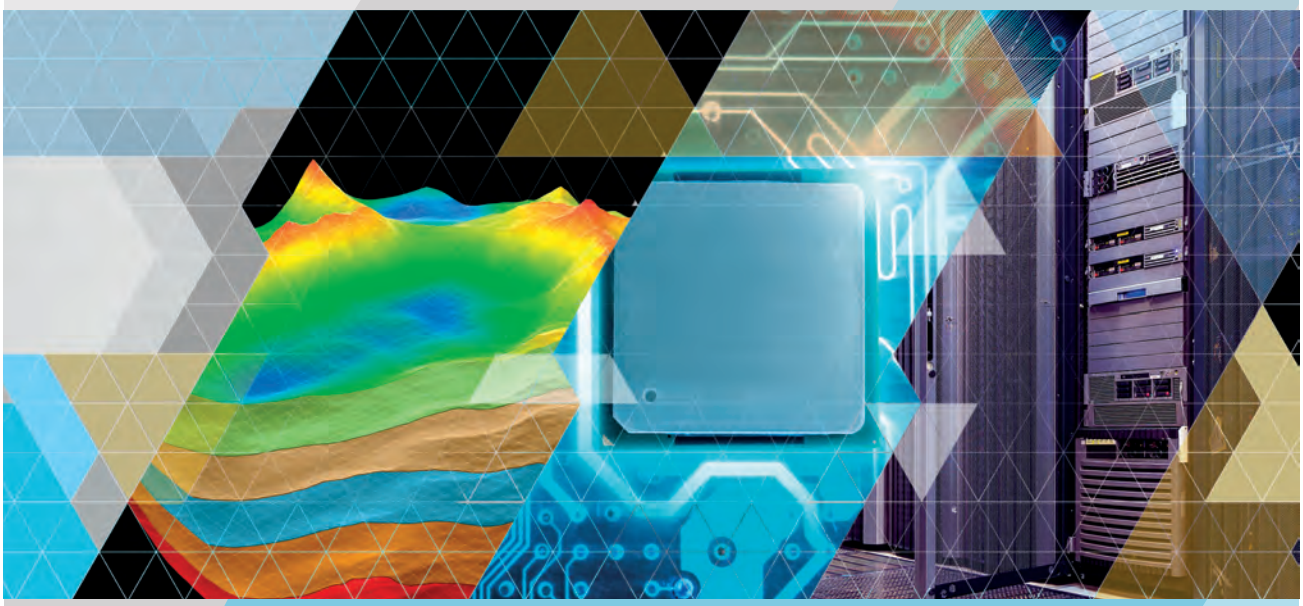
RICE OIL AND GAS

HIGH PERFORMANCE COMPUTING CONFERENCE



2020 TECHNICAL PROGRAM

Tweet and follow: #oghpc ■ http://og-hpc.org

MARCH 2-4, 2020

RICE KEN KENNEDY INSTITUTE

kenkennedy.rice.edu

MESSAGES FROM THE KEN KENNEDY INSTITUTE LEADERSHIP

Message from the Ken Kennedy Institute Director

The Ken Kennedy Institute at Rice University is pleased to offer the 13th annual Rice Oil and Gas High Performance Computing Conference. We hope that you will thoroughly enjoy the conference and use the networking sessions to initiate collaborations and promote technological innovation that will address the computing demands in the energy industry in our city, regionally and nationally.

Many people have worked very hard to bring this conference to you and are recognized in this brochure. From the Ken Kennedy Institute, Dr. Jan Odegard, who is moving on to The Ion, has been the driving force behind this conference. We deeply thank him for his initiative, enthusiasm, dedication and tireless efforts to make this conference a success, and we look forward to working with him in the future for the continued success of this conference.

Lydia E. Kavraki
Director, Ken Kennedy Institute

Welcome to the 13th annual Oil and Gas High Performance Computing Conference at Rice University. It may seem a bit eccentric to reflect on our history at the 13-year mark, but there is a rationale for my eccentricity. As many of you may have heard, I am moving to a new role with The Ion in Houston. After 18 years as Executive Director of the Ken Kennedy Institute, it was time for a change. In fact, 2019 was a year of change. We now have an entirely new institute staff. Victoria Langlais and Debbie Heath moved on to new positions at Rice, and in September, Lydia Kavraki was appointed as the fifth faculty Director of the Ken Kennedy Institute, taking over from Moshe Vardi after 19 years. I am grateful to Michelle Atkinson and Meredith Westover for joining the Ken Kennedy Institute and carrying on the good work of their predecessors.

My 18 years with the Ken Kennedy Institute have been a wonderful journey. Perhaps I am proudest of having helped launch and co-organize the Oil & Gas HPC Conference. How strange it is to write this final message after 13 years – 15, if you count the two times I helped organize workshops during SEG.

What you may not know is that we have never formally appointed a chair for the conference, which has always been a collaboration among friends with a shared passion for making a difference in Houston and supporting the digital transformation – even before digital transformation was all the hype. Having said that, no conference program can come to life without a conductor of sorts – professional nagger, some will say. Conductor is probably the best description of my role over the years. All credit goes to the committee members. I am here to make sure we don't miss a beat. It is bittersweet to step back, but the time has come for me to move on and for others to pick up the baton. I will continue to be part of this community as it is a part of who I am. It is in my DNA, so I look forward to being connected but less visible.

When we launched the workshop – yes, it was a workshop back then -- in 2008, it was a modest experiment among like-minded HPC colleagues who had many shared experiences, not all of them good. Simply put, we wanted to create a pre-competitive networking platform that would allow us to share experiences and best practices, and work on shared challenges openly and inclusively. Our premise was that Houston is the home for some of the largest HPC deployments. However, as a city known for its heavy asset industry: 1) We lacked the visibility and voice that was afforded the national laboratories. 2) We lacked a platform to position the energy industry to engage the computing and data industry to flag technology needs and challenges. 3) We lacked the recognition for being a high-tech job market, making it a challenge to attract and retain the computationally skilled workforce needed to innovate in the energy industry.

The workshop continued to grow year by year until we hit 330 in attendance in 2013 and we outgrew our first venue. We would have been living a lie if we continued calling it a workshop, so we morphed into the Oil & Gas HPC Conference in 2014. We have since averaged about 500 attendees each year. The program grew from a one-day event to three-day program with pre- and post-conference workshops.

Many of you here today have been with us from the start. We could not have done this without your continued support and interest. You are the reason we are here. I want to thank all of our sponsors that have been steadfast in their support. Without you the conference could not have survived. In particular I want to call out Intel: You have been unwavering in your commitment to our community by being a lead-level sponsor since we started. Thank you, Noe Garcia.

