Pershing called "one of the crown jewels of the University of Utah," and it's part of why Parashar came to SCI three years ago. "The opportunity to build on SCI, to work with the excellent faculty, researchers, and students at SCI, and to realize a leading trans-disciplinary institute focused on computation and data with broad scientific and societal impact is what attracted me to SCI," the director said. The co-founders, accordingly, are optimistic about SCI's continued evolution under Parashar. "The arc is clear and exciting," MacLeod said, "and the bottom line is that we're definitely not done."

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The Responsible AI Initiative:
An Investment to Position the University of Utah for AI Leadership

Concept

The One-U Responsible AI initiative (One-U RAI) is led by a leadership team from the Scientific Computing and Imaging (SCI) Institute, including the Director, Manish Parashar, Mike Kirby, Penny Atkins, and Patti Ross. The One-U RAI aims to catalyze *transdisciplinary excellence in responsible AI* at the University of Utah by bringing together the use-inspired/applied AI research and technological expertise, advanced cyberinfrastructure, and translational workforce needed to position the U as a regional and national leader. The intent is for the Responsible AI initiative to be inclusive of many disciplines. The guiding principles of the initiative include:

- Bridge traditional research boundaries across the university to catalyze and sustain large, multidisciplinary research collaborations, with an awareness of socio-technical dimensions and societal implications;
- Complement existing research and educational structures and focus on catalyzing novel transdisciplinary and convergent research thinking and training; and
- Build on existing strengths and align with university, state, regional, national, and global priorities while emphasizing overarching regionally important thematic drivers, providing opportunities for first-mover advantage, and differentiating the U from peer and aspirational institutions.

Initially, One-U RAI will focus on the following three thematic application areas, which build on a range of research strengths across the U, including scientific computing, data analytics, genomics,

imaging, visualization and graphics, robotics, planning, and decision support:

- The environment
- Healthcare and wellness
- Future of teaching and learning

The One-U RAI is a university-wide initiative. Its conceptualization and execution will include a university-wide executive committee and working groups, a dedicated program office housed at SCI, and will be in coordination with other AI-related initiatives at the university. Additionally, the initiative will be guided by external and internal advisory committees.

Key Components
Attracting Talent and Expertise

Distinguished Visitors Program: The One-U RAI Distinguished Visitor Program will support extended visits by leading researchers from across the globe. Visitors will be selected using an open nomination and selection process and will be invited to stay for up to one year. The visitors will be hosted at SCI and will engage with researchers and students across the U through a distinguished lecture as well as activities including activities such as mentorship, discussion sessions, and teaching. The Distinguished Visitor Program will also serve as a mechanism for attracting potential hires.

One-U RAI Faculty Fellowships: The One-U RAI will establish a One-U RAI Faculty Fellowship program that will support relevant

existing faculty as well as new hires who align with the One-U RAI. The program will enable faculty to directly contribute to the One-U RAI and will aim to increase the diversity of faculty affiliated with SCI and the One-U RAI. The fellowship will provide a stipend over their academic base salary and/or to support research activities for 3 years and may be renewed following review.

One-U RAI Cluster Hires: The One-U RAI will support the hiring of synergistic clusters of experts in the initial thematic application areas. Each transdisciplinary cluster will be comprised of a senior, internationally renowned faculty member, 2-3 promising and upcoming mid- and or early-career faculty members, a team of software/data professionals and practitioners, and research staff and students. Hired faculty will receive the One-U RAI Faculty Fellowship.

Advanced Cyberinfrastructure

Advanced cyberinfrastructure (including computing, storage, software and services, and expertise) is essential to progress at the frontiers of AI. The One-U RAI will invest in providing widely accessible advanced cyberinfrastructure resources and services critical for driving AI R&D. Specifically, the initiative will build on and expand the Center for High Performance Computing (CHPC), prioritizing the addition of data-center capacity (along with power and cooling), adding personnel as needed, and supporting the scale-up of its operations as a regional resource.

Community Engagement & Outreach

Establishing an environment and support structures that facilitate creativity and collaboration is a key to the success of this initiative. The One Utah Data Science Hub will serve as the community building arm of the One-U RAI. Through this, the Hub will support activities necessary for the strategic planning and execution of the One-U RAI and develop essential models for partnership, especially with research and industry across the state.

Ongoing Activities and Progress
Executive Committee and Working Groups

The One-U RAI executive committee meets weekly with the leadership team to provide feedback and a breadth of perspectives around planning for the activities of the One-U RAI. At least one member of the executive committee serves as a liaison for each of the three working groups, which align with the three thematic areas. These working groups have been formed to help define how these key components should be organized and developed within their thematic area. Each of the working groups includes a three-person leadership team, including a One-U RAI executive committee liaison and faculty members, with a total working group size of twelve or less.

