Rice University
The Ken Kennedy Institute

Annual Report
January 1 – December 31, 2021

Lydia E. Kavraki, Director
Angela Wilkins, Executive Director
Anton Zhang, Data Scientist
Michelle Atkinson, Program Administrator
Meredith Westover, Administrative Assistant (Jan – Aug)
Mackenzie Lee, Marketing & Events Specialist (Aug – Dec)

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December 31, 2021

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1. Executive Summary

While 2021 has continued to be a challenging year for all of us, requiring flexibility and perseverance due to the coronavirus (COVID-19) global pandemic, we can look back with a sense of accomplishment and success. The Institute continued to develop collaborative efforts across Rice and the Houston community.

The Ken Kennedy Institute is a multidisciplinary group that works collaboratively on groundbreaking research in artificial intelligence, data, and computing. Our goals for 2021 were multifaceted to impact research, support innovation, and build partnerships:

- Enable faculty to take their research to the next level
- Partner with universities, Texas Medical Center (TMC), and industry on transformative efforts
- Help recruit top graduate students and postdocs
- Promote an ecosystem of innovation and entrepreneurship
- Elevate Rice's reputation and expand its reach beyond Texas

Highlights

Some of the critical efforts in the last year centered around moving the following goals forward: building partnership with Methodist/ Huntington Medical Research Institutes (HMRI) and MD Anderson Cancer Center, hiring our first staff member to move collaborations forward, external engagement through conferences and webinars, providing fellowships and seed funding, and creating research clusters.

2. Leadership and Team

The Ken Kennedy Institute is housed in Duncan Hall where it occupies three offices (the 1084-1085 office suite and office 1088). No other space is currently dedicated to or managed by the Institute.

Team

Lydia E. Kavraki, Noah Harding Professor of Computer Science; Professor of Bioengineering, Electrical and Computer Engineering, and Mechanical Engineering (office housed within the CS department in Duncan Hall) is the Director of the Institute.

Angela Wilkins is the Executive Director.

Two professional staff members support the Institute: Michelle Atkinson, Program Administrator, and Mackenzie Lee, Marketing & Events Specialist (August – December). Meredith Westover was the Administrative Assistant from January to August.

The team has expanded to five with our new Data Scientist, Anton Zhang.

Faculty Advisory Committee

The Ken Kennedy Institute's Faculty Advisory Committee members are:

- Rich Baraniuk, Electrical and Computer Engineering
- Lydia Beaudrot, Biosciences
- Keith Cooper, Computational and Applied Mathematics and Former Co-Director (Retired in July 2021)
- Farès el-Dahdah, Humanities Research Center
- Chris Jermaine, Computer Science and Former Co-Director
- Ashutosh Sabharwal, Electrical and Computer Engineering (Joined in July 2021 to replace Keith Cooper)
- Kristen Siebach, Earth, Environmental, and Planetary Sciences
- Chris Tunnell, Physics and Astronomy
- Moshe Vardi, Computer Science and Former Director

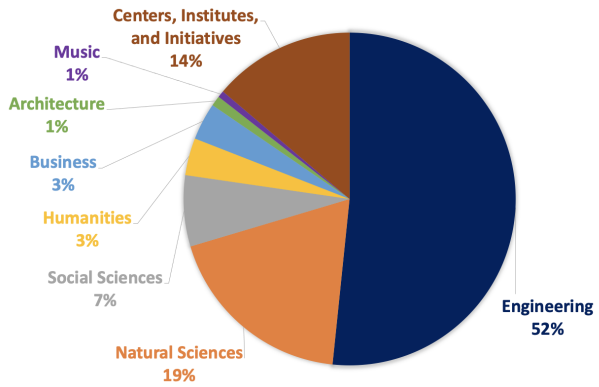
External Advisory Board

The Institute formulated an External Advisory Board to identify new ideas and opportunities to elevate the Ken Kennedy Institute and Rice University. The External Advisory Board expands the number of points of view across industries. The board members are:

- Keith Gray, Technical Computing Advisor, TGS
- Sandy Guitar, Managing Director, HX Venture Fund
- Bill Martin, Global Therapeutic Area Head, Neuroscience, The Janssen Pharmaceutical Companies of Johnson & Johnson
- Kathryn McKinley, Principal Research Scientist, Google
- Emily Reichert, Chief Executive Officer, Greentown Labs
- Jim Ward, Managing Director, Two Sigma Investments

3. Members and Subscribers

The Ken Kennedy Institute is made up of **240 faculty members and senior researchers** at Rice University spanning computer science, mathematics, statistics, engineering, natural sciences, humanities, social sciences, business, architecture, and music (increase by 17). They collaborate in interdisciplinary teams to gather and interpret data and to develop solutions that address urgent problems facing our society. The institute also has **63 associate members** who are part of the greater campus population (increase by 5).



In addition to these two communities, we have 334 subscribers to the Ken Kennedy Institute industry, 1,889 to the Data Science community, and 2,801 to the HPC community mailing lists.

4. Impacting Research

The Institute has a number of efforts to create a collaborative and productive culture within Rice University.

Proposal Development in Research Clusters

AI, Data, and Computing has become a dominant capability in all impactful technology. To advance the Ken Kennedy Institute's mission, we build research clusters in critical topics. These clusters will build collaborative initiatives in the healthcare, environmental sciences, computational sciences, and social equity with the possibility of extending to new issues. The clusters comprise a diverse group of thought leaders from Rice to lead and support these new initiatives. Supporting these clusters is key to timely initiatives as funding agencies continually adjust strategic missions.

