ENERGY HIGH PERFORMANCE COMPUTING CONFERENCE

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FEBRUARY 28 - MARCH 2, 2023
HOUSTON, TEXAS

RICE KEN KENNEDY INSTITUTE
AI, Data, and Computing for Global Impact

MESSAGE FROM THE KEN KENNEDY INSTITUTE LEADERSHIP

The Ken Kennedy Institute at Rice University is pleased to host the 16th annual Energy High Performance Computing Conference in Houston, TX. The Energy HPC Conference is the premier meeting place for key stakeholders to engage in conversations about challenges, opportunities, and new developments to help advance HPC in the energy industry.

The two-day conference features a remarkable lineup of invited speakers, technical talks, birds of a feather sessions, an exhibit hall, networking receptions, and poster presentations. Thursday is an add-on day with three post-conference workshops to dive deeper into niche topics of interest.

Tuesday's Sponsor Networking Reception will include a specialty wine, cheese, and heavy appetizer selection, with magic and entertainment to complete an evening of connecting with fellow conference attendees and sponsors. Wednesday's Poster Presentation Reception will showcase exciting research happening in the field by the future leaders in high performance computing. Networking breaks during the conference will also feature specialty coffee, a donut wall, and popsicle bar.

We hope that you thoroughly enjoy the conference and use the networking opportunities to initiate collaborations and promote technological innovation that will address computing demands as well as other issues in the energy industry — not just in Houston, but also nationally and internationally.

The Ken Kennedy Institute at Rice University is committed to supporting cutting-edge research, educating innovators, and connecting across industries by bringing together thought leaders from around the world with expertise in artificial intelligence, data, and computing. We are thrilled to host this conference at the service of our regional and global energy and high performance computing communities.

We are grateful to our sponsors, partners, speakers, and attendees who share our enthusiasm and seek the opportunity to support and engage with the community. Finally, we would like to say a special thank you to the exceptional Keith Gray and the Conference Committee for their many contributions to this year's conference — this highly anticipated event exists because of your efforts.

On behalf of the Conference Committee, Rice University, and the Ken Kennedy Institute team, we want to thank you for being here.

Lydia E. Kavraki, PhD
Director, The Ken Kennedy Institute

Angela D. Wilkins, PhD
Executive Director, The Ken Kennedy Institute

Mauricio Araya-Polo, TotalEnergies
Michelle Atkinson, The Ken Kennedy Institute, Rice University
David Baldwin, Shell
Jesse Chan, Rice University
Mike Cogan, Equinor
Donny Cooper, TotalEnergies
Erik Engquist, Rice University
Melyssa Fratkin, Texas Advanced Computing Center
Esthela Gallardo, Microsoft
Keith Gray, Intel
Elizabeth L'Heureux, bp
Christopher Leader, SLB
Alex Loddoch, Chevron
David Martin, Argonne National Laboratory
Tom McDonald, Amazon Web Services
Nefeli Moridis, NVIDIA
Samantha Nava, The Ken Kennedy Institute, Rice University
Jan Odegard, The Ion
Kelly Peters, The Ken Kennedy Institute, Rice University
Jeremy Singer, ExxonMobil
Noella Soares, Shell
Suzy Tichenor, Oak Ridge National Laboratory
Mike Townsley, ExxonMobil
Angela Wilkins, The Ken Kennedy Institute, Rice University
Muhong Zhou, bp

Energy HPC Conference Code of Conduct

The organizers invite all attendees, sponsors/exhibitors, speakers, media, volunteers, and other participants to help us realize a safe and positive conference experience for everyone. The Ken Kennedy Institute works to increase tolerance, opportunity, and diversity in an effort to continually encourage the open exchange of ideas. For these reasons, the Institute is committed to providing a harassment-free experience at all the events it organizes. If you experience or witness harassment or discriminatory behavior at the conference, report this promptly to kenkennedy@rice.edu.

Energy 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, videotaping, and/or photography of any portion of the Energy HPC Conference material is strictly prohibited without prior consent of the Energy HPC staff.