To further engage with the campus community, the One-U RAI is planning several opportunities for you to learn more about the initiative and engage around AI, including a One-U RAI townhall on May 8, an invited speaker, Julia Lane, on May 10, as well as opportunities for greater regional engagement through an industry partnership summit this summer and a community convergence in the fall. Updated information about upcoming events can be found on our website (https://rai.utah.edu/events/).

Internal and External Advisory Committees

To aid in connecting the One-U RAI with the academic programs of the university as well as to ground the One-U RAI with regards to the research and academic missions of the university, an internal advisory is being formed based upon college deans (and/or their designee) and various other members as selected by the Provost. The committee aims to both provide feedback and recommendations to the One-U RAI concerning integration and alignment with related initiatives at the college and department levels and be ambassadors and liaisons with their colleges concerning RAI-related initiatives.

In parallel, an external advisory committee includes members from industry, academia, and government to aid in connecting RAI with broader national, regional, and state AI initiatives and with complementary efforts around computing and AI. The committee has three purposes: 1) to be a sounding board concerning One-U RAI-related initiatives, activities, directions, and/or functions; 2) to apprise the One-U RAI leadership team of complementary, competing, and synergistic activities about which they should be aware, including alignment and/or mitigation strategies; and 3) to in turn be ambassadors and liaisons with their spheres of influence.

Industry engagement

The One-U RAI aims to build industry partnerships through multiple mechanisms which will be mutually beneficial, including the establishment of an industry consortium to facilitate public-private partnerships, research partnerships to advance multidisciplinary translational research, student internships, co-ops, and scholarship opportunities, partnerships to attract the best talent through a Distinguished Visitors Program, an open, shared, and equitably accessible cyberinfrastructure, as well as provide opportunities to convene experts from industry, government, and academia to share ideas and foster collaborations and engage with the broader community.

