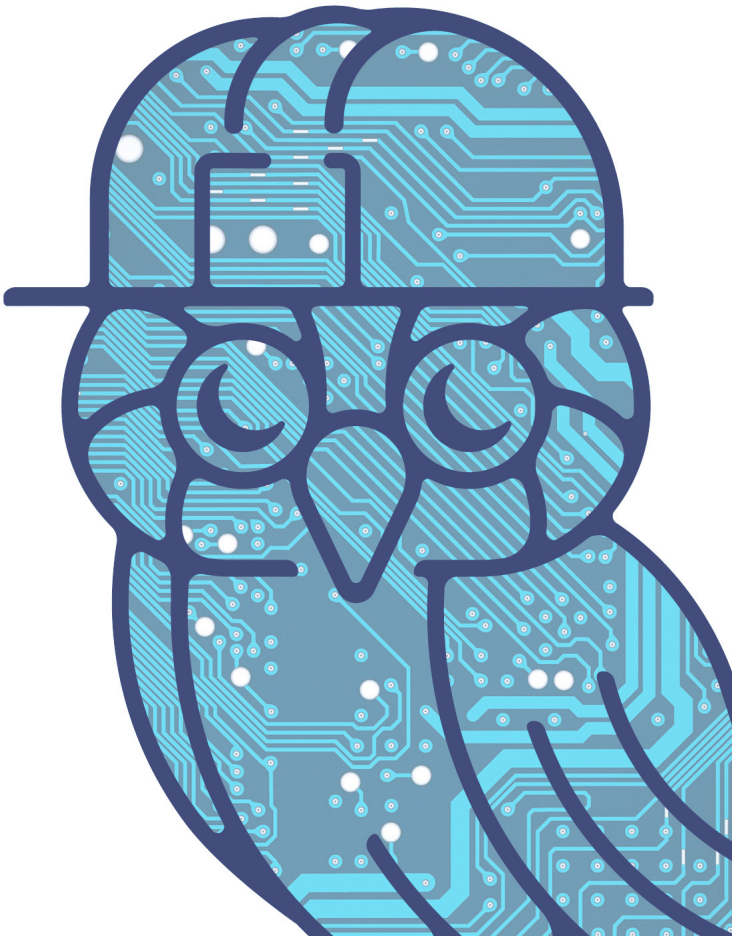
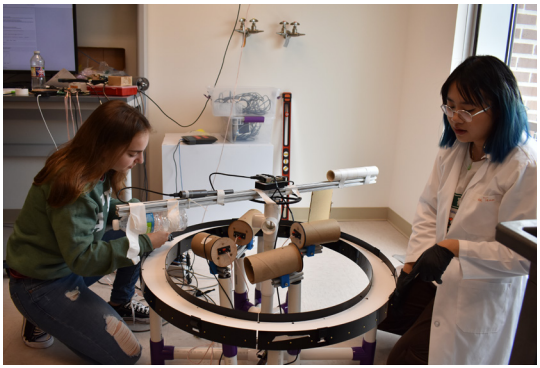
RICE ENGINEERING

Electrical and Computer Engineering

Research & Opportunities Guide

2021-2022





Building on more than forty years of research successes and discoveries, a major goal of our research efforts is to prove, encourage, and support new and far-reaching initiatives that look decades into the future.

Driven by a core group of internationally recognized faculty, extensively and uniquely experienced in research and education, our culture fosters close collaboration, which is the major force that maximizes technology impact and direction.

Table of Contents

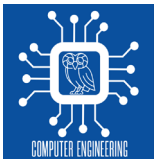
Electrical and Computer Engineering (ECE)

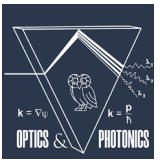
Who are ELECs?

Electrical and Computer Engineers (ELECs) create, innovate and design technologies in machine learning, computing, communications, electronics and automation. ELECs use hardware and software to create better, faster, safer technologies for things like cars, computers, smartphones, and health devices.

What do ELECs do?

ELECs are a diverse, smart, creative group of problem-solvers who make cool things that change the world. Smartphones, GPS, cars, and even things like healthcare and national security would not exist as they do today without them. ELECs go on to work in every industry imaginable, including healthcare, automation, energy, gaming, telecommunications, nanotechnology, security, and wireless.