The expected outcomes are new grant opportunities and potential centers and initiatives. Today, the faculty is interested in core research in machine learning & AI, health, neuro-engineering, data visualization, spatial analysis, resilient infrastructures for cities, environmental studies, and computational sciences.

To help move the research cluster efforts forward, the Ken Kennedy Institute:

- Provides administrative support,
- Leadership participates in research cluster meetings,
- Helps identify potential collaborators, and
- Works with the cluster to identify funding sources.

Lastly, the Ken Kennedy Institute is uniquely positioned to promote ideas and collaborations through our conferences, workshops, meetings, and other events. This would position research clusters to find new collaboration and bring awareness to faculty research at Rice. A number of these topics overlap with the interest of Ion and Ion partners.

So far, the research areas have focused on the computation in healthcare, disaster relief, and urban resilience - we are not limited to these topics. We are open to any important problems that the Rice faculty have critical mass and where artificial intelligence, data, and computing is a key element to the research.

- NSF Coastlines and People (CoPe) - Large Hub - Up to 4 million per year for 5 years (Lead PI Jamie Padgett)
- NSF Germination of Research Questions for Addressing Critical Societal Challenges (Professors Ensor and El-DahDah) - $300k
- White Paper for Translational Digital Health Center (Professor Sabharwal)
- Creative Ventures (Workshops for Digital Health Cluster) - $10,000

Member Community Networking Luncheons

We enable new conversations through our Member Luncheons which provide networking opportunities across departments at Rice to encourage culture and collaboration. Typical activity was reduced due to COVID-19.

- February 2021:
  - **Akane Sano**, Electrical and Computer Engineering, “Digital Health and Wellbeing: Data-Driven and Human-Centered Personalized and Adaptive Assistant” / Remo Networking Platform
- September 2021:
  - **Kirsten Ostherr**, English, “Health Data and Humanities Method” / Zoom
- October 2021:
  - **Yingyan (Celine) Lin**, Electrical and Computer Engineering, “Efficient and Intelligent Computing (EIC): Efficient Deep Learning Techniques Towards Ubiquitous on-Device Intelligence and Green AI”/ Zoom

Seed Funding

The Institute provides seed funding to encourage interdisciplinary research in data and computation projects. Two of our major efforts have been Enriching Rice through Information Technology and Collaborative Advances in Biomedical Computing. The Institute awarded new seed funding in humanities in 2021.

$10,000 was awarded to Alida Metcalf, History, and John Mulligan, Center for Research Computing, for "Digital Humanities Research Development Funding", December 2020 (1 year)

Ken Kennedy Institute Industry Sponsored and Memorial Graduate Fellowships: $65,000 Awarded

With the support of industry, the Energy (previously Oil & Gas) High Performance Computing Conference, and nominating departments, the Ken Kennedy Institute has awarded nearly $1.5 million to 172 students since 2001.

The Ken Kennedy Institute's annual graduate fellowship program awarded $65,000 to nine Rice University graduate students in five departments.

Recipients use fellowship awards to further research pursuits, attend conferences, travel and develop networking relationships in industry. Past recipients have spent summers as research interns with sponsoring companies.

The 2021-22 graduate fellowships are supported by BP, Schlumberger, Shell, the Energy High Performance Computing Conference, and the Andrew Ladd and Ken Kennedy-Cray endowments.

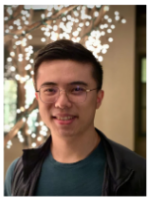
- Shabnam Daghaghi, Electrical and Computer Engineering: BP, $7,500
- Luqin Gan, Statistics: Shell, $7,500
- Bishal Lamichhane, Electrical and Computer Engineering: Energy HPC Conference, $7,500
- Thiago Jose Pinheiro dos Santos, Chemical and Biomolecular Engineering: Energy HPC Conference, $7,500
- Xin Tan, Statistics: Energy HPC Conference, $7,500
- Morgan Underwood, Earth, Environmental, and Planetary Sciences: Ken Kennedy-Cray, $7,500
- Zichao (Jack) Wang, Electrical and Computer Engineering: Schlumberger, $7,500
- Zhaozhuo Xu, Computer Science: BP, $7,500
- Zhiwei Zhang, Computer Science: Andrew Ladd, $5,000

Shabnam Daghaghi
BP

Luqin Gan
Shell

Bishal Lamichhane
Energy HPC Conference

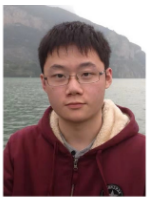
Thiago Jose Pinheiro dos Santos
Energy HPC Conference



Xin Tan
Energy HPC Conference

Morgan Underwood
Ken Kennedy-Cray

Zichao (Jack) Wang
Schlumberger



Zhaozhuo Xu
BP

Zhiwei Zhang
Andrew Ladd

Ken Kennedy Institute Computational Science and Engineering Graduate Recruiting Fellowships: $45,000 Awarded

The Institute continued to expand its recruiting fellowship program by offering four-year supplemental fellowships to three graduate students at Rice University totaling $45,000.

The fellowships are funded by the Ken Kennedy Institute, through its annual Energy (previous Oil and Gas) High Performance Computing Conference, and the nominating departments. The program's goal is to attract outstanding graduate students to Rice in the fields of high performance computing, computational science & engineering, and data science, with special consideration given to students with research interests in the energy industry. Each enhancement fellowship comes with a $15,000 stipend paid in monthly installments over four years.

In the spring of 2021, the Ken Kennedy Institute made 15 Computational Science and Engineering Fellowship offers to applicants. Of these 15 offers, three students accepted. The Institute welcomed these exceptional students to Rice in the fall of 2021.