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● Matthew Lowery ● Matthew Territo ● Maura Perez ● Mavin Martin ● Max Hansen ● Max Sergeev ● Maxim Lisnic ● Mckay Davis ● Dilshadur Rahman ● Hasibul Hisham ● Rahat Zaman ● Mehran Javanmardi ● Melissa Brooks ● Melissa Burback ● Mengjiao Han ● Miaomiao Zhang ● Michael Blatt ● Michael Young ● Michael Harris ● Michael Herron ● Michael Penwarden ● Michael Purcell ● Michael Ross Herron ● Michael Steffen ● Michael Bentley ● Michelle Dalton ● Michelle Miller ● Michelle Hromatka ● Mike Kirby ● Mike Steffen ● Milan Ikits ● Mingzhe Li ● Mingzhen Shao ● Minh Pham ● Miriah Meyer ● Mitra Alirezaei ● Mojgan Alishiri ● Mojtaba Seyedhosseini ● Mokshagna Karanam ● Moritz Dannhauer ● Mudambi Srivatsa ● Mukund Raj ● Murali Kilari ● Nan Xiao ● Naoki Tominaga ● Nate Lanza ● Nate Robins ● Nate Smith ● Nathan Dykman ● Nathan Bascom ● Nathan Galli ● Nathan Gorski ● Nathan Morris ● Nathan Marshak ● Nathan Morrical ● Nathan Sudbury ● Nathan Jacobs ● Nathaniel Smith ● Nawazish Khan ● Nazmus Saquib ● Neda Sadeghi ● Nghia Truong ● Nhat-Cuong Ly ● Nicholas Bradberry ● Nicholas Green ● Nicholas Bertognolli ● Nidhi Soley ● Nikhil Singh ● Niloofar Farhang ● Nina McCurdy ● Nisha Ramesh ● Nishith Tirpankar ● Nithin Chalapathy ● Nitish Shingde ● Oleg Portniaguine ● Oleksandr Korshak ● Olivia Walker ● Onkar Joshi ● Oren Livne ● Orly Alter ● Oscar Barney ● Owen Koppe ● Paige Ashlynn ● Pankaj Nathani ● Parth Kothari ● Pascal Goffin ● Pascal Grosset ● Patrick Rasch ● Patrick Hawkes ● Patrick Pearson ● Patrick Angell ● Paul Robertson ● Paul Rosen ● Paul Sanders ● Pavel Koshevoy ● Peer-Timo Bremer ● Peihong Zhu ● Penny Atkins ● Peter Jacobs ● Peter-Pike Sloan ● Phil Sutton ● Philip Waldis ● Philip Davis ● Philip Samuel Quinan ● Philip Waldis ● Phillip Mates ● Praful Agrawal ● Prasad Gharpure ● Prasanna Muralidharan ● Prateep Mukherjee ● Preethi Sankaranarayanan ● Qi Wu ● Qingyu Meng ● Quynhhoa Nguyen ● Rachaell Nihalaani ● Raelynn Potts ● Raghavendra Sridharamurthy ● Ramaldeep Singh ● Ran Tao ● Randy Jones ● Rayane Mouhli ● Rehman Mohammed ● Rejina incic ● Remaldeep Singh ● Remi Sondaz ● Reza Kolasangiani ● Ricardo Bigolin ● Riccardo Sonsini ● Richard Massey ● Richard Coffey ● Riddhish Bhalodia ● Ridge Durrant ● Rifat Proma ● Rinchen Phuntsok ● Rob MacLeod ● Robert Cummins ● Robert Coffman ● Robert Van Uitert ● Robert Oakes ● Robin Cinbis ● Roman Amici ● Roman Clark ● Roozbeh Gholizadeh ● Rose Cipriano ● Rose Mills ● Ross Whitaker ● Ruediger Westermann ● Rufus Tolbert ● Rui Luo ● Russell Bloomdale ● Russell Morley ● Ruth Klepfer ● Ryan Beavers ● Ryan Russon ● Ryan Vance ● Ryan Davis ● Ryleigh Moore ● Sabahudin Jonic ● Safia Hassan ● Sahithi Chaganti ● Saleem Alharir ● Salman Parsa ● Samuel Campbell ● Samuel Colby ● Samuel Gerber ● Samuel Hancock ● Samuel Leventhal ● Samuel Preston ● Sangshin Park ● Sara Scott ● Sara De Sart-Marlow ● Saradha Rajamani ● Sarah Geneser ● Sarah Schuster-Johnson ● Sarang Joshi ● Sascha Moehrs ● Saurav Basu ● Sayed Mohammadabadi ● Sayef Sakin ● Sean Curtis ● Sean Finley ● Sean Heffernan ● Sean McKenna ● Sefat Rahman ● Seok Lew ● Sergey Yakovlev ● Seungkeol Choe ● Shachar Fleishman ● Shad Dinkins ● Shadmaan Hye ● Shalinbimal Parikh ● Shana Black ● Shankar Sastry ● Shannon Ritzman ● Shashidhar Puchakayala ● Shaun Lauer ● Shaun Ramsey ● Shawn Nielsen ● Shawn Reese ● Shibo Li ● Shiji Peng ● Shikai Fang ● Shikha Dubey ● Shireen Elhabian ● Shreeraj Jadhav ● Shridharan Chandramouli ● Shusen Liu ● Shuvrajit Mukherjee ● Siddharth Shankar ● Sidharth Kumar ● Simon Gao ● Sinesio Pesco ● Siva Viknesh ● Skyler Jayson ● Songzhe Xu ● Sophia Han ● Sourabh Palande ● Spencer Frisby ● Sravan Neerati ● Sree Kadiyala ● Stanley Durrleman ● Stefan Gumhold ● Stephanie Powell ● Stephen Steele ● Steve Maas ● Steve Orme ● Steve Parker ● Steve Petruzza ● Steven Corbató ● Steven Callahan ● Steven Labelle ● Stewart Charles ● Stuart Curtis ● Sudha Belida ● Sudhanshu Sane ● Sujin Philip ● Suman Singh ● Sumedha Singla ● Sunny Hardasani ● Surojit Saha ● Suyash Awate ● Syed Ahmed ● Tamara Bidone ● Tark Patel ● Taylor Fowers ● Taylor Scheinblum ● Ted Schomay ● Teresa Hennigan ● Thanh Nguyen ● Thiago Ize ● Thomas Ward ● Thomas Clevenger ● Thomas Reiersen ● Thomas Johnson ● Thomas Robertson ● Thomas Stock ● Tiago Queiroz ● Tianlong Zhang ● Tilo Ochotta ● Tilottama BoseMaiti ● Timbwaoga Ouermi ● Timo Heister ● Timothy Sodergren ● Ting Liu ● Tobi Yoon ● Todd Green ● Todd Tapp ● Tolga Tasdizen ● Tom Fletcher ● Tomasz Skora ● Torben Spiegler ● Torin McDonald ● Trenton Vanderlinden ● Trevor Lujan ● Tristan Pudell-Spatscheck ● Tsung-Nan Liu ● Tushar Athawale ● Tushar Gautam ● Tushar Kataria ● Tyler Nichols ● Tyler Thompson ● UmaKant Pandey ● Vahid Keshavarzzadeh ● Vai Suliafu ● Vaidyanathan Krishnamoorthy ● Valerio Pascucci ● Varun Karuppannan ● Varun Shankar ● Venkata Goparaju ● Venkata Bommu ● Venkatanand Venkatachalapathy ● Vidhi Zala ● Vidya Elangovan ● Vikram Raj ● Vincent Pegoraro ● Vipin Jose ● Wangye Yin ● Wasim Gazi ● Wathsala Widanagamaachchi ● Wayne Lam ● Wayne Witzel ● Wayne Tyler ● Wei Liu ● Wei Xing ● Weiran Lyu ● Welcome Huff ● Wenzheng Tao ● Will Usher ● William Garnes ● William Mecklenburg ● William Ricardo Valdez ● Wilson Good ● Won-Ki Jeong ● Xavier Cavin ● Xavier Tricoche ● Xiang Hao ● Xiaoya Tang ● Xiaoyue Huang ● Xinghui Zhong ● Xinlong Wang ● Xinwei Xue ● Xinyuan Yan ● Xiwen Li ● Xuan Huang ● Xueyu Zhu ● Yan Zheng ● Yang Chen ● Yang Gao ● Yaniv Gur ● Yanyan He ● Yaodong Zhao ● Yarden Livnat ● Yash Lad ● Yennhi Nguyen ● Yen-Yun Yu ● Yeonjong Shin ● Yi Gan ● Yichen Zhou ● Yihao Jiang ● Yiming Xu ● Yong Wan ● Yongsheng Pan ● Youija Zhou ● Younes Tatari ● Yuhang Chen ● Yulong Liang ● Yuxiu Huo ● Zach Cutler ● Zachary Wach ● Zachary Bastiani ● Zachary Warnock ● Zeferino Andrade ● Zella Urquhart ● Zexin Liu ● Zhe Leng ● Zhen Chen ● Zhichao Xu ● Zhimin Li ● Zhisong Fu