2023 | ENERGY HIGH PERFORMANCE COMPUTING CONFERENCE

KEYNOTE CONFERENCE SPEAKERS

HENRI CALANDRA
TotalEnergies

JOHN ETGEN
bp

BRONSON MESSER
Oak Ridge National Laboratory (ORNL)

INVITED CONFERENCE SPEAKERS

WAFIK BEYDOUN
International Association of Oil & Gas Producers (IOGP)

GIBBY DUNLEAVY
Constant Impact LLC

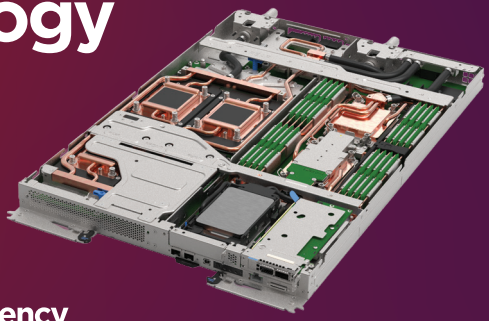
GARY GRIDER
Los Alamos National Laboratory (ORNL)

SAMIR KHANNA
bp

PARTHA ROUTH
ExxonMobil Engineering and Technology Company

DAN STANZIONE
Texas Advanced Computing Center (TACC), The University of Texas at Austin

Global leader in innovative cooling technology



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Four NVIDIA H100 Tensor Core GPUs or four Intel Data Center Max GPUs to drive HPC and AI workloads faster than ever.

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Lenovo TruScale for HPC delivers the power and performance your team needs to do their very best.

Versatile

Lenovo TruScale provides comprehensive hardware, software, and service options. This allows you to choose the solutions that fit your needs and scale seamlessly for future growth while reducing capital expenses.

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2022-2023 Ken Kennedy Institute Industry Sponsored Fellowship Recipients

Rice Ken Kennedy Institute Graduate Fellowship Award recipients (top row, from left to right): Fatima Ahsan, Paola Cascante-Bonilla, Chen Chen, Aditya Desai, Victoria Granja, Yumeng Liu, Zichang (Emma) Liu, Nicolae Sapoval, Guanchu Wang

---

bp

ExxonMobil

slb

CRAY

Andrew Ladd Memorial Excellence in Computer Science

ENERGY HIGH PERFORMANCE COMPUTING CONFERENCE

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 related to high performance computing, computational science and engineering, and data science.

Fellowship awards are made possible with support from bp, ExxonMobil, Shell, SLB, the Energy High Performance Computing Conference, and the Andrew Ladd, Ken Kennedy-Cray, and Scott Morton endowments.

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

RICE KEN KENNEDY INSTITUTE

AI, Data, and Computing for Global Impact

Ken Kennedy Institute Computational Science & Engineering Graduate Recruiting Fellowships

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

2022-2026

Brianna Barrow
Computer Science

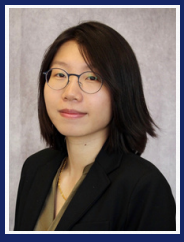
Alyssa Cantu
Computer Science

Rose Graves
Statistics

Kevin McCoy
Statistics

John Steinman
CMOR

Ria Stevens
Computer Science



Xiaoyu (Rosie) Zhu
EEPS

2021-2025

Kelsey Murphy
Earth, Environmental, and Planetary Sciences
Jose Palacio
Statistics
Xinyu (Xin) Yao)
Computer Science

2020-2024

Kristen Curry
Computer Science
Raul Garcia
Computational and Applied Mathematics
Bryant Jerome
Applied Physics
Mirae (Sunny) Kim
Computer Science
Camille Little
ECE
Catherine Tuppen
ECE
Cameron Wolfe
Computer Science
Tiancheng Xu
Computer Science
Naiming (Lucy) Liu
ECE

2019-2023

Alejandro Nicolas Diaz
Computational and Applied Mathematics
Yilei Fu
Computer Science
Christina G Taylor
Computational and Applied Mathematics
John Zito
Statistics

ENERGY HIGH PERFORMANCE COMPUTING CONFERENCE

RICE KEN KENNEDY INSTITUTE
AI, Data, and Computing for Global Impact

B Birds of a Feather (BOF)
I Invited Speaker
K Keynote
N Networking
A Technical Talk: Algorithms
M Technical Talk: Machine Learning
O Technical Talk: Optimization
S Technical Talk: Systems
W Workshop