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

Kelsey Murphy
Earth, environmental, and planetary sciences

Jose Palacio
Statistics

Xinyu (Xin) Yao
Computer science

Expanding Fellowships

Historically, the industry fellowship program has been predominantly energy industry. We would like to expand the fellowship program to include new industries and new internship opportunities. We would also like to establish a network of postdoctoral researchers who will further facilitate the work of research clusters.

Shared Computing Infrastructure

Since 2002, the Ken Kennedy Institute has successfully worked with faculty to fund and build Rice's shared cyberinfrastructure. Today, the Institute, in partnership with Rice's Office of Information Technology's (OIT) Center for Research Computing (CRC), supports the computational research needs of more than 190 faculty members and over 800 users. 250 of these users consume significant computing and storage resources in any given month. Financial support was channeled to the Institute for its contributions to Rice's shared cyberinfrastructure. This support has ended, and funding remains within CRC. We continue to meet and advise the CRC leadership on potential opportunities.

Research Computing Service Center Operation

The Ken Kennedy Institute stopped operational responsibility for the service center for shared high performance computing infrastructure at Rice in the spring of 2020. The operation of the service center was transitioned to OIT. However, while the Ken Kennedy Institute will not operate the service center, the Institute will continue to represent and support faculty interest in research computing infrastructure and provide leadership for future needs.

5. Building Partnerships

Methodist/Huntington Medical Research Institutes (HMRI) Partnership

The Institute has begun collaboration with Methodist/HMRI. Collaborating with Rice ENRICH, we are initiating workshops in Spring 2022 with $50,000 to support potential collaborative projects (through ENRICH) on Robotics, Imaging, Operation/Logistics (Business School), and Digital Health-Related Topics. In addition, we have already initiated several meetings across institution lines that will potentially lead to grant opportunities.

MD Anderson Cancer Center Partnership

The Institute is continuing collaboration with MD Anderson Cancer Center from 2020. We are collaborating with Rice ENRICH to start workshops in Spring 2022 with $50,000 to support potential collaborative projects (through ENRICH). In addition, we have already initiated several meetings across institution lines that will potentially lead to grant opportunities.

Data Scientist New Hire

The Institute hired its first in-house Data Scientist, Anton Zhang, supported by the Rice COVID-19 Research Fund. And as of now, we are working with MD Anderson to establish the data pipeline for our primary research projects. In the meantime, the Institute has also participated in alternative projects with other collaborators.

Our data scientist, Anton Zhang, finished a project with Dr. Kamil Kanipov of UTMB. The project investigates the distress level of cancer patients and its potential correlations with demographic data such as age, gender, ethnicity, marital status, etc. Our study found that specific parameters, such as type of insurance, are strongly correlated with a patient's distress. Our findings are currently being written into a manuscript for submission.

Institute External Memberships

We continued our membership with the **Alliance of Artificial Intelligence in Healthcare** as a board member. We see this as a key way to increase the exposure of the institute and Rice. This will provide new access to faculty and students to a network of over 40 exceptional organizations (including startups, big pharma, big tech, etc.). In the case of faculty, we plan to identify potential collaboration opportunities. In the case of students, we see potential internships or career opportunities.

We also continued our membership with the **Greater Houston Partnership (GHP)**. The GHP is focused on advancing Houston's position as a great global city. Their strategic plan, Houston Next, guides their efforts to improve the region by promoting a strong, diverse, 21st century economy, ensuring a great quality of life, and supporting opportunity for all. Membership investment and engagement supports this work, acting as a catalyst for their advocacy and economic development activities and offering a platform for events and programming that makes meaningful connections possible.

In 2021, the Institute partnered with the Fondren Library Research Data Services and the Center for Research Computing to split the silver level membership for **The Carpentries**. The Carpentries is a global non-profit organization that builds global capacity in essential data and computational skills for conducting efficient, open, and reproducible research by developing accessible lessons, training instructors to lead inclusive, interactive workshops and helping to coordinate these workshops. Through our membership in the Carpentries, we were able to advance our shared goal of enabling members of the Rice community—particularly graduate students—to develop computational skills. In 2021, the Institute's co-sponsorship of the Carpentries enabled Rice to hold three online two-day workshops led by certified volunteer instructors from around the world on 1) Software Carpentry Workshop on R, Git, and Unix, (2) Software Carpentry Workshop on Python, Git, and Unix, and (3) Data Carpentry Workshop on Data Skills for Social Scientists.

Additionally, in 2021, the Institute became a member of the **LF AI & Data Foundation**. The LF AI & Data Foundation connects members with innovative technical projects, companies, and developer communities transforming artificial intelligence, machine learning, and deep learning.

Expanding Partnerships

We will expand our efforts to develop partnerships with new institutions and industries. Ideally, these partnerships should enable the progress of the research clusters.

6. Supporting Innovation

The Ken Kennedy Institute continues to engage with and support the local community at Rice, in Houston, and beyond with various educational conferences, workshops, and boot camps, distinguished public lectures, and monthly networking opportunities. The Institute's power lies in its ability to build and strengthen relationships at the forefront of intellectual ambitions. Critical to its mission is the Institute's efforts to continue building and maintaining strong relationships across the community at Rice, the Texas Medical Center, and the greater Houston area.

The world's critical challenges require vision and collaboration across departments, institutions, and industries. We believe that the key steps to solving these challenges start with promoting new conversations and interdisciplinary research in artificial intelligence, data, and computing across disciplines and industry sectors.

New Effort: Innovation Fellows Program

In collaboration with Lilie, IBB, SCI, and the Provost's Office, the Rice Innovation Fellow program launched in late 2021 to support graduate students to spend additional research time focusing on the practical aspects of applying their research to industry needs.