How to Use This Guide

This guide is organized with our research areas first, then alphabetically by labs, and then alphabetically by faculty member with a brief description of their research.

Many faculty's work is interdisciplinary and covers multiple areas. Each faculty member has listed the area(s) that most pertains to their research and lists an email where you can contact them and communicate your interest.

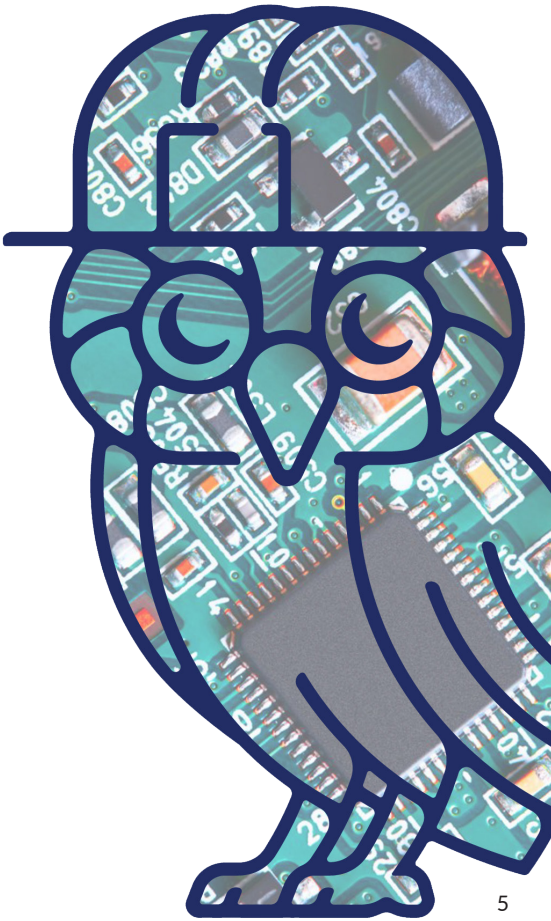
Useful information

- You can request to attend one of the regularly scheduled research group meetings held by a particular faculty member;
- Some faculty have summer Research Experiences for Undergraduates (REU) available;
- Continuing undergraduates and graduate students may take one 3-credit research course in the summer tuition free. This applies to courses like ELEC 490/590 and 491/591.

Research Area: Computer Engineering

The research in this discipline focuses on analog and mixed-signal design, computer architecture and embedded systems, hardware security and storage. Rice research in Computer Engineering touches on virtually every area that CE encompasses. Computer Engineering research at Rice is in analog and mixed-signal design, VLSI signal processing, computer architecture and embedded systems, biosensors and computer vision, and hardware security and storage systems. Current research in VLSI signal processing, focuses on algorithms for wireless communication systems and their efficient mapping to low-power architectures on DSPs, GPUs, ASICs, and ASIPs.

Analog and mixed-signal design research topics include self-healing circuits and large-scale radiating integrated circuits for medical imaging. Biosensors and mobile wireless healthcare are growing application areas in embedded systems research. Smartphones with imaging devices are leading to new areas in computer vision and sensing. Also in embedded systems, hardware security schemes are being based on physically unclonable functions. In the area of computer architecture, research interests include parallel computing for data science algorithms, large-scale storage systems, and resource scheduling for performance, power and QoS.



Faculty in this Discipline:

Athanasios C. Antoulas
Joseph R. Cavallaro
Taiyun Chi
Caleb Kemere
Yingyan Lin
Peter J. Varman
Gary Woods
Kaiyuan Yang

Research Area: Data Science

Data Science is an emerging discipline that integrates the foundations, tools and techniques involving data acquisition (sensors and systems), data analytics (machine learning, statistics), data storage and computing infrastructure (GPU/CPU computing, FPGAs, cloud computing, security and privacy) in order to enable meaningful extraction of actionable information from diverse and potentially massive data sources. Data scientists in ECE use digital signal processing algorithms to collect and understand the structure in data, looking for compelling patterns, telling the story that's buried in the data. They get to the questions at the heart of complex problems and devise creative approaches to making progress in a wide variety of application domains.

