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TCHPC

The IEEE Computer Society Technical Consortium on High Performance Computing Newsletter

Manish Parashar, Chair

New IEEE CS Technical Consortium on High-Performance Computing

The IEEE Computer Society's (IEEE CS's) technical councils, committees, and task forces (TCs) have been a mainstay of communities of interest around which sponsored conferences, publications, standards, and other activities are developed and sustained. Volunteers from all over the world join and lead these communities, as they have done since the mid 1960s—the very earliest days of the Society's history.

The IEEE CS has added a new technical consortium, bringing the total number of TCs to 31. The Technical Consortium on High-Performance Computing (TCHPC), chaired by Manish Parashar, is a consortium of IEEE communities with an interest in the HPC field. TCHPC's founding TCs include the Technical Committee on Computer Communications (TCCC) and the Technical Committee on Parallel Processing (TCPP). TCHPC will sponsor technical meetings and sessions, and promote periodicals, standards as well as educational and other activities for advancing HPC. These efforts will be achieved in concert with TCHPC's support and management of the IEEE CS's shared interest in the SC conference and related activities.

The leadership of TCHPC has set in motion three main initiatives:

1. **Education and Outreach Initiative**—coordinating activities, information, and best practices around HPC education/outreach across its member technical committees and the broader community;

2. **Reproducibility Initiative**—leading a broad and deep conversation to advance the standards of simulation- and data-based science, working with the community to coordinate efforts in this important area, as well as experiences and effective practices; and

3. **Software Engineering Practices Initiative**—leading a conversation on impactful software engineering practices to address the innate complexity present in concurrent/parallel/distributed software development, and ensure robust HPC solutions.

In addition to TCHPC's initiatives, this community has also established an awards program. The TCHPC Award for Excellence for Early Career Researchers in High-Performance Computing recognizes up to three individuals who have made outstanding, influential, and potentially long-lasting contributions in the HPC field within five years of receiving their PhD degree (as of 1 January for the year of the award). Awardees receive a plaque and are recognized through the TCPP and TCCC websites, newsletters, and archives. The awards are presented during the award ceremony at the SC conference.

For more information on TCHPC, visit http://tc.computer.org/tchpc; and for information on all IEEE CS TCs, visit https://www.computer.org/web/tandc/technical-committees.

IEEE-CS TCHPC 2017 Award Winners Announced, for Excellence for Early Career Researchers in High Performance Computing

IEEE Computer Society (IEEE-CS) selects **Antonio J. Peña** of the Barcelona Supercomputing Center (BSC), **Amanda Randles** of Duke University, and **Shuaiwen Leon Song** of Pacific Northwest National Laboratory, as 2017 winners of the IEEE-CS Technical Consortium on High Performance Computing (TCHPC) Award for Excellence for Early Career Researchers in High Performance Computing.

Dr. Antonio J. Peña

Dr. Antonio J. Peña is a Senior Researcher at Barcelona Supercomputing Center (BSC), Computer Sciences Department since 2015. He holds a Spanish Juan de la Cierva fellowship and is a prospective European Marie Curie Fellow.

Peña is the Manager of the BSC/UPC NVIDIA GPU Center of Excellence and member of the BSC Outreach Working Group. Within the Programming Models Group, he is Activity Leader for the "Accelerators and Communications for HPC" team. He has also a Teaching and Research Staff appointment at the Universitat Politècnica de Catalunya, Spain.

His research interests in the area of runtime systems and programming models for high performance computing include resource heterogeneity and communications.

Dr. Amanda Randles

Dr. Amanda Randles is an Assistant Professor in Biomedical Engineering at Duke University with secondary appointments in Mathematics, Computer Science, and Mechanical Engineering. She is also a member of the Duke Cancer Institute, and a jointly appointed faculty member of Oak Ridge National Laboratory.

Her work focuses on the design of large-scale parallel applications targeting biomedical questions. Her research goals are to both investigate fundamental questions related to fluid dynamics as well as extend the multiscale models to study cancer metastasis and vascular disease.