8:00 a.m. – 8:30 a.m.	N	**Check-in + Breakfast** ›› Exhibit Hall
8:30 a.m. – 9:30 a.m.	B	**BOF: Data Management for Huge Data Volumes for HPC** ›› Room 280 Moderator(s): **Esthela Gallardo**, Microsoft; **Stuart Bonnington** Panelist(s): **John Zinck**, ExxonMobil; **Michael Gujral**, Shell; TBA
8:30 a.m. – 9:30 a.m.	B	**BOF: Encouraging and Supporting Better Collaboration in Energy HPC** ›› Auditorium Moderator(s): **Alex Loddoch**, Chevron; **Jeremy Singer**, ExxonMobil Panelist(s): **Gerard Gorman**, Devito Codes/Imperial College London; **Sam Kaplan**, Chevron; **Altay Sansal**, TGS; **Dan Stanzione**, TACC, UT Austin
9:30 a.m. – 10:00 a.m.	N	**Morning Break** ›› Exhibit Hall
10:00 a.m. – 10:10 a.m.	K	**Welcome + Recognizing Scott Morton** ›› Auditorium Speaker(s): **Lydia Kavraki**, The Ken Kennedy Institute, Rice University; **Angela Wilkins**, The Ken Kennedy Institute, Rice University Speaker(s): **Conference Founders and Colleagues**
10:10 a.m. – 10:50 a.m.	K	**Session 1: What Really Matters to our Industry in the Area of HPC and the Era of Exascale** ›› Auditorium Speaker(s): **Henri Calandra**, TotalEnergies; **John Etgen**, bp
10:50 a.m. – 11:30 a.m.	I	**Session 2: HPC in 2023: The View from TACC on HPC, AI, and People** ›› Auditorium Speaker(s): **Dan Stanzione**, Texas Advanced Computing Center (TACC), The University of Texas at Austin
11:30 a.m. – 12:30 p.m.	N	**Lunch** ›› Exhibit Hall
12:30 p.m. – 1:45 p.m.	M	**Technical Talks: Machine Learning** › Auditorium
12:30 p.m. – 1:45 p.m.	S	**Technical Talks: Systems** › Room 280
1:45 p.m. – 2:30 p.m.	N	**Afternoon Break** ›› Exhibit Hall
2:30 p.m. – 3:10 p.m.	I	**Session 3: The Road Not Taken, a Data Science Fallacy** ›› Auditorium Speaker(s): **Gibby Dunleavy**, Constant Impact LLC
3:10 p.m. – 3:50 p.m.	I	**Session 4: LANL Platform Planning and Update** ›› Auditorium Speaker(s): **Gary Grider**, Los Alamos National Laboratory (LANL)
3:50 p.m. – 5:30 p.m.	N	**Sponsor Networking Reception** ›› Exhibit Hall

Technical Talks: Machine Learning » **Auditorium**
Moderator(s): ***Donny Cooper****, TotalEnergies*

12:30 p.m. – 12:55 p.m.	**Inversion of Time-Lapse Surface Gravity Data for Detection of 3D CO2 Plumes via Deep Learning** Author(s): **Adrian Celaya**, Rice University; **Yen Sun**, TotalEnergies EP Research & Technology US; **Bertrand Denel**, TotalEnergies; **Antony Price**, TotalEnergies; and **Mauricio Araya-Polo**, TotalEnergies EP Research & Technology US
12:55 p.m. – 1:20 p.m.	**Adsorptive CO2 Removal from Dilute Sources (ACO2RDS)** Author(s): **Donny Cooper**, TotalEnergies; **Jake Burner**, University of Ottawa; and **Santanu Chaudhuri**, Argonne National Laboratory
1:20 p.m. – 1:45 p.m.	**On Signal Processing Flaws in Convolutional Neural Networks** Author(s): **Janis Keuper**, Fraunhofer Center HPC

Technical Talks: Systems » **Room 280**
Moderator(s): ***David Baldwin,*** *Shell;* ***Tom McDonald,*** *AWS*

12:30 p.m. – 12:55 p.m.	**Petrobras HPC Infrastructure** Author(s): **Luiz Monnerat**, Petrobras
12:55 p.m. – 1:20 p.m.	**ExxonMobil's CPU to GPU Transition** Author(s): **Steven Mariani**, ExxonMobil; **Jonathan Phillips**, ExxonMobil; **Mike Townsley**, ExxonMobil; and **Rahul Sampath**, ExxonMobill
1:20 p.m. – 1:45 p.m.	**Is Hybrid Cloud the Way to Unlock Seismic HPC at Scale in the Public Cloud?** Author(s): **Tim Roden**, Shell; **Michael Gujral**, Shell; **Francesco Menapace**, Shell; **Michele Isernia**, AWS; **Chee Choon-Cheng**, AWS; and **Stephen Whitley**, AWS