As for this year's program we have a remarkable lineup of keynotes and plenaries representing energy (BP, Total), IT (AMD, HPE), academia (Rice), and technology transformation and entrepreneurship (Intel Capital, The Ion). These lectures are complemented by 20 talks, selected from submitted abstracts, arranged in four sessions. At the conclusion of the conference we will bring you the student-focused poster session. In this way, you and graduate students can talk new technology and opportunities for internships and jobs. To kick off the conference many of you will attend a set of pre-conference workshops, and some of you will stay on to attend one of the Wednesday workshops.

What we all have in common is the shared passion for technology and a desire to drive innovation that will leverage the next wave of innovation to meet industry needs. However, technology is not enough to address the challenges we face today. To recruit and retain the best talent in Houston, we must do more. We must showcase the opportunities we have and lead in the development and support of a diverse workforce, one that echoes the diversity of our city.

I am proud of our conference and want to thank all of the OG-HPC Conference Sponsors and Partners, including those who support the Ken Kennedy Institute's graduate fellowship programs at Rice. I want to personally thank the OG-HPC Technical Program Committee for their many contributions to this year's conference. Together we can make Houston and the energy industry of tomorrow the very best.

As I started with, I am moving to The Ion, where I will help develop and grow a diverse and vibrant technology and entrepreneurship ecosystem in Houston. The goal of The Ion is to be an innovation hub bringing together entrepreneurs and corporations to enhance the lives of all Houstonians.

Jan E. Odegard
Executive Director, Ken Kennedy Institute

2020 OG-HPC Organizing Committee

David Baldwin, Shell
Jesse Chan, Rice University
Donny Cooper, Total
Bosen Du, BP
Erik Engquist, Rice University
Keith Gray, BP
Samantha Krebsbach, ExxonMobil
Alex Loddoch, Chevron
Scott Morton, Rice University
Jan E. Odegard, Rice University
Ernesto Prudencio, Schlumberger
Michael Schoemann, Equinor
Mike Townsley, ExxonMobil

Technical Program Committee

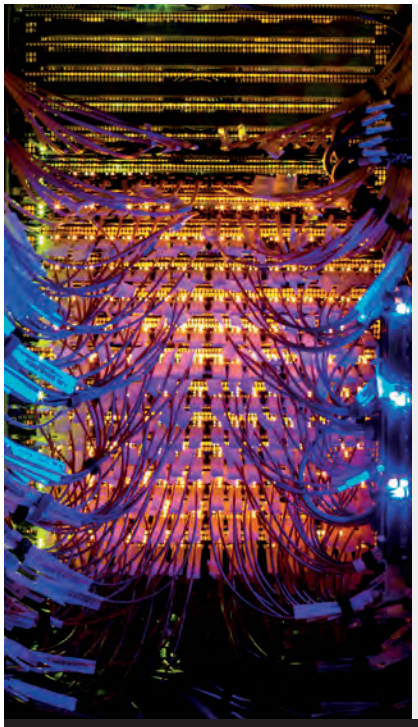
Organizing Committee
plus
Mauricio Araya-Polo, Total
Sverre Brandsberg-Dahl, Microsoft
Tom McDonald, ExxonMobil
Paul Singer, Equinor
Noella Soares, Shell
Mike Thompson, Schlumberger
Cheng Zhan, Microsoft
Muhong Zhou, NAG
Ling Zhuo, Chevron

OG-HPC Conference Code of Conduct

The conference program committee invites all sponsors, volunteers, speakers, attendees, media, exhibitors and other participants to help us realize a safe and positive conference experience for everyone.

OG-HPC Conference venues are shared with members of the public that are not attendees of the conference; please be respectful to all patrons of these locations.

Please note that audio-recording and/or videotaping and/or photography of any portion of the OG-HPC Conference Technical Program material is strictly prohibited without prior consent of the OG-HPC Staff.



RICE KEN KENNEDY INSTITUTE

The Ken Kennedy Institute is dedicated to the advancement of research in the fields of computing, data science, and information technology. Our goal is to provide broad support for a strong community of research experimentation that challenges traditional disciplinary limits. We see our most important role as being a catalyst for research collaboration across the conventional boundaries of school, department, center and laboratory. We work to encourage partnerships with industry, government and other universities to help solve real-world problems.

The Ken Kennedy Institute's power lies in its ability to challenge traditional boundaries, look beyond individual faculty members and departments, and collaborate with industry leaders to solve critical problems that will have a direct societal impact.

For more information on the Ken Kennedy Institute, visit the website: kenkennedy.rice.edu

KEYNOTE AND PLENARY SPEAKERS

Emeka Emembolu

VP Reservoir Development, Gulf of Mexico & Canada, BP

Emeka Emembolu is the Gulf of Mexico Vice President for Reservoir Development. Emeka has a degree in Biochemical Engineering from the University of Sheffield. He joined BP in 1998 as an offshore Production Engineer on the ETAP field when the asset was brought online. He has worked in a range of Petroleum, Reservoir Engineering and leadership positions on BP's assets in the UK (offshore & onshore), Angola, Central Function, Alaska, Egypt and Algeria.

Prior to joining the Gulf of Mexico team, Emeka held other key leadership roles including Vice President Reservoir Development for North Africa and Vice President Reservoir Development, Functional Performance.

Emeka lives in Houston, Texas with his wife Bethany and their four children.

Pedram Hassanzadeh

Assistant Professor of Mechanical Engineering and of Earth, Environmental and Planetary Sciences, Rice University

Dr. Hassanzadeh received his M.A. in Mathematics and Ph.D. in Mechanical Engineering from UC Berkeley in 2013. He was a Ziff Environmental Fellow at the Harvard University Center for the Environment (2013-2015) and a Postdoctoral Fellow at the Harvard University Department of Earth and Planetary Science (2015-2016). He was also a Geophysical Fluid Dynamics Fellow at the Woods Hole Oceanographic Institution (2012), and Associate at Harvard University (2016). He joined the faculty at Rice in 2016. Dr. Hassanzadeh's honors and awards include an Early-Career Research Fellowship from the National Academy of Sciences Gulf Research Program, a Ziff Environmental Fellowship from the Harvard University Center for the Environment, NSERC Postgraduate Scholarship from the Natural Sciences and Engineering Research Council of Canada, Geophysical Fluid Dynamics Fellowship from the Woods Hole Oceanographic Institution, and Outstanding Preliminary Examination Award and Jonathan Laitone Memorial Scholarship from the Department of Mechanical Engineering of UC Berkeley.

Tamiko Hutchinson

Vice President, Intel Capital

Tamiko Hutchinson is Vice President of Intel Capital and Senior Managing Director of Portfolio Development at Intel Corporation. She leads Intel Capital's efforts to help its innovative technology startups succeed. She and her team provide strategic business development, industry experience, technical and marketing support for the Intel Capital portfolio worldwide.

Hutchinson joined Intel in 1997 as the first portfolio manager for Intel Capital and helped scale its venture capital investment activity into a global, multi-billion dollar program. Intel has invested $12 billion in more than 1,500 startups around the world.

She is a member of the board of Eko, a digital media company. In 2017 she received the Rising Star award from Global Corporate Venturing.