The Rice Innovation Fellows program trains graduate students and supports their faculty to translate research into real-world impact. The Innovation Fellows program combines dedicated time and space at Lilie with personalized mentorship and equity-free funding to catalyze the next generation of world-changing, scientist-led companies.

Drawing from her entrepreneurial experience, Angela Wilkins works weekly with fellows as an advisor and mentor. Additionally, the relationships formed by the Ken Kennedy Institute have helped identify potential advisors and board members.

2021 Oil and Gas High Performance Computing Conference (March 5, 2021)

The 14th Annual Oil and Gas High Performance Computing Conference, organized by the Ken Kennedy Institute at Rice University, was held virtually (due to COVID-19) on March 5, 2021.

In recent years, the Energy Industry is beset on all sides by important changes, such as growing demand for computational capacity, incorporation of data science and machine learning in the traditional workflow, increasing market volatility, increasing concern on environmental footprint, competition from, and even switching to, renewable energy, as well as the demand for reliable infrastructures. Motivated by all these issues, the conference brings together the best minds in high-performance computing. Recognizing that discovery and innovation happen at the interfaces of disciplines and communities, the

conference convenes a diverse set of people spanning industry, academia, and national labs.

This year's conference included four keynote presentations, three panels, 27 technical talks (selected from submitted abstracts), six sponsored presentations, 12 student posters, and four post-conference workshops (Friday, March 12, 19, and 26). The annual conference had a record number of 1,125 registered for the conference (up from 638 registered in 2020), with 870 signed into the virtual conference platform Brella. Conference registration was offered for free this year (compared to $50-$325 in 2020) and we had strong international participation due to the conference being virtual with attendees from over 50 countries and 42 states. Post-conference workshops were also offered for free. We are hopeful that next year's conference will have strong attendance numbers because of the virtual format reaching many new attendees.

The Oil and Gas High Performance Computing Conference continues to be widely recognized as THE event for networking and collaboration nationwide, even as the conference moved to a virtual format. This conference is distinctive in providing an industry focus. Next year will be the 15th year of the conference and to move with the times, the Oil and Gas HPC Conference will be renamed as the Energy HPC Conference to reflect our evolving world.

The Oil and Gas HPC conference demonstrates the value the Ken Kennedy Institute brings to external communities. The conference promotes Rice's leadership role in this space. With attendance averaging 600+, we maintain our role as a leader in the HPC and computational science and engineering space. We are a valued partner with a proven commitment to supporting the needs of the energy industry ecosystem. As a result, we continue to receive strong support from the IT industry with 21 sponsors present (the who's-who across the computing and data hardware and software industry), including 5 new sponsors. We also had 12 ecosystem partners.

We worked hard to create virtual networking opportunities of value to the attendees and sponsors. In the Brella platform, attendees could send meeting requests and chat messages throughout the conference. We specifically encouraged sponsors to utilize these meeting requests for video chats. We opened nine breakout rooms during the lunch breakout where attendees could choose a topic that interested them and enter a breakout room to video chat with other attendees. Topics included: Containers for HPC, Cloud Computing, Careers in Energy Industries, Carbon Capture, and Storage, AI, Quantum Computing, HPC Storage Challenges and Products, Facilities Challenges, Directions, and Sharing within HPC, and a general breakout room.

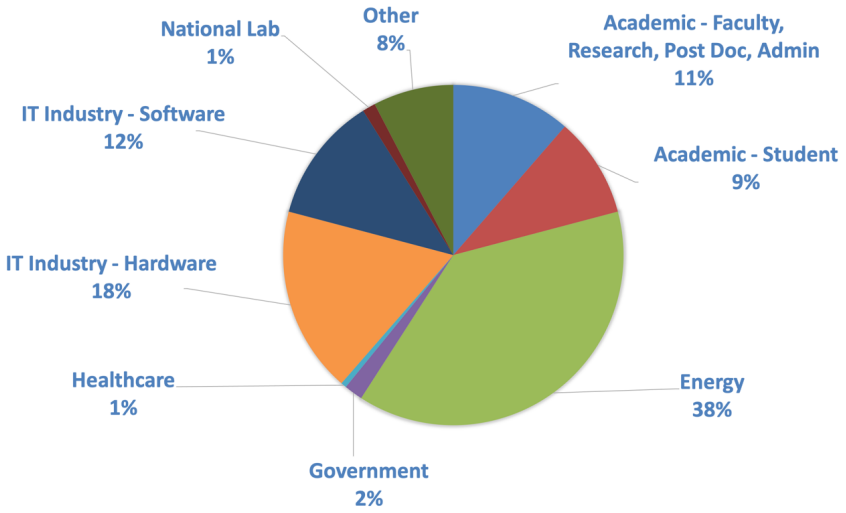
We ended the conference with a virtual Networking Reception in the Remo platform. This platform allowed attendees to move around to different tables and video chat with attendees, sponsors, and speakers to mimic the experience of an in-person conference. We had 80 participants for the reception. Sponsors also had designated tables within this platform.

The full program can be viewed on the Oil and Gas High Performance Computing Conference website (http://rice2021oghpc.blogs.rice.edu/programs/).