SDSC and SCI Democratizing Nationwide Access to Science Data

The San Diego Supercomputer Center (SDSC) at UC San Diego and the University of Utah (Utah) have announced a national-scale pilot project, called the National Data Platform (NDP), aimed at a service ecosystem to make access to and use of scientific data open and equitable across a broad range of communities, including traditionally underrepresented researchers.

Led by SDSC and Utah's Scientific Computing and Imaging Institute (SCI), and in partnership with the EarthScope Consortium, the $6 million NDP pilot is funded by the U.S. National Science Foundation. The pilot will serve as a federated and extensible data and service ecosystem to foster innovation, discoveries and collaboration through the equitable access and use of science data and leveraging existing national cyberinfrastructure capabilities.

Such access and use will ensure responsible data-driven research to address urgent national and global issues such as climate change and environmental sustainability.

Additionally, with the increasing potential of artificial intelligence (AI) to enhance and accelerate solutions to many scientific and societal problems, broad and equitable access to AI-ready data repositories is essential in developing and deploying responsible AI models and enabling everyone to be a part of AI-integrated solutions.

"NDP aims to bridge the gaps between data innovations and computing infrastructure through the combination of a data hub and an extensible service platform. Carefully designed workflows based on user needs assessment aim to bring equity for everyone to participate in AI-integrated solutions for research discoveries and global societal challenges," SDSC's Chief Data Science Officer and NDP Principal Investigator Ilkay Altintas said.

SDSC Director Frank Würthwein explained that "NDP builds a data and knowledge curation layer on top of low level content delivery networks like the Open Science Data Federation, thus leveraging prior and contemporary investments in cyberinfrastructure across dozens of academic institutions."

Utah's SCI Director Manish Parashar said, "With the growing importance of data to all aspects of science and society, there is an urgent and critical need for open and equitable access to scientific data. Open and equitable access to scientific data can democratize science and transform society. NDP aims to create a robust, scalable and agile data platform that can enable such access."

According to SCI Research Computer Scientist and NDP Co-Principle Investigator Ivan Rodero, NDP redefines cyberinfrastructure by setting new standards for data access and collaborative science. "NDP will enable a seamless integration of data services, ensuring that every researcher has the required tools to push the boundaries of discovery," he said.