Data Science Initiative

The Data Science Initiative at Rice University is a multidisciplinary coalition working towards cutting-edge data-driven solutions and education for next generation citizens. Research faculty in every School on campus are developing research projects to develop data science methods and applications.

Learn more about the Data Science Initiative at datascience.rice.edu.

Faculty in this Discipline:

Behnaam Aazhang
Genevera Allen
Guha Balakrishnan
Richard G. Baraniuk
Caleb Kemere
Yingyan Lin
Michael Orchard
Ankit Patel
Xaq Pitkow
Jacob T. Robinson
Ashutosh Sabharwal
Akane Sano
Santiago Segarra
César Uribe
Peter J. Varman
Ashok Veeraraghavan

Research Area: Neuroengineering

The brain is essentially a circuit. Neuroengineering is a discipline that exploits engineering techniques to understand, repair and manipulate human neural systems and networks. At Rice, we have a world-class team collaborating with Texas Medical Center researchers to improve the fundamental understanding of coding and computation in the human brain as well as to develop technology for treating and diagnosing neural diseases. Current research areas include interrogating neural circuits at the cellular level, analyzing neuronal data in real-time, and manipulating healthy or diseased neural circuit activity and connectivity using nano electronics, optics, and emerging photonics technologies.

Rice Neuroengineering Initiative

We apply electrical engineering, bioengineering, medical, and statistical approaches to an extremely elaborate system—the human brain. Our work addresses complex, interconnected problems within the brain that require multi-disciplinary, multi-institutional collaboration to solve.

Our Mission: We provide a cohesive environment that fosters collaboration between researchers, scientists, doctors, and clinicians. We maximize our research impact by working across traditional boundaries.

Faculty in this Discipline:

Behnaam Aazhang
Genevera Allen
Guha Balakrishnan
Richard G. Baraniuk
Caleb Kemere
Lan Luan
Ankit Patel
Xaq Pitkow
Jacob T. Robinson
Ashok Veeraraghavan
Chong Xie

Research Area: Optics and Photonics

The focus of this program is the improved understanding of electronic, photonic, and plasmonic materials, optical physics, the interaction of light and matter, along with the application of that knowledge to develop innovative devices and technologies. The specific areas of interest cover a broad range: Nanophotonics and plasmonics, optical nanosensor and nano-actuator development, studies of new materials, in particular nanomaterials and magnetically active materials; imaging and image processing, including multispectral imaging and terahertz imaging; ultrafast spectroscopy and dynamics; laser applications in remote and point sensing, especially for trace gas detection; nanometer-scale characterization of surfaces, molecules, and devices; organic semiconductor devices; single-molecule transistors; techniques for optical communications; optical interactions with random, nanoengineered, and periodic media; and applications of Nanoshells in biomedicine.

Faculty in this Discipline:

Alessandro Alabastri
Songtao Chen
Naomi J. Halas
Kevin Kelly
Junichiro Kono
Gururaj Naik
Jacob T. Robinson
Gary Woods
Yuji Zhao

Research Area: DSP and Systems

Signal processing is the analysis and transformation of signals - measurements taken over time and/or space - in order to better understand, simplify, or recast their structure. Rice has a long history in digital signal processing (DSP) dating back to its inception in the late 1960s. Current research spans a wide range of areas, including image and video analysis, representation, and compression; wavelets and multiscale methods; statistical signal processing, pattern recognition, and learning theory; distributed signal processing and sensor networks; communication systems; computational neuroscience; and wireless networking. Machine learning is a large part of our Systems research.

Faculty in this Discipline:

Behnaam Aazhang
Athanasios C. Antoulas
Richard G. Baraniuk
Joseph R. Cavallaro
Rahman Doost-Mohammady
Gene Frantz
Edward W. Knightly
Michael Orchard
Ankit Patel
Ashutosh Sabharwal
Saad Saleh
Ray Simar
Thanh Tran
Ashok Veeraraghavan

Research Area: Wireless Networking, Sensing and Security

Wireless at Rice ECE started in 1985 with an emphasis on physical layer algorithms and architectures for wireless. Since then, the group has continued to grow rapidly in new directions, including network protocols, experimental platforms, mobile systems, high-speed circuits, mmWave and THz networking, and most recent machine learning for wireless.