B Birds of a Feather (BOF)
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K Keynote
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S Technical Talk: Systems
W Workshop

8:00 a.m. – 8:30 a.m.	N	**Check-in + Breakfast** ›› Exhibit Hall
8:30 a.m. – 9:30 a.m.	B	**BOF: Communicating the Value of HPC and the Case for Growth** ›› Auditorium Moderator(s): **David Baldwin**, Shell; **Jeremy Singer**, ExxonMobil Panelist(s): **Bronson Messer**, ORNL; **Gary Grider**, LANL; **Diego Klahr**, TotalEnergies; **Elizabeth L'heureux**, bp; **Charlie Fazzino**, ExxonMobil
8:30 a.m. – 9:30 a.m.	B	**BOF: Women in Energy/HPC – Leveling the Playing Field** ›› Room 280 Moderator(s): **Melyssa Fratkin**, Texas Women in HPC, TACC Panelist(s): **Cristina Beldica**, Intel; **Esthela Gallardo**, Microsoft; **Arianna Martin**, bp/NAG; **Rosalinda Mendez**, NOA Research, LLC; **Marlo Nordt**, Chevron; **Noella Soares**, Shell
9:30 a.m. – 10:00 a.m.	N	**Morning Break** ›› Exhibit Hall
10:00 a.m. – 10:05 a.m.	K	**Welcome** ›› Auditorium Speaker(s): **Samantha Nava**, The Ken Kennedy Institute, Rice University
10:05 a.m. – 10:45 a.m.	K	**Session 5: Frontier: The World's First Exascale Supercomputer** ›› Auditorium Speaker(s): **Bronson Messer**, Oak Ridge National Laboratory (ORNL)
10:45 a.m. – 11:25 a.m.	I	**Session 6: Full Wave-field Inversion: Journey Towards Practical Applications** ›› Auditorium Speaker(s): **Partha Routh**, ExxonMobil Engineering and Technology Company
11:25 a.m. – 12:30 p.m.	N	**Lunch** ›› Exhibit Hall
12:30 p.m. – 1:50 p.m.	A	**Technical Talks: Algorithms** ›› Auditorium
12:30 p.m. – 1:50 p.m.	O	**Technical Talks: Optimization** ›› Room 280
1:50 p.m. – 2:30 p.m.	N	**Afternoon Break** ›› Exhibit Hall
2:30 p.m. – 3:10 p.m.	I	**Session 7: Role of HPC in the Energy Transition** ›› Auditorium Speaker(s): **Samir Khanna**, bp
3:10 p.m. – 3:50 p.m.	I	**Session 8: A Conversation with Wafik Beydoun** ›› Auditorium Moderator(s): **Melyssa Fratkin**, TACC Speaker(s): **Wafik Beydoun**, International Association of Oil & Gas Producers (IOGP)
3:50 p.m. – 5:30 p.m.	N	**Poster Presentation Reception** ›› Exhibit Hall

Technical Talks: Algorithms » Auditorium

Moderator(s): ***Mike Townsley****, ExxonMobil*

12:30 p.m. – 12:50 p.m.	**OpenMP Device Offloading for Seismic Modeling** Author(s): **Baodi Shan**, SUNY Stony Brook; and **Mauricio Araya-Polo**, TotalEnergies EP Research & Technology US
12:50 p.m. – 1:10 p.m.	**3D Finite Difference Elastic Wave Simulation on Nonuniform Grids** Author(s): **Longfei Gao**, University of Texas at Austin; **Omar Ghattas**, University of Texas at Austin; and **David Keyes**, KAUST
1:10 p.m. – 1:30 p.m.	**How Digital Approach Accelerated Velocity Model Building While Addressing the Data Scarcity Barrier to Leveraging Deep Learning** Author(s): **Apurva Gala**, Shell; **Pandu Devarakota**, Shell; **Engin Alkan**, Shell; **John Kimbro**, Shell; and **Gislain Madiba**, Shell
1:30 p.m. – 1:50 p.m.	**Solving Combinatorial Optimization Problem of Oil and Gas Supply Chain Optimization Using Simulated/Vector Annealing on Vector Engine Accelerator** Author(s): **Deepak Pathania**, NEC Corporation India Private Limited and **Shintaro Momose**, NEC Corporation (**Raghunandan Mathur** present for Deepak)