About NDP
NDP is a federated and extensible data and service ecosystem aimed at promoting collaboration, innovation and open and equitable use of data on top of existing national cyberinfrastructure and cloud capabilities. The platform aims to remove barriers involving access and use of data and computing.
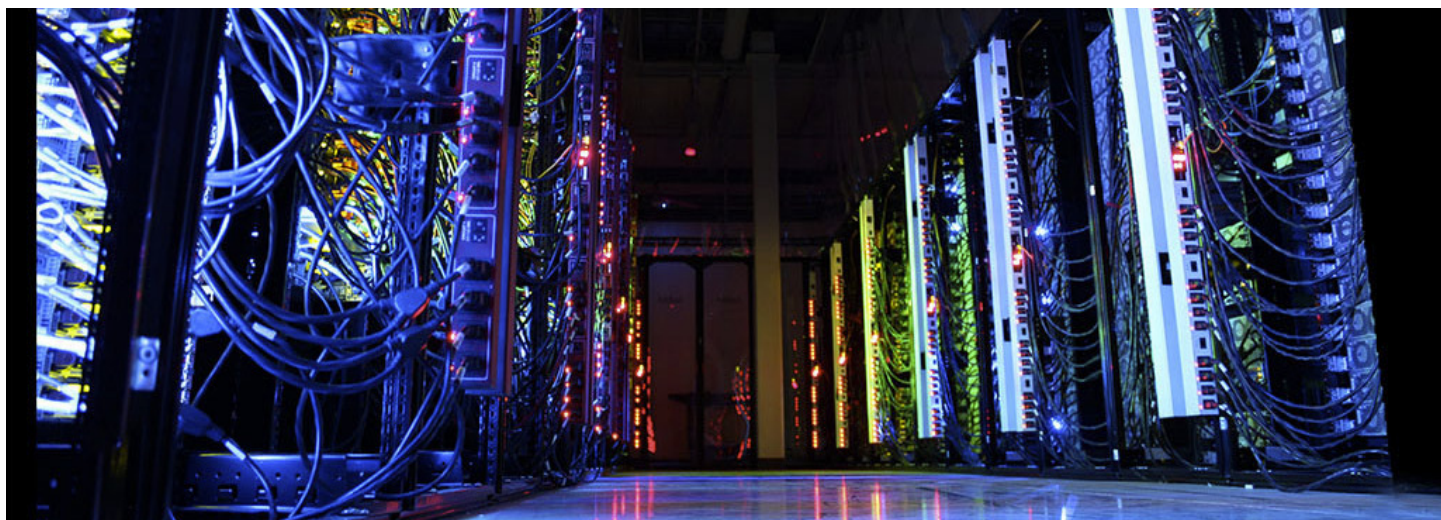
The Future of CHPC

The University of Utah has a rich and early history in research computing, data, networking and visualization. The department of computer science was formed in 1965 and the U of U became the fourth node on the Arpanet in 1969. With respect to supercomputing and high performance computing (HPC), in 1989 the Utah Supercomputing Institute (USI) was formed based on the first gift of an IBM 3090 to the academic community and this provided research computing support for the U of U at a cost to IBM of ~$22M; it is notable that the total higher education budget in the state of Utah that year was ~$28M. In 1995, USI transformed into the Center for High Performance Computing (CHPC) adding into HPC Information Technology research and design, distributed computing, security, advanced networks, visualization, and a mission to focus on computational science and interdisciplinary research on campus. Starting around 2000, CHPC began to move away from large vendor turnkey HPC solutions to design, engineer and deploy clusters first as Beowulf class "boxes on shelves" and later traditional blades from cost-effective vendors. In 2009, CHPC deployed the first protected environment (PE) compute and storage cluster prototype appropriate for handing sensitive and restricted data (HIPAA, protected health information) and in 2011 CHPC deployed the first campus science DMZ that bypassed the traditional border firewalls for fast, efficient and secure data transfer. In 2014 CHPC moved to identify as a service provider rather than a traditional research center or institute. In 2017 an NIH S10 equipment grant was awarded to upgrade the PE, and more recently the science DMZ was upgraded with Cares Act funding. In 2023 CHPC deployed an even more secure enclave – Citadel – appropriate for higher securing compliance necessary for Export Control, Controlled Unclassified Information, and CMMC level 2.

CHPC has evolved beyond HPC to support research computing and data (RCD), broadly defined, where people serve as the interface between researchers and the RCD infrastructure and services, including virtualization, web services and databases. CHPC has dedicated staff facilitators for consulting, a broad range of free training and documentation, and significant infrastructure supporting researchers with their needs beyond the desktop. At present, CHPC operates ~50,000 cores and ~40 PB of storage, has over a dozen high speed data transfer nodes, and supports over a 1000 applications and tools for researchers. Growth is rapid and continuing with doubling to 5x growth every few years across all metrics. Currently CHPC supports over 1000 PI's, and 6000 researchers at the University of Utah, Utah State University and at other institutions of higher education in the state of Utah including supporting researchers at the U of U from more than 65% of the departments on campuses and also supporting a number of core facilities. Fairly unique to CHPC's RCD service operation is in-house high-speed networking and security staff.