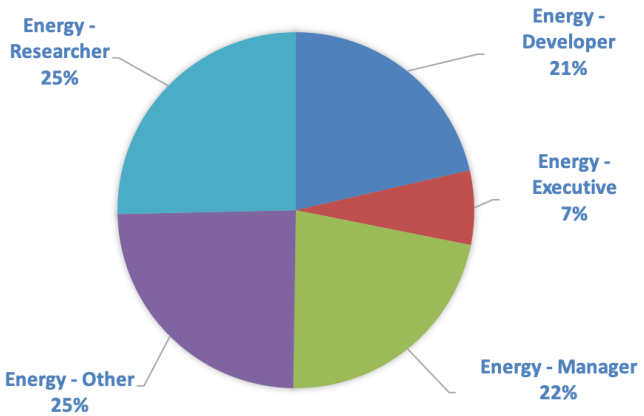
After covering operational costs, funds from the conference are used to support the Ken Kennedy Institute Computational Science and Engineering Graduate Recruiting Fellowship program. This fellowship program is designed to support the recruitment of outstanding graduate students in the fields of HPC, computational science and engineering, and data science to Rice University. The recruiting fellowships are an important part of the fellowship activities of the Ken Kennedy Institute which also include industry graduate fellowships that supplement the stipend of highly performing students. With the support of the conference, industry, and nominating departments, the Ken Kennedy Institute has awarded nearly $1.5 million to 172 students since 2001.

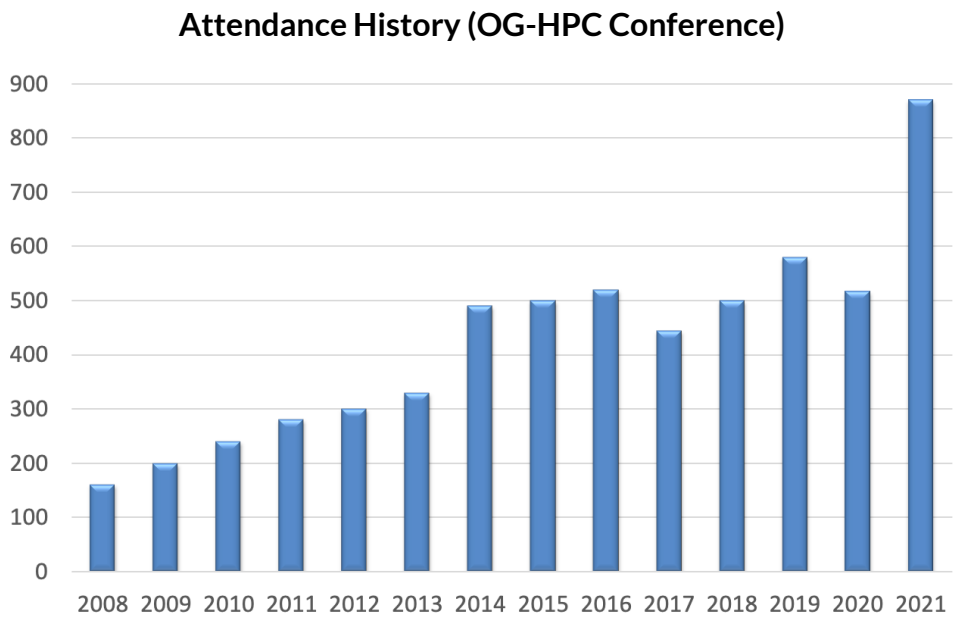
We look forward to the continued success of the conference. The 15th annual conference will take place March 1-3, 2022 and will be renamed the Energy HPC Conference.

Attendees by Industry (OG-HPC Conference)



Energy: Job Role Demographic (OG-HPC Conference)





2021 Ken Kennedy AI and Data Science Conference (Oct 25-27, 2021)

The 5th Annual AI and Data Science Conference, organized by the Ken Kennedy Institute at Rice University, held the conference presentations and sponsored booths virtually (due to COVID-19) on October 25-26 with an in-person networking reception to conclude the main conference in the afternoon on October 26. Additionally, October 27 was an in-person add-on day with a technical workshop highlighting deep learning and high performance computing.

This year's conference included six keynote presentations, 14 technical talks (selected from submitted abstracts), one lunch workshop, five sponsored presentations, 16 student posters, one post-conference workshop (Tuesday, November 30), seven sponsors, seven ecosystem partners, and a concluding in-person outdoor networking reception. The annual conference had 640 registered for the conference, with 412 signed into the virtual conference platform Brella. Conference registration was offered for free this year, and we had a strong international participation due to the conference being virtual with attendees from 29 states and 40 countries. A post-conference workshop was also offered for free as part of a Gold Sponsorship. We are hopeful that next year's conference will have strong attendance numbers because of the virtual format reaching many new attendees all over the country and all over the world.

Due to the COVID-19 pandemic, the conference was virtual for a second time, with an in-person networking reception. We explored several virtual conference platforms and networking options and ultimately decided to go with Brella again. The conference platform allowed us to host a virtual site for our presentation sessions, sponsor booths, poster presentations, and networking. Attendees could watch the pre-recorded sessions either before or after the conference, and all attendees that have logged in have access to the platform for one year. Recorded presentations are also made available to the public after the conference on the Ken Kennedy Institute YouTube channel. We worked hard to

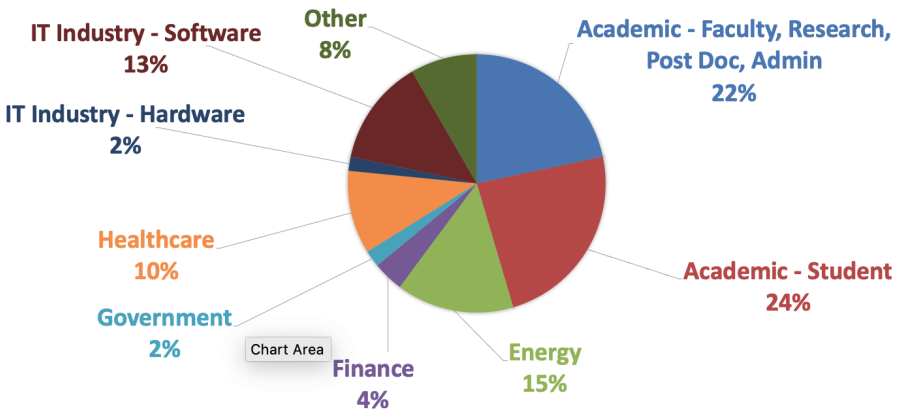
create virtual networking opportunities of value to the attendees and sponsors. In the Brella platform, attendees could send meeting requests and chat messages throughout the conference.