Technical Talks: Optimization » Room 280

Moderator(s): ***Alex Loddoch****, Chevron*

12:30 p.m. – 12:50 p.m.	**Efficient Asynchronous Data Storage for FWI Workflows in GEOSX** Author(s): **Xavier Lacoste**, TotalEnergies
12:50 p.m. – 1:10 p.m.	**Accelerating I/O Intensive GPU Applications (eg. Seismic Imaging) by Providing a Direct Pathway for the GPU to Access Storage** Author(s): **Anand Manian**, Oracle; **Fatmir Hoxha**, NVIDIA
1:10 p.m. – 1:30 p.m.	**JavaSeis Cloud: A Micro-Service Framework for Seismic Processing** Author(s): **Chuck Mosher**, MoMacMo Limited; **Sanjay Sood**, MoMacMo Limited; and **Robert Ferguson**, University of Calgary
1:30 p.m. – 1:50 p.m.	**Optimizing a Multi-Dimensional Convolution Operator on GPUs for 3D Marchenko Imaging** Author(s): **Victor Koehne**, SENAI CIMATEC HPC Center; **Matheu Santos**, SENAI CIMATEC HPC Center; **Rodrigo Santos**, SENAI CIMATEC HPC Center; **Guillaume Barnier**, NVIDIA; **Fatmir Hoxha**, NVIDIA; and **Pedro Cruz**, NVIDIA

If you decide to add-on a Thursday workshop after you have already registered, please reach out to conference staff to update your registration.

MARCH 2 • THURSDAY

8:00 a.m. – 3:30 p.m. W **Best Practices in HPC Systems Management** » Auditorium
Speaker(s): **Practitioners and Experts from Industry, Academia, and National Labs**

8:00 a.m. – 4:00 p.m. W **Introduction to Physics-Informed Machine Learning with Modulus** » 10th Floor Conference Room 1003
Speaker(s): **Pavel Dimitrov**, NVIDIA; **Ken Hester**, NVIDIA; **Fatmir Hoxha**, NVIDIA; **Guillaume Barnier**, NVIDIA; **Guillaume Thomas Collignon**, NVIDIA; **Igor Terentyev**, NVIDIA; **Kashif Chauhan**, NVIDIA

8:00 a.m. – 4:00 p.m. W **Devito Training** » Room 280 + Exhibit Hall
Speaker(s): **Gerard Gorman**, Devito Codes; **Fabio Luporini**, Devito Codes; **Rhodri Nelson**, Imperial College London; **Ed Caunt**, Imperial College London; **Zoe Leibowitz**, Imperial College London