Bradley McCredie

Corporate VP, GPU Platforms, AMD

Bradley McCredie joined AMD in June of 2019. He is the Corporate Vice President of Data Center GPU and Accelerated Processing at AMD. Prior to that he was the Vice President of IBM Power Systems Development, and IBM Fellow. He was at IBM since 1991.

In his current position as Corporate Vice President of Data Center GPU, Brad oversees the global development and delivery and sales of data center GPU products. His responsibilities span system hardware, software, solutions, and ecosystem development, incorporating the latest technology advancements to support clients changing business needs.

Brad's role at AMD also includes the development and optimization of platforms consisting of AMD CPU, GPU's and software platforms. These platforms are design to drive maximum performance and value for clients through optimization of all major system components and are called Accelerated Platforms.

Brad joined IBM in 1991, focusing on electromagnetic design and electronic packaging for IBM's mainframe system then later moving to Power Systems Development. Since moving to Power Systems in 1996, Brad has held a variety of technical and executive leadership roles. Staring with his initial work on the POWER2 processor, up through the development of Power Systems using POWER9 processors.

Brad holds a BS, MS, and PhD degree in electrical and computer engineering from the University of Illinois.

John Mellor-Crummey

Professor of Computer Science and of Electrical and Computer Engineering, Rice University

John Mellor-Crummey's research focuses on software technology for high performance parallel computing. His ongoing research includes work on tools for measurement and analysis of application performance, compiler and run-time technology for parallel and scientific computing, application performance modeling, and correctness tools for parallel programs. Past work has included developing techniques for execution replay of parallel programs, efficient software synchronization algorithms for shared-memory multiprocessors, and a system for efficiently detecting data races in executions of shared-memory programs using a combination of compile-time and run-time support.

In 2006, John Mellor-Crummey and Michael L. Scott were awarded the Dijkstra Prize in Distributed Computing for their paper Algorithms for Scalable Synchronization on Shared-Memory Multiprocessors, ACM Transactions on Computer Systems, February, 1991. In 2013, John Mellor-Crummey was named an ACM Fellow for contributions to parallel and high performance computing.

CONTINUED

Gabriella "Gaby" Rowe

Executive Director, The Ion

Gabriella "Gaby" Rowe is the Executive Director of The Ion, a 300,000-square foot structure designed to bring the area's entrepreneurial, corporate and academic communities together into collaborative spaces and programs. The Ion supports businesses at all stages of the innovation lifecycle and provides resources for Houstonians seeking to participate in the innovation economy. The innovation space is also a place where academic and corporate partners are integrated into a robust environment of educational events, demonstrations, hack-a-thons and programming.

Prior to becoming the executive director of The Ion, Gaby was CEO of Station Houston, the city's largest hub for startup technology acceleration, corporate innovation and entrepreneurship. She took Station Houston to the next level as a dominant global innovation hub and as Rice University's partner for content and programming in the development of Houston's much-anticipated innovation district.

Prior to Station Houston, Gaby was a serial entrepreneur, education executive, investment banker and management consultant in New York City for more than 25 years. Gaby received her Bachelors- of-Arts from Bryn Mawr College in Bryn Mawr, Pennsylvania and full Masters coursework from Bank Street College of Education in New York City, New York. Gaby and her husband, Kenny, have four children. She is an avid runner and football fan and can be found practicing her "pitmaster" skills on her family and friends most weekends.

Vincent Saubestre, Ph.D.

CEO & President, Total EP Research & Technology USA

Dr. Saubestre joined Total in 1990 and has held various, field, managerial and executive positions in Exploration and Production, in seven countries around the world.

Prior to his transfer to Houston in December 2018, he was VP at the Group level of Total's R&D Strategy & Intelligence and led a Group-wide effort to align the R&D strategy with Total's ambition.

Vincent Saubestre started his career in R&D, developing structural models for offshore platforms in the North Sea. After two decades in Operations and Business Development, he returned to R&D and structured Total's Calgary Research Center. In 2010, he was selected as Executive Director of the Oil Sands Leadership Initiative which became Canada's Oil Sands Innovation Alliance in 2013.

In 2013, Vincent was seconded to American Shale Oil, a startup developing subsurface technology to produce the massive oil shale resources located in Colorado.

At TEP RT USA, he coordinates Total's activity in the US in multiple areas including HPC, Computer Science, Machine Learning, Carbon Capture Utilization & Storage, Seismic Interpretation, Deep Offshore Technology and Reservoir & Flow Modeling.

Vincent is a graduate engineer of Ecole Polytechnique and Ecole Nationale Supérieure des Techniques Avancées (Paris) and holds an M.Sc. and a Ph.D. in Mechanical Engineering from the University of California (@ Santa Barbara).

Vincent believes in blending past experience to innovate, and is still under the illusion that he has not peaked at hockey, surfing and long distance cycling.

Steve Scott

SVP, Senior Fellow, & CTO, Hewlett Packard Enterprise

Steve Scott is Senior Vice President, Senior Fellow, and Chief Technology Officer of HPC and AI at Hewlett Packard Enterprise, where he is responsible for guiding the long-term technical direction of computing, storage and analytics/AI products within HPE's HPC & AI Business Unit. Steve holds 42 US patents, and was the chief architect of several supercomputers and interconnects at Cray. He received the 2005 ACM Maurice Wilkes Award and the 2005 IEEE Seymour Cray Computer Engineering Award, and is a Fellow of the ACM and the IEEE. Steve earned a BS in electrical and computer engineering, and a Masters and PhD in computer architecture, all from the University of Wisconsin Madison.

2019-20 Ken Kennedy Institute Graduate Fellowship Awards

The Ken Kennedy Institute is pleased to recognize the achievements and research of Rice University's graduate students by awarding fellowships to students pursuing research in computational science and engineering, high performance computing, and data analytics.

Fellowship awards are made possible with support from AMD, BP, ExxonMobil, Schlumberger, and Shell as well as from the Andrew Ladd and Kennedy-Cray endowments.

We welcome you to become a partner in sponsoring the Ken Kennedy Institute Fellowship Program at Rice University. For more information, please visit the website at kenkennedy.rice.edu.

THANK YOU TO ALL THE 2019-2020 GRADUATE FELLOWSHIP SPONSORS!