We ended the conference with an in-person networking reception at Holman Draft Hall. The reception was the highlight of the conference for attendees and sponsors. We had over 75 participants at the reception.

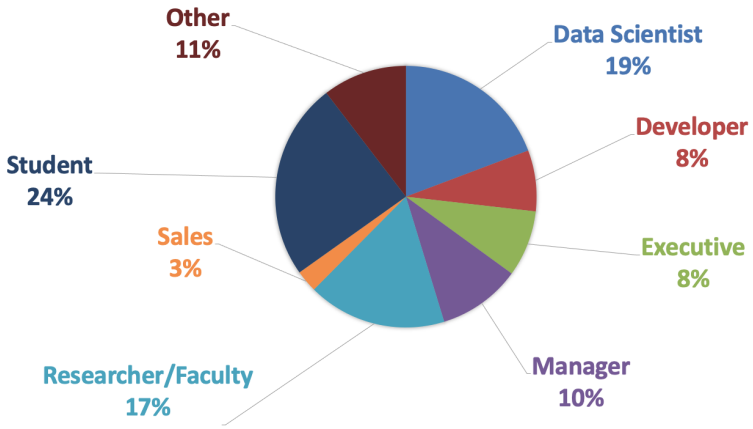
Wednesday, October 27 was an in-person add-on day with a technical workshop highlighting deep learning and high-performance computing at the BioScience Research Collaborative (BRC) on Rice University campus titled Scalable and Sustainable AI Workshop: Overcoming the Wide Gap Between AI in Theory and AI in Production. This workshop explored recent advances in designing a new generation of scalable and sustainable AI algorithms that are exponentially cheaper and can cope with future demands. The workshop was also live-streamed for those unable to make it in person.

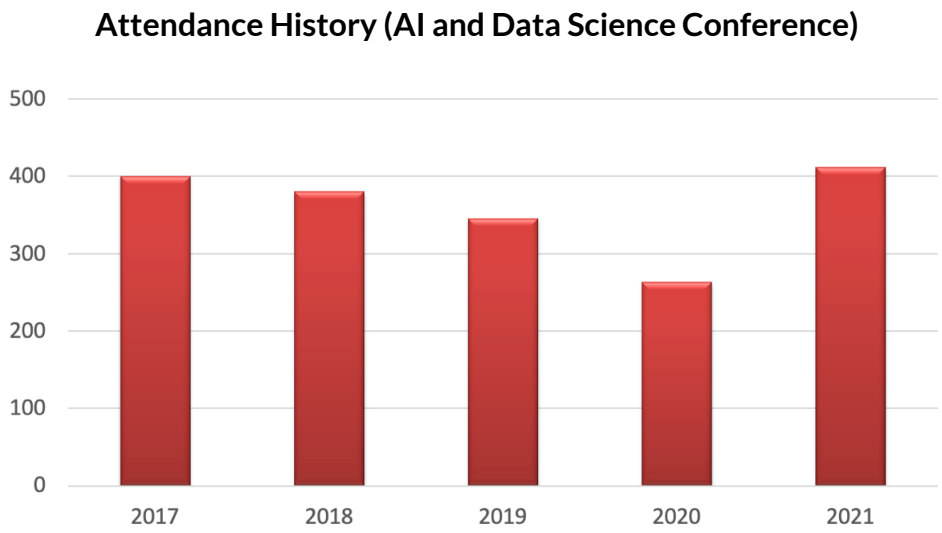
The Ken Kennedy Institute looks forward to hosting the next Ken Kennedy AI and Data Science Conference in fall 2022.

Attendees by Industry (AI and Data Science Conference)



Attendees by Job Role (AI and Data Science Conference)





Virtual Machine Learning Boot Camp, 2021 Focus: Machine Learning for Executives (May 20-21, 2021)

This two-day boot camp provided a broad introduction to Machine Learning from an executive perspective. Our goal was to give a manager or a CEO in a field such as medicine, finance, manufacturing, or energy an introduction to the essential concepts behind Machine Learning. Taught by a team of Rice professors in the computational sciences, the Machine Learning Boot Camp integrated lectures describing the basic concepts to state-of-the-art Machine Learning.

The boot camp assumed no specific prerequisites and highlighted a broad set of concepts, ranging from classical supervised and unsupervised methods to modern machine learning approaches, with numerous case studies and applications. Throughout its duration, the workshop provided practical suggestions to executives with dos and don'ts when using Machine Learning in practice.

The two-day boot camp had 40 attendees from 3 universities and 5 companies (19 attendees from Chevron).

The schedule included Fundamentals of ML with Chris Jermaine, Basic Methods with Santiago Segarra, Deep Learning with Tasos Kyrillidis, and Advanced Deep Learning and RL with Santiago Segarra.

This was the 9th year offering a Data Science/Machine Learning boot camp. The Institute plans to offer this executive-level summary as well as a hands-on Machine Learning Boot Camp in summer of 2022. We also plan to extend these boot camps with topics such as machine learning for the biomedical area.