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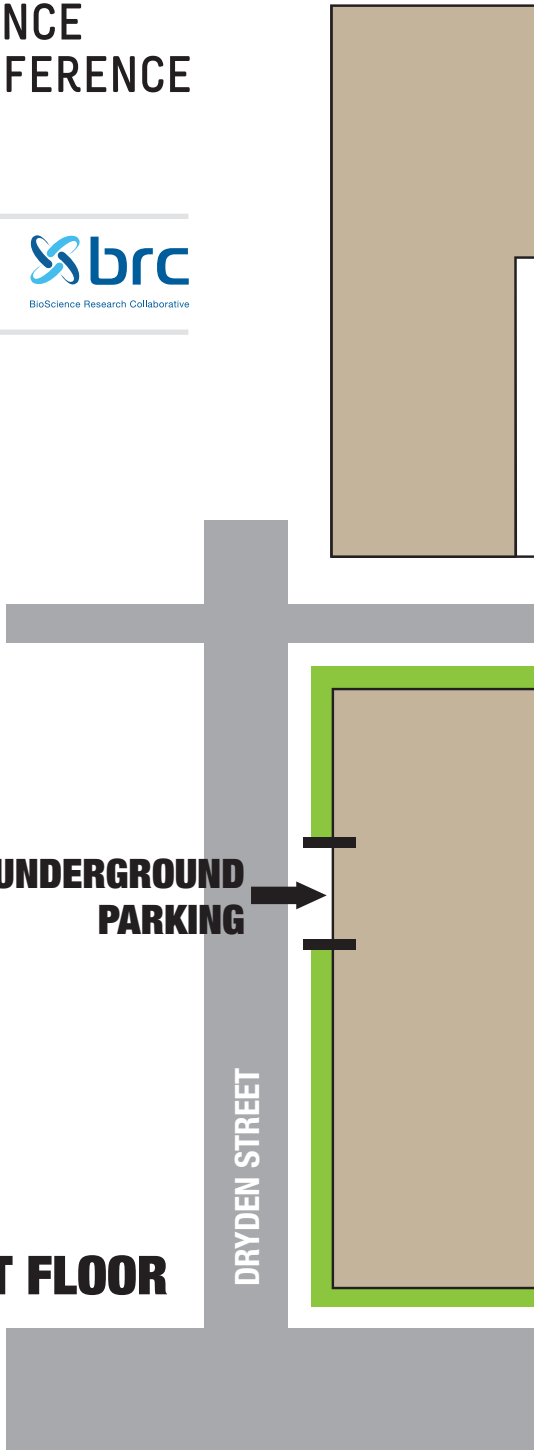
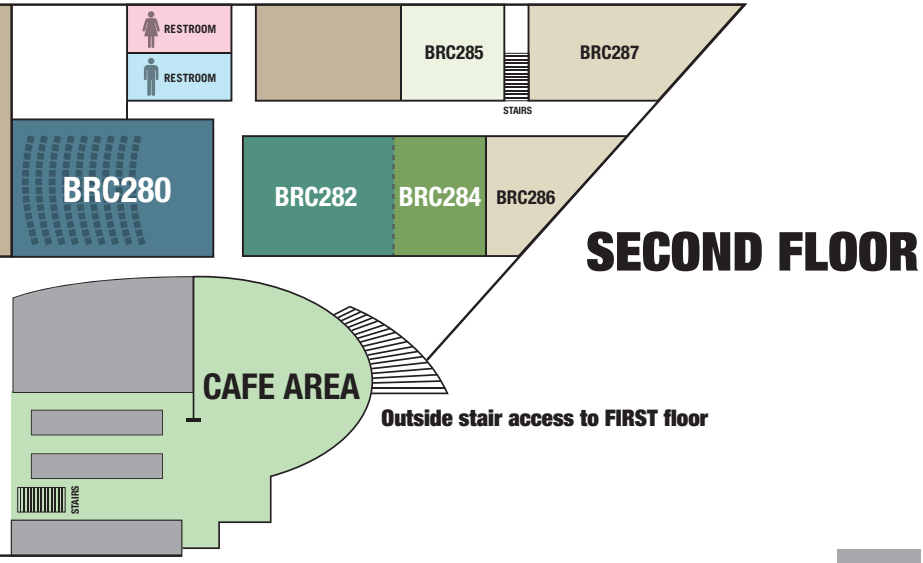
BioScience Research Collaborative

