The Ken Kennedy Institute 2022

Goals

Our goals are multifaceted to impact research at Rice University:

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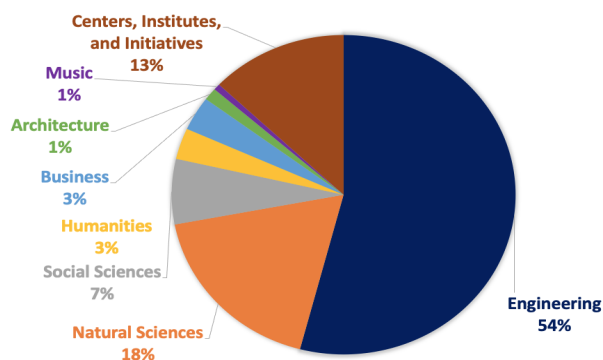- Promote an ecosystem of innovation

New in 2022:

- Partnership with Houston Methodist Academic Institute to create a seed grant program for robotics, medical imaging, and mental health for faculty, collaborating researchers, and clinician scientists
- Launched the inaugural AI in Health Conference, a new research conference for the community.

About The Ken Kennedy Institute

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.

The Ken Kennedy Institute is made up of 250 faculty members and senior researchers at Rice University, spanning engineering, natural sciences, humanities, social sciences, business, architecture, and music (increased by ten new members in 2022). Our members collaborate in interdisciplinary teams to gather and interpret data and develop solutions that address urgent problems facing our society. The Ken Kennedy Institute also has 67 associate members who are part of the greater campus population. In addition to these two communities, we have 4,550 subscribers to the Ken Kennedy Institute Community mailing list, 2,287 subscribers to the Data Science Community mailing list, and 3,141 subscribers to the HPC Community mailing list.

The Ken Kennedy Institute's members work in a variety of fields:

- AI, Robotics, & Neuroengineering
- Machine Learning, Optimization, & Statistics
- Bioinformatics and Data Science in Life & Health
- Computational Methods in Physics, Chemistry, & Materials Science
- Analytics in Business, Humanities, & Social Sciences
- Computer Systems & Engineering
- Data and Modeling in Energy, Infrastructure, & Sustainability
- Programming & High-Performance Computing

Primarily, the Ken Kennedy Institute is a catalyst for research collaborations across the conventional boundaries of laboratory, department, center, and university. Our increasingly complex world demands solutions that span disciplines. Today, most of our activities are in machine learning, AI, data science, and high-performance computing and how these can provide insight and enable convergent research in medicine, engineering, natural sciences, social sciences, humanities, and the arts. To facilitate new collaborations, we are continuing to establish research communities that focus on key problems affecting the world. These research communities are faculty-led collaborative efforts that are enabled by the Ken Kennedy Institute.

We encourage new conversations through our member events and Distinguished Lecture Series. We promote interdisciplinary research in AI and data science through a number of events, including our AI in Health Conference and Energy High Performance Computing Conference. We aid in workforce development through our summer Machine Learning Boot Camp. We work closely with industry to bring promising ideas to market, and we develop academic, industry, and community partnerships in the computational sciences.

The Ken Kennedy Institute staff comprises Lydia E. Kavraki, Director; Angela Wilkins, Executive Director; Michelle Atkinson, Program Administer; Samantha Nava, Director of Partnerships; and Kelly Peters, Marketing, Events, and Administrative Specialist. To help identify new ideas and opportunities to elevate the Ken Kennedy Institute and Rice University, the Ken Kennedy Institute has an External Advisory Board that expands the number of points of views across industries as well as a Faculty Advisory Committee consisting of Rice Faculty across multiple departments.

Throughout the year, the Ken Kennedy Institute has continued to develop collaborative efforts across Rice and the Houston data, computing, and technology community.

Impacting Research

Seed Funding. The Ken Kennedy 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 Ken Kennedy Institute awarded $32,500 in Digital Humanities seed funding in April 2022 to support four Rice faculty projects.

