Association for Computing Machinery

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NEWS RELEASE

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TWO TEAMS HONORED FOR WORK IN COMBATING OPIOID ADDICTION, UNDERSTANDING CLIMATE CHANGE

Supercomputing Experts Share ACM Gordon Bell Prize

Dallas, TX, November 15, 2018 – ACM, the Association for Computing Machinery, has announced that two teams will share the 2018 ACM Gordon Bell Prize. A seven-member team affiliated with the Oak Ridge National Laboratory is recognized for their paper "Attacking the Opioid Epidemic: Determining the Epistatic and Pleiotropic Genetic Architectures for Chronic Pain and Opioid Addiction," and a 12-member team affiliated with the Lawrence Berkeley National Laboratory is recognized for their paper "Exascale Deep Learning for Climate Analytics."

The ACM Gordon Bell Prize tracks the progress of parallel computing and rewards innovation in applying high performance computing (HPC) to challenges in science, engineering, and large-scale data analytics. The award was presented today by ACM President Cherri M. Pancake and Valerie Taylor, Chair of the SC18 Awards Committee, during the International Conference for High Performance Computing, Networking, Storage and Analysis (SC18) in Dallas, Texas. Prior to the awards ceremony, all of the Gordon Bell Prize finalists presented their papers during SC18.

Employing Supercomputers to Combat the Opioid Epidemic

Paper Title: "Attacking the Opioid Epidemic: Determining the Epistatic and Pleiotropic Genetic Architectures for Chronic Pain and Opioid Addiction"

Prize Category: Sustained Performance Prize

Team: Oak Ridge National Laboratory

According to the US Centers for Disease Control and Prevention (CDC), 115 people die every day in the US from opioid overdoes. Additionally, the CDC found that there was a 30% increase in opioid overdoes

in the period between July 2016 and September 2017 in 52 areas and 45 states. The aim of the Oak Ridge National Laboratory (ORNL) team is to use supercomputing to provide a tool in combating the opioid epidemic by understanding the underlying genetic architecture of how individuals develop chronic pain and respond to opioids. ORNL team members also believe that their project will help with the identification of new therapeutic approaches for opioid misuse. Genome-wide association studies (GWASs) have led to important discoveries in varied types of diseases. For a genome dataset, the ORNL team had access to the Million Veterans Program (MVP), a joint initiative of the US Department of Energy and the US Veterans Administration (VA). The MVP dataset includes 750,000 human genome types, associated with more than a billion medical records over a 20-year period.

The ORNL team developed a new "CoMet" algorithm that allows supercomputers to process vast amounts of genetic data and identify genes that may be more susceptible to pain and opioid addiction—as well as promising treatments. By running the ORNL team's algorithm, supercomputers were able to successfully process genetic data at a magnitude that is four to five times greater than the latest state-of-the-art approaches. In addition to processing information about the genetics of pain and opioid addiction, CoMet is currently being used in projects ranging from bioenergy to clinical genomics.

The ORNL team includes Daniel Jacobson, Wayne Joubert, Deborah Weighill, and David Kainer (all of Oak Ridge National Laboratory); Sharlee Climer (University of Missouri-St. Louis); Amy Justice (Yale University/Department of Veterans Affairs); and Kjiersten Fagnan (US Department of Energy Joint Genome Institute).

Employing Deep Learning Methods to Understand Weather Patterns

Paper Title: "Exascale Deep Learning for Climate Analytics"

Prize Category: Scalability and Time to Solution

Team: Lawrence Berkeley National Laboratory

Climate change poses a major challenge to humanity in the 21st century. Increasingly, state and local governments are interested in the question of how extreme weather events will change (or affect) their local communities. In order to address these important questions, climate scientists routinely configure and run high-fidelity simulations under a range of different climate change scenarios. Recently, it has been shown that deep learning methods, wherein artificial neural networks vaguely inspired by the human brain learn from large amounts of data, can be applied to better understand extreme weather

conditions. Using high-performance computers, the Lawrence Berkeley National Laboratory (LBNL) team trained a deep neural network to identify extreme weather patterns from high-resolution climate simulations. They demonstrated that accurate datasets can be computed for weather patterns such as tropical cyclones and atmospheric rivers.

To train the neural network, the LBNL team paper proposed an innovative blend of hardware and software solutions. These included a novel architecture as well as a number of system-level innovations to enable the largest graphics processing units (GPU)-based HPC systems in the world to process vast amounts of weather-related data. Their application represents the largest successful high performance computer scaling of a deep learning application to date.

Winning team members from the LBNL include Mr Prabhat, Thorsten Kurth, Mayur Mudigonda, Jack Deslippe, Ankur Mahesh (all from Lawrence Berkeley National Laboratory); Sean Treichler, Joshua Romero, Nathan Luehr, Everett Phillips, Massimiliano Fatica, Michael Houston (all of NVIDIA); and Michael Matheson (Oak Ridge Leadership Computing Facility).

Innovations from advanced scientific computing have a far-reaching impact in many areas of science and society—from understanding the evolution of the universe and other challenges in astronomy, to complex geological phenomena, to nuclear energy research, to economic forecasting, to developing new pharmaceuticals. The annual SC conference brings together scientists, engineers and researchers from around the world for an outstanding week of technical papers, timely research posters, and tutorials.

About ACM

ACM, the Association for Computing Machinery is the world's largest educational and scientific computing society, uniting computing educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

About the ACM Gordon Bell Prize

The ACM Gordon Bell Prize is awarded each year to recognize outstanding achievement in high-performance computing. The purpose of this recognition is to track the progress over time of parallel computing, with particular emphasis on rewarding innovation in applying high-performance computing to applications in science. The prize is awarded for peak performance as well as special achievements in scalability and time-to-solution on important science and engineering problems and low price/performance. Financial support for the $10,000 awards is provided by Gordon Bell, a pioneer in high-performance and parallel computing.

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