Notable milestones of the Wireless Research area include:

- Multiuser decoding, including bounds, methods and hardware architectures
- Cooperative communications
- Full-duplex wireless
- Technology-for-all deployed testbed
- Wireless open-Access Research Platform (WARP)
- Argos Project

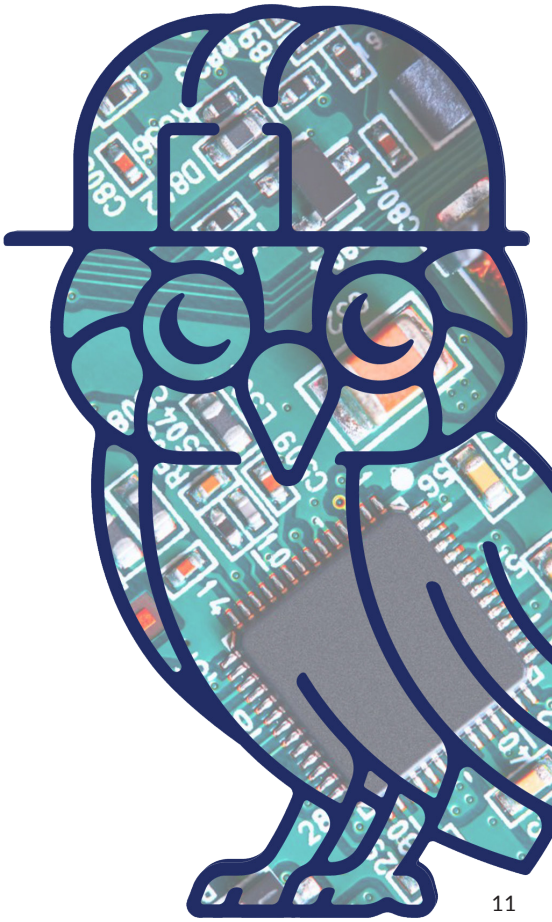
Faculty in this Discipline:

Joseph Cavallaro
Ang Chen
Taiyun Chi
Rahman Doost-Mohammady
Edward Knightly
Yingyan Lin
Ashutosh Sabharwal
Santiago Segarra
Ashok Veeraraghavan

Research Area: Health

The Rice ECE Health research area focuses on healthcare and wellness technologies. Projects include bio-behavioral sensing, and bio-imaging. Faculty are dedicated to quantitatively understand the behavior-biology-health pathways. With each innovation, they move a step closer to the vision of bio-behavioral medicine, where behavior and biology are treated cohesively and with empathy.

Currently, 10-15% of the department research budget is in health-related applications. Research teams take advantage of being located within the Texas Medical Center area; they also work with community partners to hold “computing for health” programs for k-12 students and high school teachers.



Faculty in this Discipline:

Guha Balakrishnan
Ashutosh Sabharwal
Akane Sano
Ashok Veeraraghavan

Research Area: Quantum Research

Quantum mechanics has been studied in the research community for nearly a century, providing rules that explain physical processes in atoms, molecules, and solids, which led to the invention and commercialization of lasers, MRI imagers, transistors, and nuclear power generation. Now the field is undergoing a revolution, enabling even more powerful applications, based on genuinely quantum, nonintuitive concepts such as superposition and entanglement. We are utilizing cutting-edge photonic, electronic, and magnetic technologies to control excitons, phonons, plasmons, magnons, and polaritons in quantum materials for applications in quantum simulation, quantum sensing, and quantum networks.

Faculty in this Discipline:

Alessandro Alabastri
Songtao Chen
Taiyun Chi
Naomi J. Halas
Junichiro Kono
Lan Luan
Gururaj Naik
Gary Woods
Yuji Zhao

How Can Students Get Involved?

ECE faculty regularly have openings for undergraduate and graduate students in their research labs. Students interested in research are strongly encouraged to speak with faculty whose work aligns with their own interests to see what opportunities may be available.