AMD

bp

CRAY THE SUPERCOMPUTER COMPANY

ExxonMobil

Schlumberger

Rice Ken Kennedy Institute Graduate Fellowship Award recipients: (top row, from left to right) Nidish Narayanaa Balaji, Randall Balestriero, Ao Cai, Mae Markowski, Afsaneh Rahbar, (second row, from left to right) Thomas Roddenberry, Christina Taylor, Keren Zhou, Ye Emma Zohner

RICE KEN KENNEDY INSTITUTE

kenkennedy.rice.edu

RICE OIL AND GAS HIGH PERFORMANCE COMPUTING CONFERENCE

RICE | DATA SCIENCE CONFERENCE

Save the Date | Rice University | October 26-27, 2020

https://dsconference.rice.edu

A Parallel Session A: AI & Deep Learning
B Parallel Session B: Data Storage & I/O Performance
K Keynote
N Networking
P Plenary
S Poster Session
W Workshop

8:15 a.m. – 12:00 p.m.	W	**Workshop A: Analyzing CPU and GPU Application Performance with HPCToolkit** » Room 280 Speaker(s): **John Mellor-Crummey**, Rice University
OPTION 1 (WORKSHOP A+B)	W	**Workshop B: WHPC Roundtable: Growing a Diverse Talent Pool in HPC for Oil & Gas** » Room 280 Speaker(s): **Texas Women in HPC**
OPTION 2 (WORKSHOP C)	W	**Workshop C: Best Practices in Supercomputing Systems Management** » Auditorium Speaker(s): **Practitioners and Experts** from Industry, Academia and National Labs
12:00 p.m. – 1:00 p.m.	N	**Conference Registration & Networking** » Exhibit Hall
1:00 p.m. – 1:15 p.m.		**Welcome** » Auditorium
1:15 p.m. – 2:00 p.m.	K	**The Deepwater Gulf of Mexico – A Success Story of High Performance Computing** » Auditorium Speaker(s): **Emeka Emembolu**, BP
2:00 p.m. – 2:30 p.m.	P	**Scaling TCO in a Post-Moore's Law Era** » Auditorium Speaker(s): **Bradley McCredie**, AMD
2:30 p.m. – 3:00 p.m.	P	**Using Deep Learning to Accelerate Computational Fluid Dynamics** » Auditorium Speaker(s): **Pedram Hassanzadeh**, Rice University
3:00 p.m. – 3:30 p.m.	N	**Break** » Exhibit Hall
3:30 p.m.	A	**Parallel Session A: HPC Standards, Applications & Cloud Usage** » Auditorium
3:30 p.m.	B	**Parallel Session B: Data Science Technology & Applications** » Room 280
5:10 p.m. – 7:00 p.m.	N	**Networking Reception** » Exhibit Hall

Parallel Session A: HPC Standards, Applications & Cloud Usage » **Auditorium**
*Moderator(s): **David Baldwin, Shell** • **Bosen Du, BP***

3:30 p.m. – 3:50 p.m.	**Open Subsurface Data Universe (OSDU) HPC Project** Speaker(s): **James Clark**, **Christine Rhodes**, Chevron
3:50 p.m. – 4:10 p.m.	**The Art of Serving HPC Products to the Business While They Are Still Hot** Speaker(s): **Vadim Dyadechko**, ExxonMobil
4:10 p.m. – 4:30 p.m.	**Seismic Benchmark Results on Multiple Generations of CPUs** Speaker(s): **Ronald Cogswell**, **Adam Hough**, **Siebren Reker**, **David Baldwin**, Shell
4:30 p.m. – 4:50 p.m.	**Running Novel FWI Algorithms Cost-efficiently by Integrating Cloud-Native Architecture Onto an Existing MPI-Based Production Codebase** Speaker(s): **Tim T.Y. Lin**, **Nikhil Shah**, S-Cube; **Srinivas Tadepalli**, Amazon Web Services
4:50 p.m. – 5:10 p.m.	**Large Scale Seismic Processing in Public Cloud** Speaker(s): **Paulo Souza Filho**, **Lito Bejarano**, **Fernando Sierra**, Atrio Inc.; **Luiz Felipe**, **Daniel Thomé de Paula**, **Alexandre Sardinha**, **Antonio Azambuja**, Petrobras; **Paulo Aragão**, Amazon Web Services

Parallel Session B: Data Science Technology & Applications » **Room 280**
*Moderator(s): **Mauricio Araya-Polo, Total** • **Cheng Zhan, Microsoft***

3:30 p.m. – 3:50 p.m.	**Solving Wave Equations and Seismic Inversion Using Deep Learning Platform** Speaker(s): **Ted Clee**, **Lei Huang**, Prairie View A&M University
3:50 p.m. – 4:10 p.m.	**PHS: A Toolbox for Parellel Hyperparameter Search** Speaker(s): **Peter Habelitz**, Fraunhofer; **Janis Keuper**, Hochschule Offenburg
4:10 p.m. – 4:30 p.m.	**An Attempt to Decode Reverse Time Migration with Machine Learning** Speaker(s): **Licheng Zhang**, **Cheng Zhan**, University of Houston; **Chang-chun Lee**, Rice University; **Yong Chang**, TGS
4:30 p.m. – 4:50 p.m.	**D-FLASH: A Distributed MPI Based LSH System for Large-Scale Similarity Search** Speaker(s): **Nicholas Meisburger**, **Anshumali Shrivastava**, Rice University
4:50 p.m. – 5:10 p.m.	**RALI & MIVisionX Optimizing Seismic Interpretation / Live Demo** Speaker(s): **Mazda Sabony**, AMD

C Parallel Session C: Systems & Facilities
D Parallel Session D: Software Technology & Applications
K Keynote
N Networking
P Plenary
S Poster Session
W Workshop

7:30 a.m. – 8:30 a.m.	N	**Breakfast & Networking** » Exhibit Hall
8:30 a.m. – 8:45 a.m.		**Welcome** » Auditorium
8:45 a.m. – 9:30 a.m.	K	**Citius, Altius, Fortius (Faster, Higher, Stronger): How Total's HPC R&D Activity Supports the Group's Ambition to Become the Responsible Energy Major** » Auditorium Speaker(s): **Vincent Saubestre**, Ph.D., Total EP Research & Technology USA
9:30 a.m. – 10:00 a.m.	P	**The Ion, a Catalyst for the Transformation and Growth of the Houston Technology Ecosystem** » Auditorium Speaker(s): **Gabriella "Gaby" Rowe**, The Ion
10:00 a.m. – 10:30 a.m.	P	**Helping Innovative Technology Startups Succeed** » Auditorium Speaker(s): **Tamiko Hutchinson**, Intel Capital
10:30 a.m. – 11:00 a.m.	N	**Break** » Exhibit Hall
11:00 a.m.	C	**Parallel Session C: HPC Systems & Facilities** » Auditorium
11:00 a.m.	D	**Parallel Session D: HPC Software Tools & Technologies** » Room 280
12:40 p.m. – 1:45 p.m.	N	**Lunch & Networking** » Exhibit Hall
1:45 p.m. – 2:30 p.m.	K	**The Cray Shasta Architecture: Designed for the Exascale Era** » Auditorium Speaker(s): **Steve Scott**, Hewlett Packard Enterprise
2:30 p.m. – 3:00 p.m.	P	**Plenary 5 TBA** » Auditorium Speaker(s): TBA
3:00 p.m. – 3:30 p.m.	P	**Performance Tools for GPU-Accelerated Computing** » Auditorium Speaker(s): **John Mellor-Crummey**, Rice University
3:30 p.m. – 5:30 p.m.	S	**Poster Session & Networking Reception** » Exhibit Hall