Ken Kennedy Institute Distinguished Lectures

The Ken Kennedy Institute hosts several lecture series throughout the academic year. Our Distinguished Lecture Series focuses on bringing new ideas and potential

collaborators from outside Rice. These lectures are given by well-known speakers that are invited to present talks that allow for discussion, networking, and an opportunity to hear from top executives and leaders from around the globe. These lectures are open to the public with no cost for admission.

- April 1, 2021: **Daniela Rus**, Andrew and Erna Viterbi Professor of Electrical Engineering and Computer Science, Director of the Computer Science and Artificial Intelligence Lab (CSAIL) at MIT, and Deputy Dean of Research in the Schwarzman College of Computing at MIT
    - "One Robot for Every Task"
    - Co-Sponsored by Department of ECE and Department of Computer Science
- Nov 3, 2021: **Vivek Sarkar**, Chair of the School of Computer Science and the Stephen Fleming Chair for Telecommunications in the College of Computing at Georgia Institute of Technology
    - "Back to the Future: Revisiting Data Flow through a Software Lens"

Technology Innovation Lecture Series

Technology Innovation Lecture Series is sponsored jointly by the Ken Kennedy Institute and the Liu Idea Lab for Innovation and Entrepreneurship (Lilie).

- March 10, 2021: **Sunil Nagaraj**, Founding and Managing Partner of Ubiquity Ventures
    - "Why venture capitalists are investing in 'software beyond the screen'"
    - We brought in Sunil again (also spoke in September 2020) as a deep technology investor to speak on venture and investing in software. Sunil participated in office hours and spoke directly with students and faculty on their entrepreneurial pursuits.
    - Co-Sponsored by Lilie Lab and Rice Center for Engineering Leadership
- April 20, 2021: **Suman Talukdar**, Founder of AiSprouts VC
    - "Finding Your Homerun: My Entrepreneurial Journey from Engineering to Investing"
    - Co-Sponsored by Lilie Lab and Department of ECE

Data Science Coast to Coast Seminar Series

The Ken Kennedy Institute hosted jointly the Data Science Coast to Coast (DS C2C) Seminar Series with six other academic data science institutes, including the Institute for Data Intensive Engineering and Science at John Hopkins, NYU Center for Data Science, Stanford Data Science, Berkeley Institute for Data Science, Michigan Institute for Data Science, and the eScience Institute at the University of Washington. The goal is to provide a unique opportunity to foster a broad-reaching data science community.

Speakers throughout the spring of 2021 included faculty members and postdoctoral fellows at the seven host universities whose research spans the theory and methodology of data science and their application in arts and humanities, engineering, biomedical, natural, physical, and social sciences. Each seminar featured one faculty member and one

postdoctoral fellow from two universities. Each speaker gave a 20-minute talk about ongoing projects and motivating issues, followed by 20 minutes of discussion with the audience. These seminars are the launching point for follow-on research discussion meetings which will hopefully lead to fruitful collaborative research.

- March 17, 2021: **Dr. Lydia Kavraki**, Director of the Ken Kennedy Institute and Professor of Computer Science, Rice University, and **Dr. Angela Radulescu**, Moore-Sloan Faculty Fellows, Center for Data Science, New York University
    - “Robotics in the Data Science Era” by Lydia Kavraki
    - “Toward Naturalistic Task Representation in Health and Disease” by Angela Radulescu
- April 8, 2021: **Dr. Arya Farahi**, Michigan Data Science Fellow, University of Michigan, and **Dr. Kate Starbird**, Associate Professor of Human-Centered Design and Engineering, University of Washington
    - "Quantifying and Mitigating Sources of Bias in a Decision-Support System" by Arya Farahi
    - "Revealing the “Big Lie”: Methodological Innovation for Rapid Response to Online Disinformation" by Kate Starbird
- April 21, 2021: **Dr. H.V. Jagadish**, Director of Michigan Institute for Data Science and Professor of Computer Science and Engineering, University of Michigan and **Dr. Ciera Martinez**, Biodiversity and Environmental Sciences Lead, Berkeley Institute for Data Science
    - "Data Equity: A Core Requirement for Responsible Data Science" by H.V. Jagadish
    - "Open Science in the Wild: Principles to Build Reproducible and Collaborative Data Analysis Workflows" by Dr. Ciera Martinez
- May 19, 2021: **Dr. Rosemary Gillespie**, Professor & Schlinger Chair in Systematic Entomology, University of California, Berkeley and **Dr. Shelly Trigg**, Data Science Postdoctoral Fellow, University of Washington
    - "Data Science to Measure the Natural World" by Rosemary Gillespie
    - "Diversity in Animal Response to Environmental Change" by Shelly Trigg
- June 16, 2021: **Dr. Laure Zanna**, Professor of Mathematics & Atmosphere/Ocean Science, New York University, and **Dr. Miguel Jimenez-Urias**, Postdoctoral Fellow, Earth and Planetary Sciences, Johns Hopkins University
    - "Blending Machine Learning and Physics to Improve Climate Models" by Laure Zanna
    - "Oceanic Stirring and Mixing of Passive Scalars: A Novel Closure" by Miguel Jimenez-Urias

Co-Hosted/Sponsored Webinars

- March 29-30, 2021: **Hands-on SARS-CoV-2 Genome Analysis Workshop**
    - Event organized and hosted by Baylor College of Medicine Human Genome Sequencing Center, Rice University, the COVID-19 International Research

Team (COV-IRT), DNAnexus, and the BCM Alkek Center for Metagenomics and Microbiome Research