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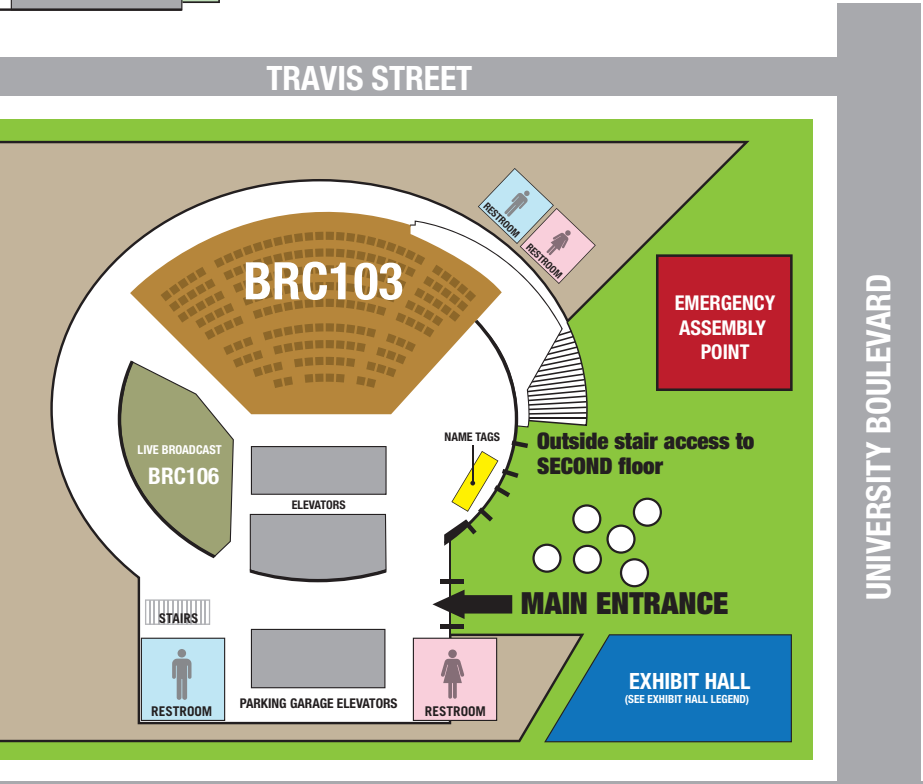
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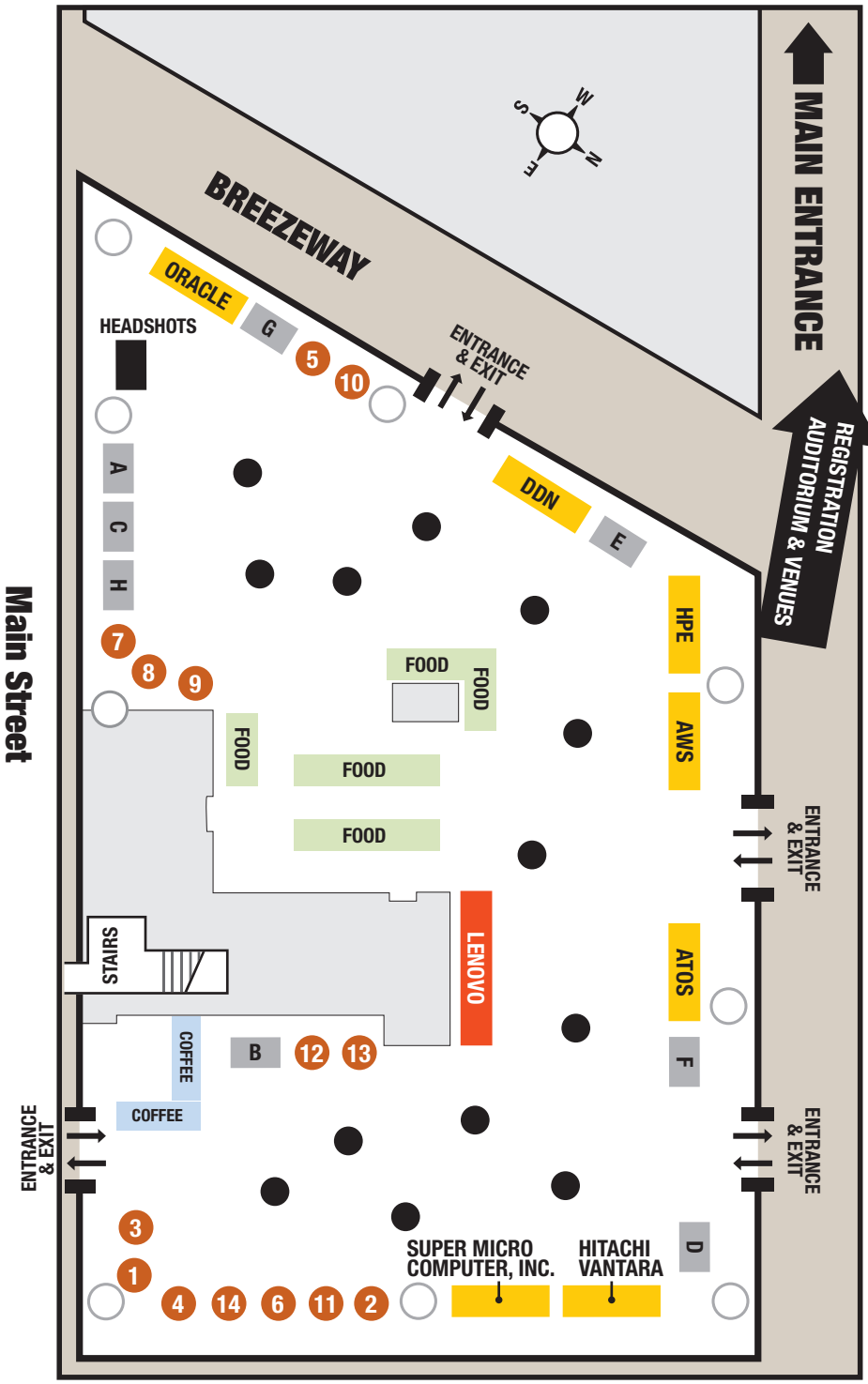
(SEE EXHIBIT HALL LEGEND)
UNIVERSITY BOULEVARD
MAIN STREET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ECOSYSTEM PARTNERS