WEDNESDAY, MARCH 4

8:15 a.m. – 3:45 p.m.	W	**Workshop D: From Zero-to-Devito** » Exhibit Hall Speakers: **Dr. Gerard Gorman**, **Dr. Fabio Luporini**, **Dr. Rhodri Nelson**, **Mr. Navjot Kukreja**, Imperial College London
	W	**Workshop E: HPC in the Cloud Tutorial** » Room 280 Speakers: **Pierre Yves-Aquilanti**, **Matt Koop**, **Stephen Sachs**, Amazon Web Services

Parallel Session C: HPC Systems & Facilities » **Auditorium**
*Moderator(s): **Keith Gray, BP** • **Donny Cooper, Total***

11:00 a.m. – 11:20 a.m.	**Pangea III - A Seismic Shift in Total's Computing Platform** Speaker(s): **Diego Klahr**, Total
11:20 a.m. – 11:40 a.m.	**Experience Installing a Cluster with Direct-to-Chip Water Cooling** Speaker(s): **Kent Blancett**, BP; **Gary Kuzma**, HOK
11:40 a.m. – 12:00 p.m.	**Cloud Capability Brings Global Flexibility and Increased Scalability to E&P HPC Workloads** Speaker(s): **Jeff Nealon**, **Joe Patry**, Chevron; **Hussein Shel**, **Alex Morris**, Microsoft
12:00 p.m. – 12:20 p.m.	**Moving Massive Amounts of Data Across Any Distance Efficiently** Speaker(s): **Chin Fang**, Zettar Inc.
12:20 p.m. – 12:40 p.m.	**Timing-Agnostic SVE Analysis of Seismic Kernels** Speaker(s): **Fabrice Dupros**, **Conrad Hillairet**, Arm

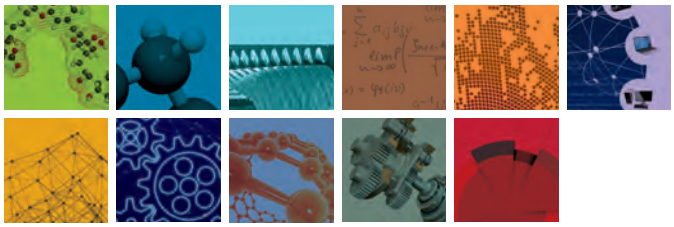
Parallel Session D: HPC Software Tools & Technologies » **Room 280**
*Moderator(s): **Scott Morton, Rice University** • **Alex Loddoch, Chevron** • **Mike Townsley, ExxonMobil***

11:00 a.m. – 11:20 a.m.	**Serverless Seismic Imaging in the Cloud** Speaker(s): **Philipp Witte**, **Mathias Louboutin**, **Felix Herrmann**, Georgia Institute of Technology; **Charles Jones**, Osokey
11:20 a.m. – 11:40 a.m.	**Large Scale-Data Reduction and Data State Management with SZ and VeloC** Speaker(s): **Franck Cappello**, Argonne National Laboratory and University of Illinois at Urbana-Champaign; **Sheng Di**, **Bogdan Nicolae**, Argonne National Laboratory
11:40 a.m. – 12:00 p.m.	**Automatic Code Generation for GPUs Using Devito** Speaker(s): **Fabio Luporini**, **Gerard Gorman**, Imperial College London
12:00 p.m. – 12:20 p.m.	**Hybrid-Parallel Multigrid Preconditioners in a Pore-Scale Flow Simulation** Speaker(s): **Christopher Thiele**, **Beatrice Riviere**, Rice University
12:20 p.m. – 12:40 p.m.	**Discontinuous Galerkin Method for Seismic Applications** Speaker(s): **Andreas Atle**, **Aurelien Carron**, Total EPRT USA; **Pierre Jacquet**, INRIA Magique3D


intel
UP TO 30X FASTER*
WITH AI
ACCELERATION
Boost AI inference on HPC workloads
with Intel® Deep Learning Boost to get
insights faster.
intel
XEON
PLATINUM
inside
THIS IS HPC ON INTEL
intel.com/HPC
*Compared to previous generation.
For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

PROFESSIONAL MASTER'S IN ENGINEERING

Merge your engineering background with management, communication and leadership with a professional master's!



Choose from 12 engineering programs at Rice University offering:

- Interdisciplinary, nonthesis Master of Engineering degrees
- Course combinations available in your engineering interest area enriched with options in business, management, entreprenuership, leadership and communication
- Professional Development Seminars and Networking Opportunities

RICE ENGINEERING
Engineering Professional Master's Programs

Bioengineering

Chemical Engineering

Civil and Environmental Engineering

Computational and Applied Mathematics

Computational Science and Engineering

Computer Science

Computer Science Online

Electrical and Computer Engineering

Industrial Engineering

Materials Science and Nanoengineering

Mechanical Engineering

Statistics

epmp.rice.edu

RICE ENGINEERING

20% faculty growth in 3 years

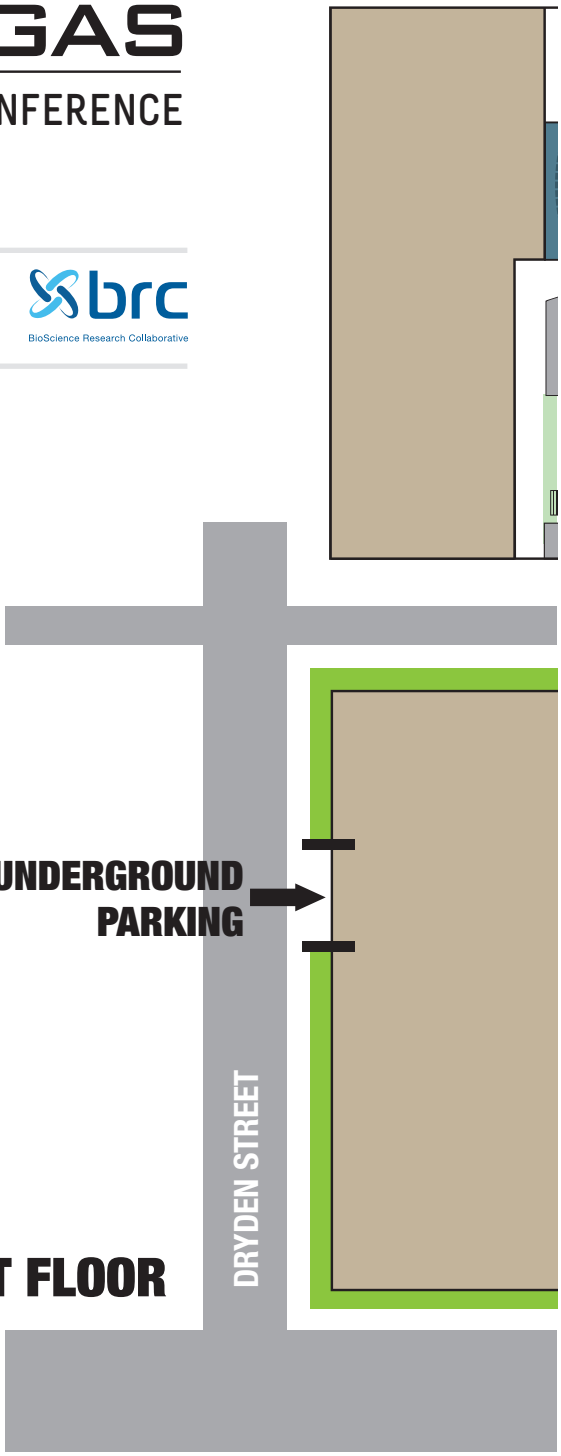
RICE UNIVERSITY
George R. Brown School of Engineering