What are REU's?

Research Experience for Undergraduates (REU) opportunities are often available through individual National Science Foundation (NSF) research grants in the ECE Department. Each student is associated with a specific research project, where they work closely with the faculty and other researchers. Many ECE faculty offer REU's and students are encouraged to seek out professors they would like to work with.

Distinction in Research and Creative Work Award

Rice University has a long tradition of encouraging undergraduate research which is one of the distinctive features of the curriculum. In the Electrical and Computer Engineering Department, students conduct research in computer engineering, data science, neuroengineering, photonics, nanoengineering, and systems. Our students have received scholarships and awards, along with external recognition for their research presentations at conferences, and through publications in proceedings and journals.

The ECE Undergraduate Committee and the ECE Undergraduate Student Awards Committee will evaluate applications from the students. The distinction is for projects "above and beyond the norm" in the field.

ELEC 490/590: Electrical Engineering Research Projects

ELEC 490/590 is a course where undergraduates and graduate students can conduct theoretical and experimental investigations under ECE faculty direction.

Rice ECE Bybee Travel Award

The Bybee Travel Award is awarded annually to Rice ECE undergraduate students. Applicants who are seeking financial assistance for design projects, research or study abroad are encouraged to apply. Funding rates and the number of awards distributed vary, but will typically fall between $500 and $2000. The award recipients will be chosen by merit of the project. More details such as application dates and deadlines can be found at https://bit.ly/2G6400M.

The award is provided by Dr. Hal H. Bybee, Jr., ‘64, to recognize undergraduate juniors or seniors in Electrical and Computer Engineering for design team projects, research or study abroad.





Research Internships Abroad

Contact the Rice Study Abroad office for possible opportunities. For example, the DAAD RISE Germany offers summer research internships in Germany for undergraduate students from North America, Great Britain and Ireland.

Check out https://www.daad.de/rise/en/rise-germany/ to learn more.

More details about opportunities can be found at abroad.rice.edu and https://bit.ly/3o1XrAb

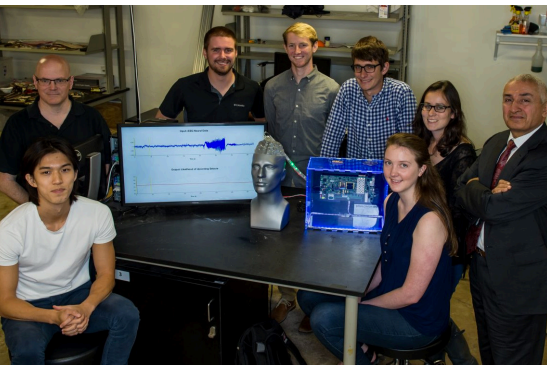
VIP Vertically Integrated Projects @ Rice

The Vertically Integrated Projects (VIP) Program at Rice unites undergraduate education and faculty research in a team-based context. Undergraduate Rice VIP students earn academic credits, while faculty and graduate students benefit from the design/discovery efforts of their teams.

VIP at Rice extends the academic design experience beyond a single semester. It provides the time and context to learn and practice professional skills, to make substantial contributions, and experience different roles on large multidisciplinary design/discovery teams.

The long-term nature of VIP creates an environment of mentorship, with faculty and graduate students mentoring teams, experienced students mentoring new members, and students moving into leadership roles as others graduate. Rice VIP teams are comprised of students from first years to seniors, with a variety of majors and backgrounds.

Rice's VIP program helps involve undergraduates in ongoing research. The implementing faculty members are all in the Department of Electrical and Computer Engineering (ECE). New teams are forming that include the following departments: Mechanical Engineering, Physics and Bioengineering.