CHPC while working towards a more sustainable funding model is partnering and collaborating with SCI and other independent IT units on campus to engineer, deploy and operate innovative and emerging compute solutions, broadly defined. CHPC has deep ties into the national RCD ecosystem and leverages strengths of the community to keep up to date on emerging trends, challenges and solutions. The intent is to keep the University of Utah on the leading edge of RCD infrastructure, support and services.
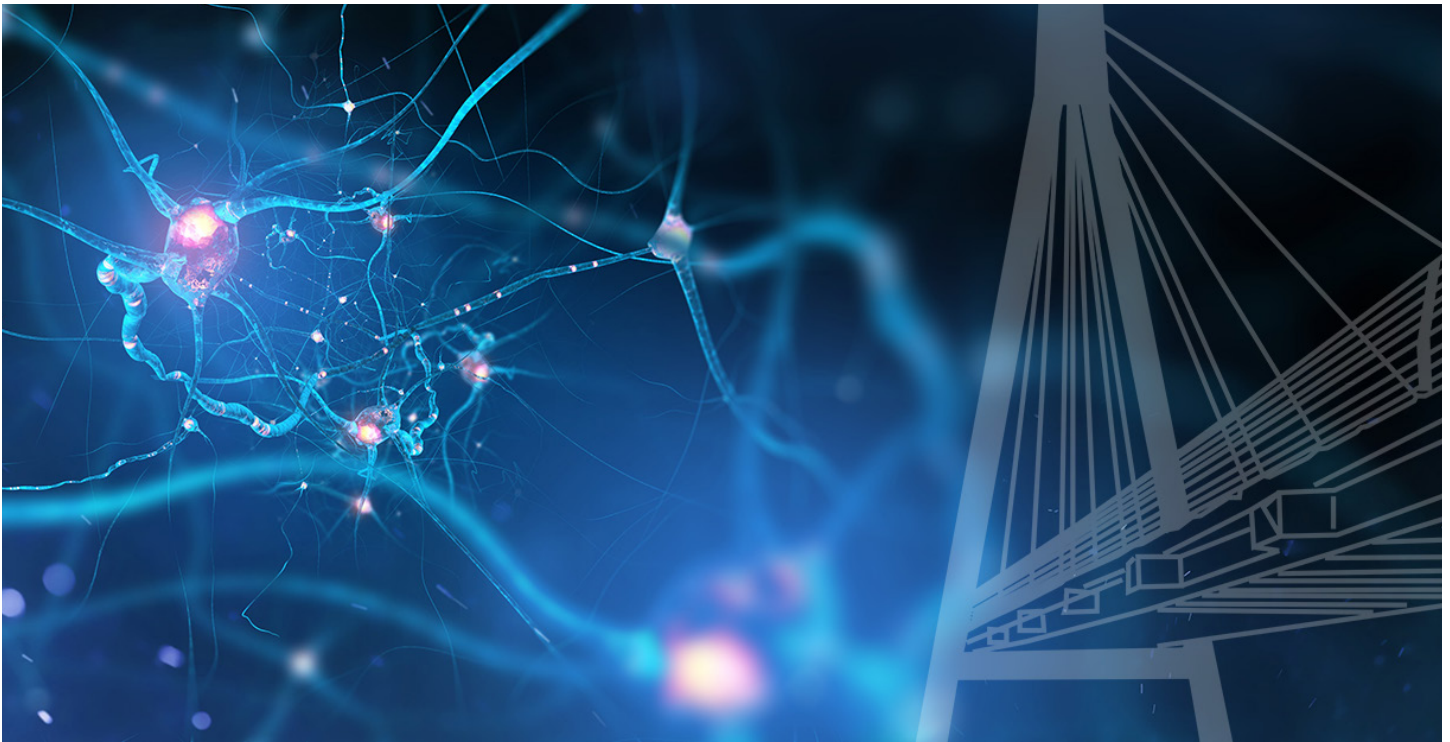
Interdisciplinary Institutes Essential for Responsibly Leveraging AI

By Manish Parashar, PhD
Director of the Scientific Computing and Imaging Institute

Artificial intelligence (AI) has become the transformative technology of our time, driving discoveries and spurring economic growth, and its rise highlights the critical role of data and computing. AI impacts everything from routine daily tasks and services to scientific grand challenges—it has the potential to improve lives drastically. However, new technologies, such as AI, also bring new challenges. For example, there are growing concerns that AI and its use could have adverse social, environmental, and economic consequences.

Responsible progress at the current frontiers of AI and its applications, i.e., progress that advances AI and its use while mitigating its adverse effects, depends on bringing disciplines together to effectively leverage computational and data-driven techniques and harness large amounts of data and computational power. This requires research and educational structures that cut across traditional disciplinary silos not only to exploit technologies more effectively but also to address disruptive societal impacts more holistically. Such innovation ecosystems bring together multidisciplinary talent within collaborative spaces with the necessary support services and infrastructure. These systems are becoming a differentiating characteristic of leading public research universities.

Over the last three decades, the Scientific Computing and Imaging (SCI) Institute has positioned itself to establish such an innovation ecosystem at the University of Utah. SCI bridges colleges and other traditional disciplinary boundaries to unite faculty, researchers, staff, and students to address the grand challenge problems.