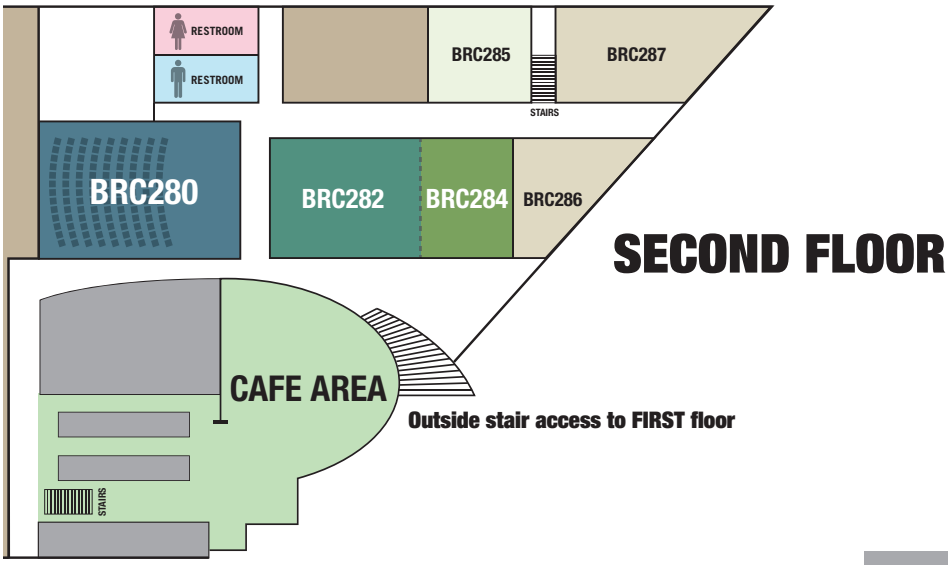
RICE OIL AND GAS

HIGH PERFORMANCE COMPUTING CONFERENCE

RICE KEN KENNEDY INSTITUTE

brc BioScience Research Collaborative




RESTROOM
RESTROOM
BRC285
BRC287
STAIRS
BRC280
BRC282
BRC284
BRC286
SECOND FLOOR
CAFE AREA
Outside stair access to FIRST floor
STAIRS

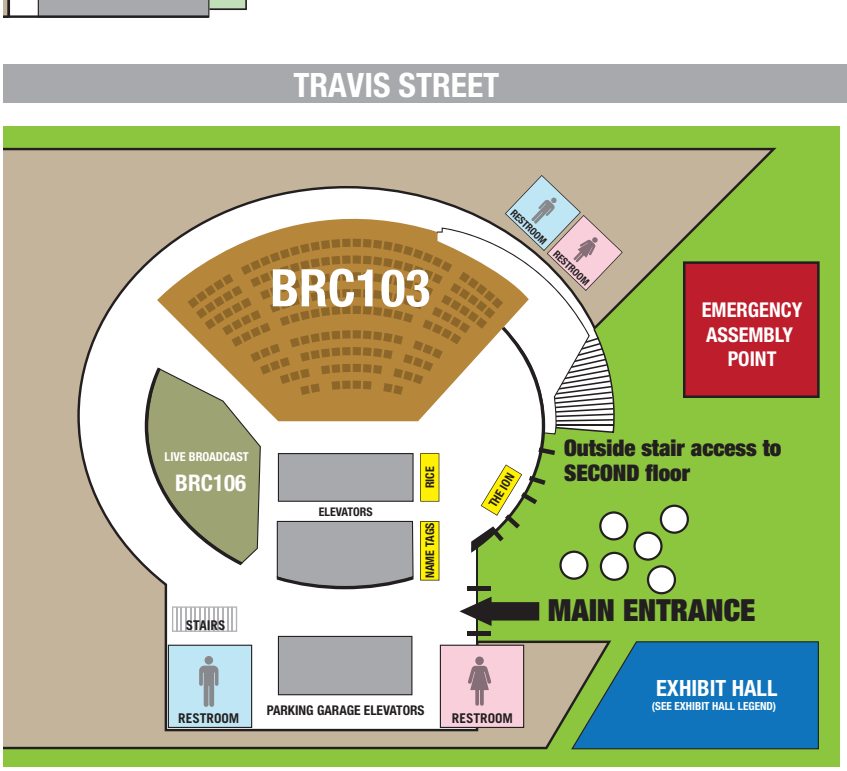
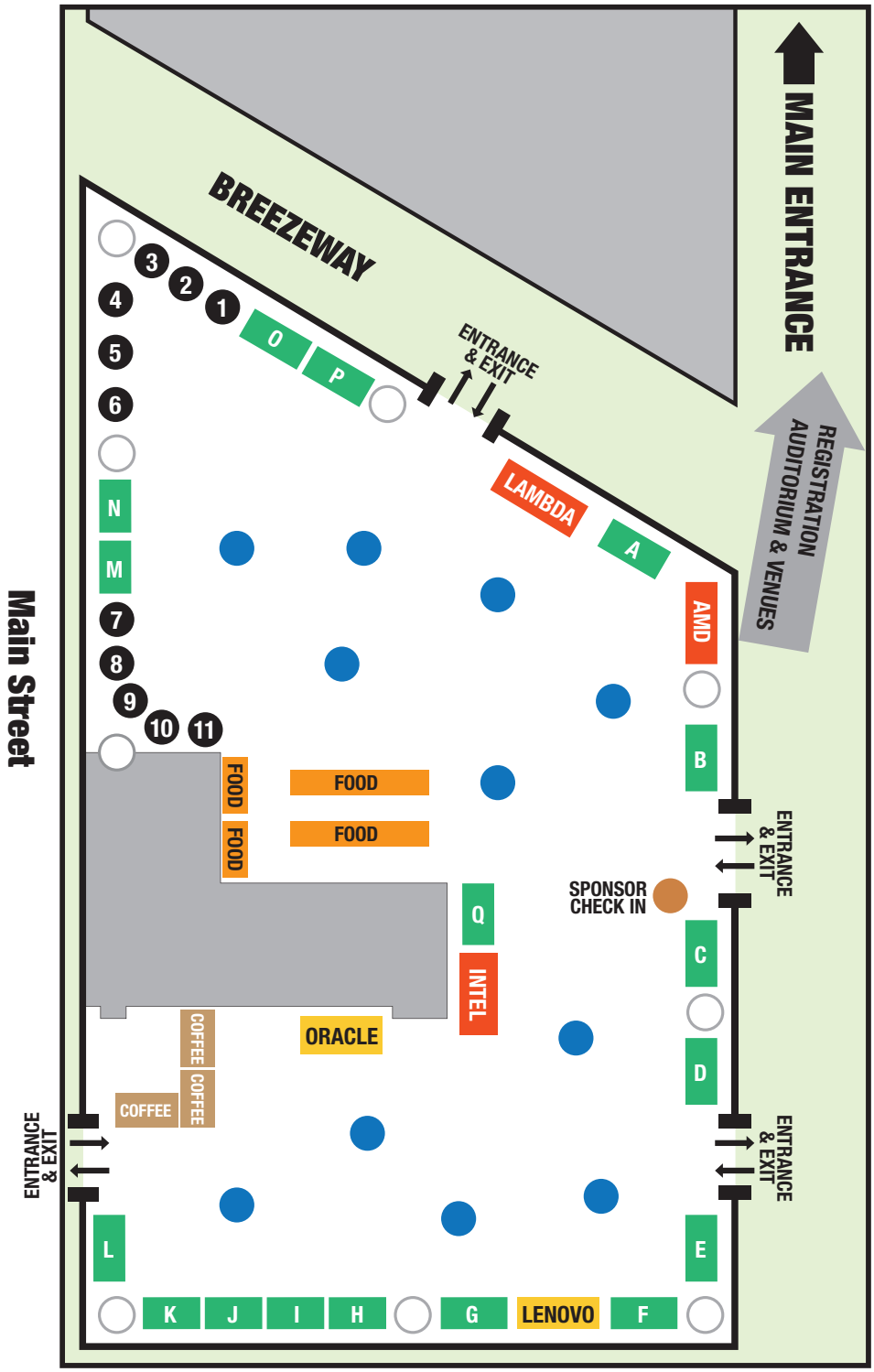