Current Projects | New Projects

- PHAST: Parallel Hardware Applications in Science and Technology
- Next-Gen Wearables
- IOT Flood Sensor
- Rice Electric Vehicle
- Renew Wireless
- PROJ 979 - RVR, DSP, ML, HS

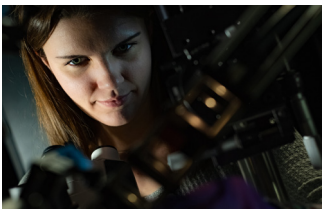
Past Projects:

- A Digital Cure for Epilepsy
- DISSECT: Embedded Systems

Research Groups

Chen Lab

The Chen Lab works on quantum defects and quantum optics. They explore solid-state spins in silicon with telecom optical interfaces as qubits for quantum information processing towards quantum communication and computing applications. On a system level, the Chen Lab aims to build hybrid integrated silicon quantum photonic chips consisting of spin-based quantum memories and other photonic circuit elements, as multiplexed quantum registers and repeaters, for realizing scalable quantum networks.



Associated ECE Faculty:
Chen

Data to Knowledge Lab (D2K)

The Rice D2K Lab provides students with engagement, enrichment, and experiential learning opportunities by connecting students with real-world data science challenges from companies, community organizations and researchers.

Associated ECE Faculty:
Allen

Digital Signal Processing Group

Digital Signal Processing (DSP) - the transformation of data (signals, images, video, etc.) to extract or better transmit information - has evolved from an obscure research discipline into an essential technology of everyday life. Rice has been a major force in DSP research and education and many outstanding DSP alumni now hold leadership positions in academia and industry.

Associated ECE Faculty:
Baraniuk, Cavallaro, Frantz, Johnson, Kemere, Orchard, Patel, Pitkow, Sabharwal, Veeraraghavan

Computational Wellbeing Group

This research involves data science, machine learning, behavioral science, mobile and ubiquitous computing, physics and human computer interaction studies of non-clinical populations as well as clinical populations in collaboration with researchers in psychology, psychiatry, sleep and circadian disorders, engineering and behavioral science.

Associated ECE Faculty:
Sano

Halas Research Group

The Halas group is focused on four principal missions: to design new optically active nanostructures driven by function; to develop and implement new nanofabrication strategies to build, orient, and pattern these nanostructures into new materials and devices; to characterize and understand the physical properties of these optically active nanostructures, devices and materials; and to prototype the use of optically active nanostructures in applications of potential technological and broad societal interest.

Associated ECE Faculty:
Halas

Nanoscale Neural Interface Laboratory

Nanoscale Neural Interface Laboratory (Xie Lab) develops theories focused on tissue integrated neural electrodes, neural recoding, neural interfaces, and longitudinal electrophysiology in clinical research.

Associated ECE Faculty:
Xie

Kono Lab

The Kono group is currently focused on the physics and applications of semiconductor nanostructures and quantum device structures. They use state-of-the-art spectroscopic techniques to study charge, spin, and vibrational dynamics in a variety of nanostructures.

Associated ECE Faculty:
Kono

Efficient and Intelligent Computing Lab

The Efficient and Intelligent Computing (EIC) Lab explores techniques that highlight a holistic optimization of algorithm, system, and application-level opportunities that can bring powerful machine-learning systems to devices.

Associated ECE Faculty:
Lin

Patel Lab

Part of Rice Neuroengineering, the Patel Lab's focus is to bridge neuroscience and deep machine learning by building theories that work in the real world.

Associated ECE Faculty:
Patel

Laboratory for Nanophotonics

The goal of the Laboratory for Nanophotonics (LANP) is to invent, understand, develop, simulate, control, optimize, and apply nanoscale optical elements to components and systems.

Associated ECE Faculty:
Alabastri, Halas, Naik

The Laboratory for Nanophotonic Computational Imaging and Sensing (NCIS)

NCIS designs and builds imaging systems that can dramatically outperform systems built from traditional physical optics. The founding principle is that by co-designing nanophotonic devices and imaging algorithms, we can break free of the limitations imposed by conventional physical optics like lenses and mirrors.

Associated ECE Faculty:
Robinson, Veeraraghavan

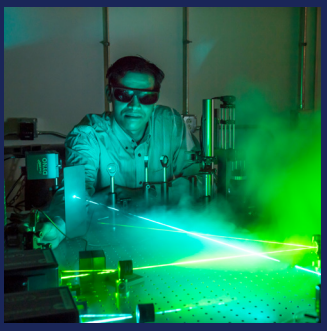
Luan Laboratory of Integrative Neural Interface

The Luan Laboratory of Integrative Neural Interface research focuses on the development of multimodal neural interfaces that combine the state-of-art electrical, optical and other technologies to monitor and manipulate brain activity. The application of these neurotechnology advancements enables the fundamental investigation of neurological disorders and the development of novel therapies.