As we launch the ambitious and timely One-Utah Responsible AI initiative (One-U RAI), we envision a reality where researchers can responsibly leverage data, computation, and emerging technologies such as AI to benefit humanity. Building on SCI's expertise in applied scientific and data computing, imaging, and visualization—and a tradition of real-world impact—my vision is an ecosystem that brings together multidisciplinary research, technological expertise, advanced cyberinfrastructure, and a translational workforce to address scientific and societal grand challenges. Such an ecosystem will position the University of Utah as a regional and national leader.

New Hires

Paul Robertson
IT Specialist

Paul is a native Utahn with a background in geology. Six years ago, he made the decision to become a web developer and IT specialist. Paul enjoys designing and building websites. Paul is an avid rock climber of 23 years and has worked both as an outdoor guide and indoor instructor. Paul's successful ascent of the Phantom Wall in the Denali Range marked an early end to his career as an Alpinist (in the interest of spending more time with his kids) but did not subdue his passion for climbing. Most often you'll find him at the gym or on a large boulder somewhere in Little Cottonwood Canyon trying to get on top via its least accessible aspect. He and his kids enjoy canyoneering, rafting, biking, movies/anime, and reading scary books.

Todd Green
Director of IT

Todd came to Utah from the Midwest in the late 1990's to work at SCI running what was at that time the world's largest graphics supercomputer. Realizing his aptitude and enthusiasm for all things computing, he was soon promoted to manage IT for the Kahlert School of Computing where he worked for more than 25 years. This past year Todd rejoined SCI as the Director of IT to help the institute's cutting-edge research realize the vision of making both data and compute more widely available on both a regional and national platform. When he isn't wrangling bits, he enjoys wrestling mountains as an avid rock climber or racing his car at Utah Motorsports Campus. Most of all, he enjoys traveling with his wife to her native land of Brazil.

Kate Craven
Administrative Assistant

Kate recently relocated to Utah with her husband and young daughter from Memphis, Tennessee. She's a graduate of the University of Memphis, and was previously employed in a similar administrative role at the University of Memphis' College of Nursing. In her free time, she enjoys doing any activity that makes my daughter smile. She loves going to parks, indoor playgrounds, and attending children's plays. "I have found a new love for the mountains, and I spend my weekends exploring sites around the SLC area," she says. "I am an avid sports fan, and I am passionate about University of Memphis Football & Basketball. I love watching sports and attending football games in the fall. I am very excited to join SCI and the U of U!"

Kelly Hermans
Communications and Public Relations Manager

Kelly is SCI's new manager of communications and public relations. She has a collective 20 years of experience in journalism, communications, and marketing, most recently for Huntsman Cancer Foundation. Previously an East Coaster, she earned journalism degrees from the University of Georgia and the University of Maryland, where she held a Carnegie-Knight reporting fellowship. She enjoys all things storytelling, especially writing, editing, and graphic design. When she's not working, she gets outside as much as possible, whether to hike, ski, kayak, or just lounge on her patio with a good book. She enjoys exploring Utah and the Mountain West with husband Tucker, rescue mutt Buddy, and the family's newest addition, baby Naomi, born in December 2023.

Ed Cask
IT Project Manager

As an accomplished IT project manager, Ed serves as a dedicated hardware steward at the institute. From procurement to disposition, in his new role he oversees the lifecycle of equipment, ensuring seamless operations, including tasks like procurement, inventory control, and responsible hardware disposal. His commitment to optimizing the hardware infrastructure showcases his vital role in sustaining the institute's technological ecosystem. Beyond his technical responsibilities, Ed's proficiency extends to diverse tasks such as conference room support and AV assistance. Additionally, his passion for nature photography adds a unique and artistic dimension to his multifaceted role.

Jess Tate
Manager, Cyber Infrastructure Professional (CIP) CoOP

Jess is a Utah native who joined SCI as an undergraduate and continued at SCI while earning his PhD in Bioengineering, then as a technical manager for the Center for Integrative Biomedical Computing (CIBC) and research associate. His research interests include computational electrophysiology, statistical shape modeling, uncertainty quantification, machine learning, and developing software products and systems that support sustainable research communities. In his new role, Jess will lead the cyber infrastructure professional (CIP) CoOP at SCI coordinating software and IT needs for research projects, organizing training efforts, and supporting the CIP community and SCI in their mission to produce high quality computing products that benefit research efforts around the world. When he is not pursuing these research interests, Jess spends time with his kids taking care of animals, hiking, cooking, and crafting things both practical and not.