TRAVIS STREET
RESTROOM
RESTROOM
BRC103
EMERGENCY ASSEMBLY POINT
LIVE BROADCAST
BRC106
ELEVATORS
RICE
NAME TAGS
THE IOM
Outside stair access to SECOND floor
MAIN ENTRANCE
STAIRS
RESTROOM
PARKING GARAGE ELEVATORS
RESTROOM
EXHIBIT HALL
(SEE EXHIBIT HALL LEGEND)
UNIVERSITY BOULEVARD
MAIN STREET

EXHIBIT HALL AND SPONSOR EXHIBITS



Platinum Sponsors

Gold Sponsors

Silver Sponsors

Bronze Sponsors

Food Tables

Coffee Bar

Guest Tables

SPONSOR INDEX

PLATINUM

Advanced Micro Devices, Inc.

Intel Corporation

Lambda

GOLD

Lenovo

Oracle Cloud Infrastructure

SILVER

A Fraunhofer ITWM - Competence Center for High Performance Computing

B Dell Technologies

C Starfish Storage

D NEC Corporation

E Penguin Computing

F Arista Networks

G PCPC DIRECT

H Nimbus Data

I Super Micro Computer, Inc.

J WekaIO

K Mellanox Technologies

L Hewlett Packard Enterprise

M Amazon Web Services

N Stream Data Centers

O Microsoft

P TotalView by Perforce

Q NetApp

BRONZE

1 VAST Data

2 Univa

3 Spectra Logic

4 Geophysical Society of Houston

5 SoftNAS, Inc.

6 Qumulo

7 SchedMD

8 DDN

9 Red Hat

10 Pure Storage

11 Arm

ECOSYSTEM PARTNERS

Houston Exponential

HPCwire

insideHPC

Intersect360

Station Houston

Texas Women in High Performance Computing

The Ion

The Next Platform

Ken Kennedy Institute Computational Science & Engineering Recruiting Fellowships

Funded by proceeds from the OG-HPC Conference, the goal of this fellowship program is to attract exceptional graduate students to Rice University in the fields of computational science and engineering, high performance computing, and data analytics, with special consideration given to students with research interests in areas of relevance to the energy industry.

2019-2023

Alejandro Nicolas Diaz
Computational & Applied Mathematics

Yilei Fu
Computer Science

Christina G. Taylor
Computational & Applied Mathematics

John Zito
Statistics

2018-2022

Kyle Busse
Computational & Applied Mathematics

Yuxin Tang
Computer Science

William Lewis
Computer Science

Maryam Khalid
Electrical & Computer Engineering

Alex Macklin
Electrical & Computer Engineering

Yujie Jiang
Statistics

2017-2021

Nathaniel Kroeger
Computational & Applied Mathematics

Nigel Tan
Computational & Applied Mathematics

Teresa Tse
Electrical & Computer Engineering

Keren Zhou
Computer Science

2016-2020

Jonas Actor
Computational & Applied Mathematics

Andrew Wells
Computer Science

2015-2019

Temitayo Ajayi
Computational & Applied Mathematics

Jeff Dudek
Computer Science

Indu Manickam
Electrical & Computer Engineering

Rebecca Smith
Computer Science

Jasper Tan
Electrical & Computer Engineering

Robert Weylandt
Statistics

Yabin Zhang
Computational & Applied Mathematics

For additional details, visit kenkennedy.rice.edu

RICE OIL AND GAS
HIGH PERFORMANCE COMPUTING CONFERENCE

RICE KEN KENNEDY INSTITUTE

STUDENT POSTERS

3D Printed Tubulanes as Light-weight Hypervelocity Impact Resistant Structures
Seyed Mohammad Sajadi, Cristiano F. Woellner, Douglas S. Galvão, Chandra Sekhar Tiwary and Pulickel M Ajayan

3D Printing Under Visible Light Using Cadmium Selenide Semiconducting Quantum Dots as Photoinitiators
Yifan Zhu and Eilaf Egap

A Discontinuous Galerkin Method for the Two-phase Flow in Deformable Porous Media
Boqian Shen and Beatrice Riviere

A Framework for Monetary Loss Assessment of Petroleum Infrastructure in Storm Surge Events
Kendall Capshaw, Majid Ebad Sichani, Katherine Anarde and Jamie Padgett

A Graphical Tool for Latent Feature Representation
Ye Emma Zohner and Jeffrey Morris

A Python Framework for Rapidly Migrating, Building and Optimizing a High-Performance Parallel Multi-Stencil System
Charly Bechara and Santiago Cortijo

A Spline Theory of Deep Networks
Randall Balestriero and Richard Baraniuk

A Tool for Top-Down Performance Analysis of GPU-Accelerated Applications
Keren Zhou, Mark Krentel and John Mellor-Crummey