Associated ECE Faculty:
Luan

The Naik Lab

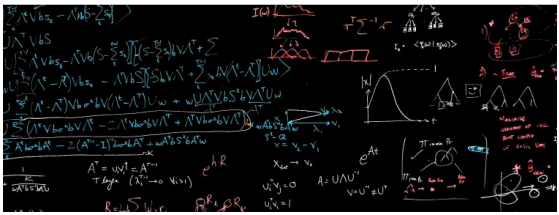
The Naik Lab explores, invents and innovates the science and technology of extreme control of light and heat using nanotechnology. While discovering new scientific phenomena, the Naik Lab addresses global challenges in energy and healthcare by developing new technologies for efficient renewable energy harvesting, compact imaging, and sensing.



Associated ECE Faculty:
Naik

The Neural Computation Laboratory

The Neural Computation Laboratory aims to understand how the brain works using mathematical principles. They develop theories of neural computation and collaborate with experimentalists to test these predictions.



Associated ECE Faculty:
Pitkow

The Realtime Neural Engineering Laboratory

Forming, storing, and using memory requires the hippocampus. Problems in the hippocampal circuit can lead to memory problems (e.g., Alzheimer's, PTSD), depression and anxiety. We work to understand how the hippocampal circuit works at a systems-level in healthy brains, how it goes wrong, and what can be done to change how it functions.

Associated ECE Faculty:
Kemere

Rice Integrated Systems and Electromagnetics Lab

Rice Integrated Systems and Electromagnetics (RISE) Lab focuses on integrated circuits and systems for various high-impact and emerging applications, including high-speed wireless communication, sensing, imaging, and health care.

Associated ECE Faculty:
Chi

NEUROENGINEERING
AT RICE UNIVERSITY

Neuroengineering Initiative at Rice

The sole focus of the Neuroengineering Initiatve is applying electrical engineering concepts to an extremely elaborate system—the human brain. Through our work, we strive to address complex, interconnected problems within the brain that require multi-disciplinary collaboration to solve. The Rice Neuroengineering Initiative brings together the brightest minds in neuroscience, engineering, and related fields to improve lives by restoring and extending the capabilities of the human brain.

Associated ECE Faculty:
Aazhang, Chi, Kemere, Luan, Patel, Pitkow, Robinson, Seymour, Veeraraghavan, Xie, Yang

Rice Networks Group

Rice Networks Group (RNG) is devoted to protocols, theory, and experimental research in next generation wireless networks. The group has deployed and operates a large-scale programmable and experimental access network in Southeast Houston.

Associated ECE Faculty:
Knightly

Robinson Lab for Nano-neurotechnology

The Robinson Lab for Nano-neurotechnology believes that new methods to measure and manipulate the activity of specific brain cells will reveal fundamental principles of brain function and advance the treatment of neurological disorders. Using semiconductor nanofabrication and genetic engineering, the lab creates electronic, photonic, and magnetic interfaces to the brain. In addition, the lab studies millimeter-sized invertebrates with tiny nervous systems.

Associated ECE Faculty:
Robinson

Wireless

Rice University Wireless Research Group has received a $1.5 million National Science Foundation (NSF) grant to develop an open-source platform to meet the urgent need of developing and validating machine-learning (ML)-based innovations for future wireless networks and mobile applications. The goal of the project led by Yingyan Lin, is to develop a first-of-its-kind community platform to turbocharge the research process of inventing novel ML-based techniques for intelligent wireless network management and optimization.