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Oil IT Journal

Texas Women in High Performance Computing

The Society of HPC Professionals

A Production Ready Seismic Imaging Method on Cloud

Weishan Han (Seiswave Corporation), Kun Jiao (Amazon)

A Truly Global Data Platform - Anyone Gets Anything Anywhere

Dave McDonnell, Chris Maestas, (IBM)

BED: A Real-Time Object Detection System for Edge Devices

Guanchu Wang, Daochen Zha, Alfredo Costilla Reyes, Xia Hu (Rice University), Zaid Pervaiz Bhat, Zhimeng Jiang, Yi-Wei Chen (Texas A&M University), Afshin Niktash, Gorkem Ulkar, Erman Okman (Analog Devices), Xuanting Cai (Meta Platforms, Inc.)

Deep Learning Strategies for Seismic Demultiple

Mario Fernandez (Fraunhofer ITWM, École Normale Supérieure), Norman Ettrich (Fraunhofer ITWM), Matthias Delescluse (École Normale Supérieure), Alain Rabaute (Sorbonne Université), Janis Keuper (Fraunhofer ITWM, Offenburg University)

Devito - From Seismic to Covid

Zoe Leibowitz (Imperial College London)

Efficient Model Compression with Random Operation Access Specific Tile (ROAST) Hashing

Aditya Desai, Keren Zhou, Anshumali Shrivastava (Rice University)

EMvelop Stimulation: Minimally Invasive Deep Brain Stimulation Ising Temporally Interfering Electromagnetic Waves

Fatima Ahsan, Taiyun Chi, Behnaam Aazhang (Rice University), Raymond Cho, Sameer Anil Sheth, Wayne Goodman (Baylor College of Medicine)

Evolutionary Power Spectra Estimation of Nonstationary Stochastic Processes by Energy-Based Reckoning

Hanshu Zhang, Pol Spanos (Rice University), Alberto Di Matteo (University of Palermo)

How Extra Dispatchable Energy Could Solve Energy Crisis in Texas

Chen Chen, Daniel Cohan (Rice University)

Independent Physics-Guided Mesh Adaptivity and Finite Element Discretization for High-Performance Multiphysics Modeling

Ahmed Almetwally, Mary Wheeler (University of Texas at Austin)

Learning Closed-Form Equations for Subgrid-Scale Closures from High-Fidelity Data: Promises and Challenges

Karan Jakhar, Yifei Guan, Rambod Mojgani, Ashesh Chattopadhyay, Pedram Hassanzadeh (Rice University)

MLPerf Storage Benchmark Aids Deployment Planning for AI/ML Processing

Curtis Anderson, Jeff Whitaker (Panasas Inc.)

Preparing HPCToolkit for Exascale Supercomputers

Yumeng Liu, Jonathon Anderson, John Mellor-Crummey (Rice University)

QuaID: Enabling Earlier Detection of Recently Emerged SARS-CoV-2 Variants of Concern in Wastewater

Nicolae Sapoval, Yunxi Liu, Esther G Lou, Katherine B Ensor, Lauren B Stadler, Todd J Treangen (Rice Unviersity), Loren Hopkins, Rebecca Schneider (Houston Health Department)

Robust Synchronization and Policy Adaptation for Networked Heterogeneous Agents

Miguel Felipe Arevalo-Castiblanco, Cesar A. Uribe (Rice University), Eduardo Mojica-Nava (Universidad Nacional de Colombia)

SimVQA: Exploring Simulated Environments for Visual Question Answering

Paola Cascante-Bonilla, Vicente Ordonez (Rice University)

Wave Propagation on the STX Accelerator

Ryuichi Sai, John Mellor-Crummey (Rice University), Marc Andre Heller, Jens Kruger (Fraunhofer ITWM), Mauricio Araya-Polo (TotalEnergies EP Research & Technology US)

NOTES


2023 AI IN HEALTH CONFERENCE
OCTOBER 9 – 12, 2023
HOUSTON, TX | RICE UNIVERSITY
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RICE KEN KENNEDY INSTITUTE
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