- March 31, 2021: **3rd Virtual Symposium Presented by the COVID-19 International Research Team**
    - Co-Hosted with COV-IRT

Research Oriented Workshop

- December 9, 2021: **Unofficial NeurIPS Workshop**
    - Organized by the Ken Kennedy Institute with collaboration by Rice faculty Anshumali Shrivastava, Computer Science
    - 17 Rice speakers (graduate students) gave 18 20-min talks, highlighting the latest research on machine learning and artificial intelligence

Institute Sponsorship

- September 17-19, 2021: **HackRice 11**
    - HackRice is Rice University's premier student-run hackathon that brings together some of the brightest problem-solvers at Rice and from around the world. This year's themes were connectivity, digitization, and transitioning to a world post-COVID-19.
    - Anton Zhang helped mentor students during the hackathon

7. Rebranding

Updated Mission Statement

"The Ken Kennedy Institute is a multidisciplinary group that works collaboratively on groundbreaking research in artificial intelligence, data, and computing. We foster a clear and strategic pathway to real-world impact."

Ken Kennedy Institute Newsletters

Through our re-branding work with Sahar Paz, the Institute started weekly emails with several templates to our members, industry, and conference subscribers: weekly membership newsletters, spotlights, event reminders, and conference newsletters.

- 5,331 Total Subscribers (increase by 1,359, 34%)

Member of the Month

Beginning in July 2020, the Ken Kennedy Institute launched our Member of the Month highlight in member/industry newsletters as well as the website news. The member highlights have been featured pieces bringing notice to our members as well as the Institute when shared on LinkedIn by the members themselves.

Increased Social Media Presence

We enhanced the Institute's and Rice's visibility by actively posting to our Facebook, LinkedIn, and Twitter profiles combined with targeted marketing. We also created a Medium page where Angela Wilkins and Anton Zhang are contributing authors.

Working with Sahar Paz, starting in June we created a social media planning calendar and document to help schedule organized. Each post is posted to all three of our platforms – Facebook, LinkedIn, and Twitter. Based on our target audience and low activity levels, we deleted our Instagram account.

We worked on expanding our social media posts to cover a variety of content, including (1) Sales Content – make a donation, opt-in to our newsletter, follow on social, forward to a colleague, attend an event; (2) Brand Content – blog posts, quotes from our community, story or case study, highlighting past events; (3) Educational Content – educate about the Institute, highlight faculty, engage Rice community; and (4) Growth Content – giving value and motivation.

We have also created monthly marketing reports to track activity levels on our platforms and see where we can improve. We have improved and increased our interactions with the community, particularly on LinkedIn, through comments and posts.

- LinkedIn: 918 Followers (increase by 306)
- YouTube: 688 Subscribers (increase by 165)
- Twitter: 610 Followers (increase by 111)
- Facebook: 344 Followers (increase by 47)
- Medium: 22 Followers (Launched in July 2021) >> 1500+ views

Medium Articles

- July 13, 2021: **Angela Wilkins**, Executive Director, The Ken Kennedy Institute
  - "Welcome to the Era of Hardware-Algorithm Coevolution"
- July 19, 2021: **Angela Wilkins**, Executive Director, The Ken Kennedy Institute
  - "The State of Quantum Computing"
- July 28, 2021: **Anton Zhang**, Data Scientist, The Ken Kennedy Institute
  - "It's Time to Revamp Mask Fitting - Part I: How Covid-19 Revealed an Opportunity for Innovation"
- August 14, 2021: **Angela Wilkins**, Executive Director, The Ken Kennedy Institute
  - "DeepMind Has Not Solved The Protein Folding Problem Yet"
- August 30, 2021: **Anton Zhang**, Data Scientist, The Ken Kennedy Institute
  - "It's Time to Revamp Mask Fitting - Part 2: Will AI Save the Game?"
- September 3, 2021: **Angela Wilkins**, Executive Director, The Ken Kennedy Institute
  - "Four Uses for AI in Physics"
- October 5, 2021: **Angela Wilkins**, Executive Director, The Ken Kennedy Institute
  - "How Data Science in Houston is Driving Global Solutions"

- November 2, 2021: **The Ken Kennedy Institute**
    - "The Intersection of Healthcare and Artificial Intelligence"
- November 15, 2021: **Anton Zhang**, Data Scientist, The Ken Kennedy Institute
    - "How Does AI Reshape Material Science?"
- December 15, 2021: **The Ken Kennedy Institute**
    - "Why the Energy Transition Needs AI"

Website

Last year in 2020, the Ken Kennedy Institute went through a complete website overhaul in the summer, transitioning from Drupal 7 to 8. In June this year, we worked with Sahar and Rice's IT Team to make further changes to our site and customize it more to our needs.

The Institute added new material to the website, including a new Home, About, People, Research, Innovation, and Partnership pages. The updates highlight how the Institute impacts research, supports innovation and builds partnerships.

Materials

The Institute updated branding with new slide decks and letterhead. We also created a Brand Colors document to ensure we are following our brand guidelines as well as implementing our brand font, Lato.

8. The Future

Faculty have limited resources to move research forward that does not fit into the typical academic funding process. This hinders innovation, leading to large inter-institution centers, industry collaborations, and new ventures. We believe there is a need to build a community of data scientists with exceptional data science, machine learning, and AI skills to work in partnership with its world-renowned faculty at Rice to start, enable, and translate data-driven research. The Rice Data Science Initiative brought new faculty to its campus, but these faculty are separated by distance in space and departments. This team could act as a conduit to bring together the many data science efforts at Rice.