Shuaiwen Leon Song

Shuaiwen Leon Song is a senior staff scientist in High Performance Computing (HPC) Group at Pacific Northwest National Lab (PNNL). He is also an adjunct scholar with the Computer Science department at College of William&Mary.

His previous research interests have covered a broad spectrum of HPC research topics, with a recent focus on software-architecture co-design, large-scale system modeling and optimization, and providing optimized design solutions for complex emerging HPC architectures.

Click here for the full press release.

Awardees will be presented a plaque and will be recognized by IEEE Computer Society TCPP and TCCC websites, newsletters and archives.

IEEE CS Announces 2017 Global Student Challenge Winners

The IEEE CS is pleased to announce the winners of the IEEE CS Global Student Challenge, an international competition to solve a real-world problem. The contest is open to all IEEE CS student members.

The winning submissions incorporate ideas from the IEEE CS 2022 Report, developed by IEEE CS past president Dejan Milojičić and a team of nine technologists who surveyed the landscape and identified the 22 game-changing technologies that they expect will have the biggest impact on our way of life by 2022. This competition is a unique opportunity for the IEEE CS's student members to create a solution and get feedback from the panel of judges.

The winners of the 2017 Global Student Challenge are:

First Place: Muhammad Asad Raza, Syed Abrahim Ali Shah, and Muhammad Haris

Second Place: Nelson Daniel Troncoso Aldas,

Justin Hardin, Kevin Irick, Tom Kawchak, Chris Kim, David de Matheu, Ikenna Okafor, Christoper Pratt, John Reid, Henry Gus Smith, Peter Zientara, and Alexander Smit

Third Place: Henok Gezaw, Andrew Leverkuhn, Miguel Rosales, Jose Daniel Velazco, and Daniel Weaver

For the first-place winners, their submission, "Diagnosis, Monitoring and Rehabilitation of Parkinson's Disease Using Machine Learning and Big Data," presented a complete range of tools for diagnosis, rehabilitation, and monitoring of Parkinson's disease. This included a Clinical Decision Support System (CDSS) that helps doctors diagnose Parkinson's disease accurately by analyzing tremor patterns through machine learning and big data. Two other devices developed for the competition were a data-driven management tool for optimized drug administration and 24/7 monitoring and a physiotherapeutic technique for controlling Parkinson's symptoms.

The second-place winners presented "Computer Vision for Good," which helps bring sight to the visually impaired. Their design was based on replicating the power of the human visual cortex using computer vision algorithms accelerated on HPC cloud platforms, and delivered to people with visual impairment through natural user interfaces and Internet of Things devices.

The third-place winners presented "Growth Line," to help address food supply and nutritional issues in developing parts of the world. The design would help a small group of locals to successfully cultivate fruits and vegetables, so that a small village has an adequate and steady supply of food.

The first-place winners will receive $1,500; the second-place winners will receive $500, and the third-place winners receive $300.

For complete submission details, visit www.computer.org/web/studentchallenge.

ACM and IEEE Announce the 2017 George Michael Memorial HPC Fellowship Winners

Shaden Smith of the University of Minnesota and Yang You of the University of California, Berkeley are the recipients of the 2017 ACM-IEEE CS George Michael Memorial HPC Fellowships. Smith is being recognized for his work on efficient and parallel large-scale sparse tensor factorization for machine learning applications. You is being recognized for his work on designing accurate, fast, and scalable machine learning algorithms on distributed systems

Shaden Smith

Shaden Smith's research is in the general area of parallel and HPC with a special focus on developing algorithms for sparse tensor factorization. Sparse tensor factorization facilitates the analysis of unstructured and high dimensional data.

Yang You

Yang You's research interests include scalable algorithms, parallel computing, distributed systems and machine learning. As computers increasingly use more time and energy to transfer data (i.e., communicate), the invention or identification of algorithms that reduce communication within systems is becoming increasingly essential. In well-received research papers, You has made several fundamental contributions that reduce the communications between levels of a memory hierarchy or between processors over a network.

The Fellowship includes a $5,000 honorarium and travel expenses to attend SC17 in Denver Colorado, November 12-17, 2017, where the GMM Fellowships will be formally presented.