Suman Singh
Grants & Contracts Officer

Suman is the newest grants and contracts officer at SCI. She provides expert support for pre-award and post award activities. Her role revolves around assisting principal investigators in navigating the complexities of grant funding, ensuring compliance, and effectively managing financial resources. Outside of work, she finds immense joy in the simple pleasures of life: spending quality time with my family, exploring new destinations through travel, and rejuvenating herself through regular exercise. Nature holds a special place in her heart, as it allows her to reconnect with the beauty and calm of the world around her.
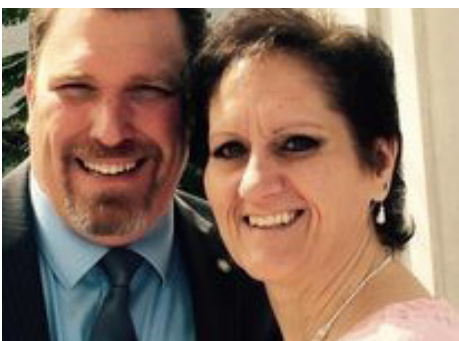
Brenda Peterson
Executive Assistant

Brenda has been promoted to executive assistant, which will include being the events manager at SCI. Brenda enjoys planning and helping students and leading being behind the scenes. She has worked at SCI for 13 years. I couldn't be more excited to take on this new role and continue to contribute to its success. Brenda says she cannot wait to see where this new chapter of my career will take me, and to grow and learn in this new role. When Brenda isn't working, she is enjoying time with her family, cooking and gardening.

News and Notes

National Academy of Sciences Names Tamara Bidone a 2024 Kavli Fellow

Dr. Bidone, Assistant Professor of Biomedical Engineering and Adjunct Assistant Professor of Biochemistry and of Molecular Pharmaceutics at University of Utah, is also appointed faculty in Utah's Scientific Computing and the Imaging Institute. Her research focuses on understanding how changes in conformation and dynamics of proteins and protein-protein complexes control cell behavior. This work involves her development and integration of new molecular, macromolecular and cellular computational methods.

Her research has contributed substantially to elucidating diverse roles of molecular interactions in governing functional states of biological macromolecules and their subsequent impact on cellular-level systems. Her lab applies these modeling techniques to problems related to engineering on the molecular, cellular and tissue levels, such as extracellular matrix effects on cell spreading, the assembly of the cytokinetic ring in cell division, the role of forces on chromosome separation and the response of cells to altered external stiffness, as in fibrosis and cancer.

Youjia Zhou wins the Price College of Engineering Outstanding Dissertation for 2023

Youjia defended and graduated in 2023 and is a SCI and SoC alumni. Her Dissertation was titled *Topology-based Visualization of Graphs and Hypergraphs*.
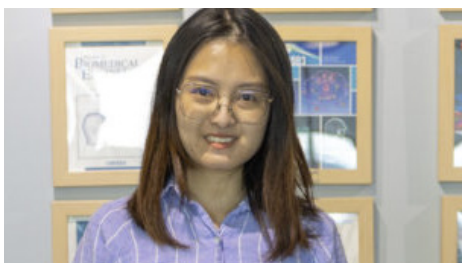
SCI Institute Alumnus Steve Parker to Receive Honorary Degree

Steven G. Parker has a long list of "firsts" and "bests" in the field of computer science, where he is celebrated as one of the most talented researchers in the world. Today, he is the vice president of professional graphics at NVIDIA, a semiconductor company that makes high-end graphics processors used in video games, editing, 3-D rendering and artificial intelligence and machine learning applications.

SCI Partners with the Leonardo for "Into the Mind of AI"

We are delighted to partner with the Leonardo on this important and timely exhibit. A new, cutting-edge immersive exhibit coming to The Leonardo, "Into the Mind of Artificial Intelligence," offers guests a unique glimpse into the realm of artificial intelligence. Guests are challenged to look closely, and to question everything. Where might this incredible technology take us in the future?

Guests will enjoy a provocative immersive experience before being invited to explore artificial intelligence and robotic technology through several unique interactive displays and workstations.

The exhibit offers supplemental programming such as lectures, panel discussions, and special events, aimed at further engaging community partners and facilitating collaboration between academia, industry, and the public.

Manish Parashar Wins the 2024 CRA Distinguished Service Award

The Computing Research Association (CRA) has selected Dr. Manish Parashar as the recipient of the 2024 CRA Distinguished Service Award in recognition of his multi-faceted and highly impactful service to the computing research community.

The CRA Distinguished Service Award, now in its 36th year, recognizes service in the areas of government affairs, professional societies, publications or conferences, and leadership that has a major impact on computing research.

Recent SCI Ph.D.s

Mitra Alirezaei - Deep Learning with Imperfect Noisy Data
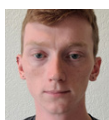
Chris Gritton - Modeling Electrochemistry Problems using the Material Point and Finite Volume Methods

Kiran Gadhave - Towards Reproducible and Reusable Visual Analysis

Bo Zhang - Interoperable and Portable I/O Abstraction for GPU-Based In Situ Workflow

Michael Penwarden - Advancing Physics-Informed Neural Networks (PINNs): Metalearning, Multifidelity, Multitask, and Multidomain Strategies