In the summer of 2022, the Ken Kennedy Institute provided $140,000 seed funding for the Rice University/Houston Methodist robotics and imaging seed grant program for a total of nearly $419,500 with Rice ENRICH and Houston Methodist Academic Institute. The purpose is to facilitate Houston Methodist and Rice University faculty collaborations.

The Ken Kennedy Institute looks to expand its seed funding awards in 2023.

Graduate Fellowships. The Ken Kennedy Institute continued to expand its recruiting fellowship program by offering four-year supplemental fellowships to seven graduate students at Rice University, totaling $105,000 in spring 2022. The fellowships are funded by the Ken Kennedy Institute, through its annual Energy High Performance Computing Conference, and the nominating departments. The goal of the program is to attract outstanding graduate students to Rice in the fields of high-performance computing, computational science and engineering, and data science, with special consideration given to students with research interests in the energy industry.

The Ken Kennedy Institute's annual graduate fellowship program awarded $65,000 to nine Rice University graduate students in four departments in the fall of 2022. The 2022-23 graduate fellowships are supported by bp, ExxonMobil, SLB, Shell, the Scott Morton Memorial (provided by the Energy HPC Conference), Andrew Ladd Memorial Excellence in Computer Science, and the Ken Kennedy-Cray Inc. endowment.

With the support of industry, the Energy High-Performance Computing Conference, and nominating departments, the Ken Kennedy Institute has awarded $1.6 million to 188 students since 2001.

Proposal development. The Ken Kennedy Institute is part of a research engine proposal on health equity and longevity. The goal is to create sustainable and transformative scientific contributions to improve healthcare equity through accelerating innovations in decentralized healthcare and educating a broad workforce.

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

The expected outcomes are new grant opportunities and potential centers and initiatives.

Shared Computing Infrastructure. Since 2002, the Ken Kennedy Institute has successfully worked with faculty to fund and build Rice's shared cyberinfrastructure. Today, the Ken Kennedy 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 users consume significant computing and storage resources in any given month. Financial support was channeled to the Ken Kennedy 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.

Building Partnerships

Building External Partnerships. The Ken Kennedy Institute has continued its partnership with Houston Methodist Academic Institute and Rice ENRICH to jointly support robotics and imaging seed funding for Rice and Methodist faculty. Our seed funding commitment grew into a seed grant program to foster innovative research between Rice University and the Houston Methodist Academic Institute faculty, collaborating researchers, and clinician scientists. Each institution will share equally in the funding of 20 multi-year projects in robotics, imaging, nursing, cardiovascular engineering, and psychological and behavioral health. The Ken Kennedy Institute will continue to lead this collaborative effort between our two institutions.

In partnership with Rice ENRICH, the Ken Kennedy Institute collaborated on the Rice University/Houston Methodist Nursing Innovation Retreat in October 2022. The day opened a conversation between Rice faculty and Houston Methodist nurses on novel ideas such as reducing barriers, optimizing nursing care at the bedside, and improving nursing workflow. We look

forward to continuing these connections and future conversations with Houston Methodist.

The Ken Kennedy Institute is continuing its collaborative relationship with MD Anderson Cancer Center, with discussions of creating a potential center around operations research and cancer treatments.

Institute External Memberships. We continued membership with the Alliance of Artificial Intelligence in Healthcare, the Greater Houston Partnership, the Carpentries (a global non-profit organization that builds global capacity in essential data and computational skills for conducting efficient, open, and reproducible research by developing openly accessible lessons, training instructors to lead inclusive, interactive workshops, and helping to coordinate these workshops), and the LF AI & Data Foundation (connects members with innovative technical projects, companies, and developer communities that are transforming artificial intelligence, machine learning, and deep learning).
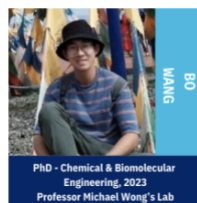
Supporting Innovation

Innovation Fellows. 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 support 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.

After only 2.5 months of the program, three Innovation Fellows qualified for the coveted six spots at the Napier Rice Launch Challenge Championship in April 2022.