Visit http://awards.acm.org/hpc-fellows for the full press release.

TCHPC Initiatives

Eduation and Outreach Initiative

The objective of the TCHPC Education and Outreach Initiative is to coordinate activities, information and best practices around HPC education/outreach across its member technical committee and the broader community. Currently planned activities with this initiative include:

- Coordinate student activities across conferences (e.g., Ph.D., forums and student mentoring); develop a repository of related material and best practices.
- Develop a web portal integrating resources and activities in the area of HPC education at both the undergraduate and graduate level. The portal will also link to various efforts in HPC curriculum development.
- Create a list of HPC resources available for educational use to support faculty teaching classes that need these resources.
- Serve as a bridge between undergraduate programs and industry and labs seeking to host HPC REU students and interns.

Reproducibility Initiative

Raising standards for reproducibility and rigor in scientific research is a growing concern across all science, and is particularly relevant to the area of high-performance computing and the science it enables. Some unique questions pertain to this sector, like: What is the purpose of requiring code and data to be open, when other researchers don't have access to the same or even comparable computers? What if the research findings specifically address computational performance, an attribute that is notoriously hard to replicate as you move to different hardware? When is achieving numerical reproducibility in finite-precision parallel computations a sensible demand?

The situation is further complicated in domains where software stacks combine complex numerical libraries and domain-specific code written over many years, and where computations run in leadership facilities via competitive allocations. The objective of the TCHPC Reproducibility Initiative is to lead a broad and deep conversation to advance the standards of simulation- and data-based science, and to work with the community to coordinate efforts in this important area as well as to document experiences and effective practices.

Software Engineering Practices

Progress in scientific research, in part, depends upon progress in scientific software development, which is often done in high-performance computing environments, such as clusters, supercomputers, and the cloud. Embracing best practices in software engineering will be necessary to ensure robust HPC solutions, owing to the innate complexity present in concurrent/parallel/distributed software development in general. While many associate software engineering with stereotypical monolithic software development processes (e.g., waterfall, spiral, etc.), we argue that embracing SE does not require a one-size-fits-all model and is worthy of community attention.

Some questions we plan to address in this space include, but are not limited to: (1) What SE process is best suited to typical HPC software development? (2) Given the mathematical/scientific nature of most HPC software development, how effective are modern code-testing techniques for addressing this domain? (3) How well can traditional SE methods support important quality (and other) metrics needed in HPC software development? (4) What impact does the use of SE methodology have on important considerations such as quality, sustainability (of the software itself) and reproducibility (a peer TCHPC initiative)? The objective of the SE initiative is to have a conversation to advance impactful SE practices within the HPC community.

To learn more about the TCHPC, visit http://tc.computer.org/tchpc/.

Upcoming Events

The following conferences are being held in cooperation with IEEE-CS TCHPC.

- **SC17**: International Conference on High Performance Computing, Networking, Storage and Analysis, November 12-17 2017 in Denver, Colorado, USA.
- **IEEE-CS TCHPC Birds of a Feather at SC17:** Wednesday, November 15 at 12:15-1:15pm in room 201-203 in the Colorado Convention Center, Denver, Colorado, USA.

IEEE-CS TCHPC Executive Committee	
Leadership	
Chair	Manish Parashar, Rutgers University, USA
Vice Chair	Jeff Vetter, Oak Ridge National Laboratory, USA
TCPP Representative	David Bader,Georgia Institute of Technology, USA
SC Steering Committee Representative	Ewa Deelman, University of Southern California, USA
TCCC Representative	Anura Jayasuman, Colorado State Univeristy, USA
Member-at-Large	Vladimir Getov, University of Westminster, UK
Volunteer	
Education and Outreach Initiative	Leads: Martina Barnas, Indiana University & Akshaye Dhawan, Ursinus College
Reproducibility Initiative	Lead: Lorena A. Barba, The George Washington University
Software Engineering Practices	Lead: George K. Thiruvathukal, Loyola University Chicago and Argonne National Laboratory
Publicity	Sharan Kalwani
Newsletter	Leah Glick