Break GPU Memory Wall Using Distributed Deep Learning for Large Scale Image Segmentation
Sergio Botelho, Vinay Rao and Santi Adavani

Data Weighted Full-Waveform Inversion for Near-Surface Seismic Refraction Data
Ao Cai and Colin Zelt

Exact Blind Community Detection from Signals on Multiple Graphs
T. Mitchell Roddenberry, Santiago Segarra, Michael T. Schaub and Hoi-To Wai

Fast Generation of Virtual 3D Concrete Microstructures Coupled with Experimentally Validated Creep Prediction Model
Christa Torrence, Aishwarya Baranikumar, Edward Garboczi and Zachary Grasley

Fast Inversion of Directional Resistivity Logging-While-Drilling Data Using Supervised Descent Method
Yanyan Hu, Rui Guo, Yuchen Jin, Xuqing Wu, Maokun Li, Aria Abubakar and Jiefu Chen

GPU Accelerated Modeling of Triaxial Induction Resistivity Logging and Electromagnetic Telemetry in Multilayered Formation
Shubin Zeng, Han Lu, Xin Fu, Jiefu Chen and Yueqin Haung

High Performance Seismic Imaging Using Low-Rank Matrix Computations
Kadir Akbudak, David Keyes and Hatem Ltaief

Make Multicast Great Again
Afsaneh Rahbar, Sushovan Das, Xinyu Wu, Weitao Wang, Dingming Wu, Ang Chen and Eugene Ng

Modeling the Effects of Stress, Defects and Surface Reaction on Microstructure Evolution in Battery Electrodes
Kaiqi Yang, Liang Hong and Ming Tang

Newton-Based Methods for the Numerical Solution of Risk-Averse PDE-Constrained Optimization Problems
Mae Markowski and Matthias Heinkenschloss

Parareal-Based Preconditioners for Linear-Quadratic Optimal Control Problems
Shengchao Lin and Matthias Heinkenschloss

Photothermal Chirality in Gold Helicoids and Aggregation of Gold Nanorods in Contact with Blood-Abundant Proteins
Ali Rafiei-Miandashti, Stephan Link, Christy Landes and Lauren Warning

Preconditioner for Estimation of Multipole Sources via Full Waveform Inversion
Mario Bencomo and William Symes

Recurrent Neural Network for Predicting Polycrystalline Microstructure Evolution
Yifan Cao, Kaiqi Yang, Ming Tang and Fei Zhou

Repeated and Merged Bloom Filter (RAMBO) for Sequence Search: Indexing 170TB data in 14 hours
Gaurav Gupta, Minghao Yan, Benjamin Coleman, R. A. Leo Elworth, Todd Treangen and Anshumali Shrivastava

Scalability Studies for Nonlinear Contact Problems
Nidish Narayanaa Balaji and Matthew Rw Brake

Shared Memory Communication Optimizations to Adaptive MPI
Sam White and Laxmikant Kale

Simulation Study of CO2-Foam Injection for Diversion of a Hydrocarbon Miscible Solvent in a Fractured Carbonate Reservoir
Reza Amirmoshiri, Manmath Panda, Raul Valdez, Sibani Lisa Biswal and George Hiraski

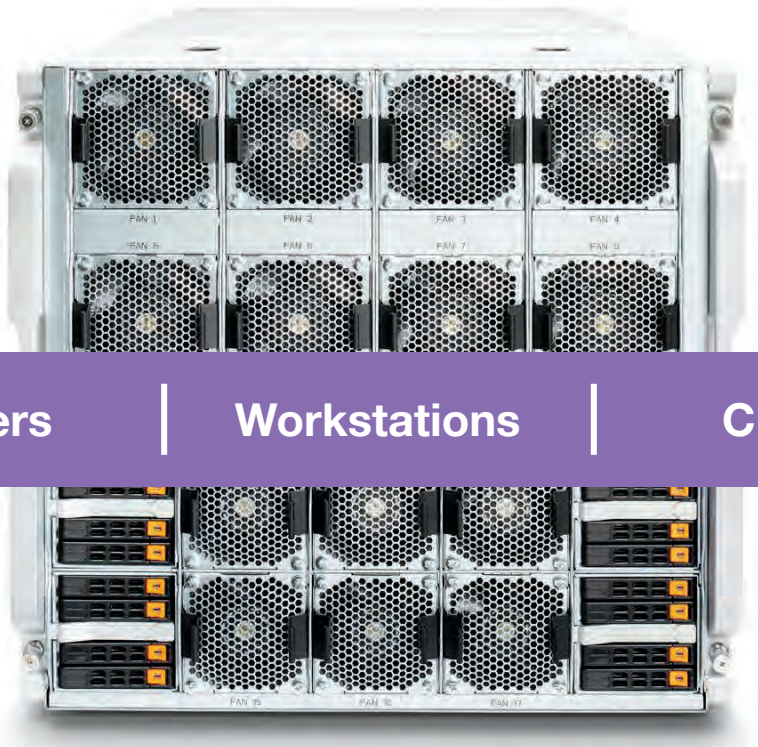
Stabilizing Deep Convolutional Neural Networks for Image Segmentation
Jonas Actor, Beatrice Riviere and David Fuentes

StreamQL: A Query Language for Efficient Data Stream Processing
Lingkun Kong and Konstantinos Mamouras

Two-Phase Partially Miscible Flow Simulation in Porous Media
Lu Lin and Beatrice Riviere

Lambda

Deep Learning Infrastructure at Scale



Servers | **Workstations** | **Cloud**

Call
(866) 711-2025

Email
sales@lambdalabs.com

Visit
lambdalabs.com

NOTES

THANK YOU TO THIS YEAR'S PARTICIPANTS AND SPONSORS!

PLATINUM LEVEL SPONSORS

AMD

intel

Lambda

GOLD LEVEL SPONSORS

Lenovo

ORACLE
Cloud Infrastructure

SILVER LEVEL SPONSORS

Amazon Web Services
Arista Networks
Dell Technologies
Fraunhofer ITWM - Competence Center for High Performance Computing
Hewlett Packard Enterprise
Mellanox Technologies
Microsoft
NEC Corporation
NetApp
Nimbus Data
PCPC DIRECT
Penguin Computing
Starfish Storage
Stream Data Centers
Super Micro Computer, Inc.
TotalView by Perforce
WekaIO

BRONZE LEVEL SPONSORS

Arm
DDN
Geophysical Society of Houston
Pure Storage
Qumulo
Red Hat
SchedMD
SoftNAS, Inc.
Spectra Logic
Univa
VAST Data

ECOSYSTEM PARTNERS

Houston Exponential
HPCwire
insideHPC
Intersect360
Station Houston
Texas Women in High Performance Computing
The Ion
The Next Platform

RICE OIL AND GAS
HIGH PERFORMANCE COMPUTING CONFERENCE

RICE KEN KENNEDY INSTITUTE

kenkennedy.rice.edu