Engagement. The 15th annual Energy High Performance Computing Conference on March 1-3, 2022, returned to be in person on the Rice campus. Attendees and sponsors were excited about the ability to network in person with 450 registered in-person attendees, 180 registered virtual attendees, and 35 sponsors (with a waitlist). This conference is the premier meeting place for the energy industry to engage in conversations about challenges and opportunities in high-performance computing, computational science and engineering, machine learning, and data science annually. The conference was renamed Energy (previously Oil & Gas) HPC Conference to allow for the inclusion of newer aspects of the energy industry.

The inaugural AI in Health Conference on November 7-9, 2022, brought together thought leaders from academic, clinical, and corporate settings to explore the intersection between healthcare and artificial intelligence. The creation of the conference was led by a driving force: the awe-inspiring potential for innovation to transform the health industry. The conference was hugely successful in its first year, with 377 registered attendees and eight sponsors. An attendee stated it was "the place to meet for learning about how healthcare is being transformed and will be transformed by artificial intelligence." The conference also included a workshop on reading, assembling, analyzing, and designing genomic data. The Ken Kennedy Institute looks forward to growing the AI in Health Conference in the years to come to be an annual celebration of advancements in artificial intelligence and machine learning in healthcare, as well as a space for researchers and clinicians to come together in pushing those advancements to new heights. We will pair the conferences with technical workshops led by invited faculty who have timely research topics.

The Machine Learning Boot Camp on May 19-20, 2022, hosted 59 attendees focused on machine learning for executives and beginners. The goal is 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, as well as be an opportunity for non-practicing beginners looking to learn. We also plan to offer an engineering-focused ML boot camp as well as extend with topics such as machine learning for the biomedical area in future years.

The Ken Kennedy Institute hosted several events and eight lecture series given by well-known speakers throughout the year. This year the Ken Kennedy Institute collaborated with the Rice Liu Idea Lab for Innovation and Entrepreneurship (Lilie) for the Technology Innovation Lecture Series, Rice Scientia for the Technology, Culture, & Society Lecture Series, the Rice Computer Science department for various lectures, and the Treangen Lab at Rice for the COVID-19 Symposium.

The Ken Kennedy Institute organized the Unofficial NeurIPS Workshop in Dec 2021 that allowed 17 Rice graduate students to give short talks highlighting the latest research on ML and AI. The workshop was well received, so the Ken Kennedy Institute plans to expand upon this type of event in the future.

We sponsored and provided support for HCC's Artificial Intelligence & the Future of Houston Conference and the Texas-Israel Alliance Healthcare Innovation Summit.

Visibility

- **Increased Presence.** The Ken Kennedy Institute increased marketing efforts and social media presence:

  - LinkedIn: 1,241 Followers (increase by 195)
  - YouTube: 943 Subscribers (increase by 184)
  - Twitter: 699 Followers (increase by 53)
  - Medium: 25 Followers (launched in July 2021)

Future Movement

- **Providing Unique Advantages for Data Science.** 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 community building and partnership development is key to these efforts.

  The Ken Kennedy Institute is uniquely positioned to tackle these challenges. The Institute can leverage the 300+ members across more than 10 departments at Rice University. Through events such as conferences, lectures, boot camps, and workshops, the Institute has built up a large base of connections and presence in industry, venture capital, and government. The institute can use these events to further its research agenda.

- **Research communities.** To advance the Ken Kennedy Institute's mission, we continue to build research communities in critical topics. These communities will build collaborative initiatives in the AI, healthcare, and computational sciences. We will support these communities with new resources and incentives for

faculty. The expected outcomes are new grant opportunities and potential centers and initiatives.

- **Expanding Fellowships.** Historically, the industry fellowship program has been predominantly in the energy industry. We would like to expand the fellowship program to include new industries and new internship opportunities.

- **Expanding Partnerships.** We will expand our efforts to develop partnerships with new institutions and industries. These strategic partnerships are targeted to enable the progress of the research communities and seed funding.

- **Strategic Partner Program.** We are in the process of creating a multi-level partnership program for the industry to engage with the Ken Kennedy Institute through multiple channels, such as sponsorships, fellowships, and workshops.

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AI, Data, and Computing for Global Impact

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