Associated ECE Faculty:
Cavallaro, Chen, Doost-Mohammady, Lin, Sabharwal

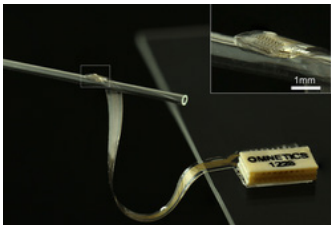
Scalable Health Labs

Scalable Health Labs is focused on mobile bio-behavioral sensing, to develop novel "sensors" that can simultaneously measure both bio- and behavioral-markers for a given healthcare context. The challenge lies in measuring both bio- and behavioral-markers in-situ, away from a clinic or healthcare facility. The new sensors will be the foundation of next-generation healthcare architecture, where both the patient and healthcare providers are empowered by relevant and timely information.

Associated ECE Faculty:
Sabharwal, Sano, Veeraraghavan

Translational Biomimetic Bioelectronics Lab

TBBL designs, builds, and tests novel translational tools to address needs in neurology and brain computer interfaces. We employ biophysics, material science, advanced manufacturing, and neuroscience methods to move neurotechnology closer to reality.



Associated ECE Faculty:
Seymour

Wide Bandgap Innovative Device Engineering (WIDE) Lab

The WIDE Lab at Rice University seeks wide understandings, wide approaches, wide applications, and wide impacts in fundamental science and novel device technologies. The current research projects involve the materials science and device engineering of wide bandgap semiconductors, such as GaN, AlN and diamond, for energy efficiency, RF and power electronics, and quantum photonics applications.

Associated Faculty:
Zhao

ECE Faculty

Behnaam Aazhang, J.S. Abercrombie Professor
aaz@rice.edu
Research areas: Data Science, Neuroengineering, Systems
Dr. Aazhang's research interests are signal processing, information theory, and their applications to neuroengineering with a focus on developing minimally invasive and non-invasive real-time closed-loop stimulation of neuronal systems to mitigate disorders such as epilepsy, Parkinson, depression, and obesity.

Alessandro Alabastri, Assistant Professor
alabastri@rice.edu
Research areas: Optics and Photonics, Quantum Engineering
Dr. Alabastri's focus is in nanophotonics and computational modeling of photo-thermal interactions in complex nanostructures.

Genevera Allen, Associate Professor
gallen@rice.edu
Research areas: Computer Engineering, Systems, Data Science
Dr. Allen's research focuses on developing statistical machine learning tools to help scientists make reproducible data-driven discoveries. Dr. Allen is also the Founder and Faculty Director of the Rice Center for Transforming Data to Knowledge, informally called the Rice D2K Lab.

Athanasios C. Antoulas, Professor
aca@rice.edu
Research areas: Computer Engineering, Systems
Dr. Antoulas is interested in large-scale dynamical systems, approximation, computation, and linear algebra.

Richard G. Baraniuk, C. Sidney Burrus Professor
richb@rice.edu
Research areas: Data Science, Neuroengineering, Systems
Dr. Baraniuk is the founder of OpenStax, providing free college textbooks. He is interseted in multiscale, computational signal and image processing and open access, collaborative scholarly publication.

Guha Balakrishnan, Assistant Professor
guha@rice.edu
Research areas: Data Science, Neuroengineering, Health
Dr. Balakrishnan is interested in the theory, design and applications of generative models for visual data like images and videos. He also often works at the intersection of computer vision and healthcare.

Joseph R. Cavallaro, Professor
cavallar@rice.edu
Research areas: Computer Engineering, Systems
Dr. Cavallaro's research impacts the development of the next generation of cellular mobile phones. He studies Wireless Communication Systems Architectures, VLSI Systems Design and Prototyping.

Songtao Chen, Assistant Professor
songtao.chen@rice.edu
Research areas: Optics and Photonics, Quantum Engineering
Dr. Chen's research focuses on exploring and exploiting the optically interfaced solid-state spins for quantum information processing, towards quantum communication and quantum computing applications.

Taiyun Chi, Assistant Professor
taiyun.chi@rice.edu
Research areas: Computer Engineering, Quantum Engineering
Dr. Chi focuses on RF/millimeter-wave/terahertz integrated circuits, integrated bio-sensors and bio-actuators.

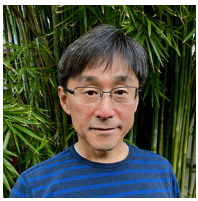
Rahman Doost-Mohammady, Assistant Research Professor
doost@rice.edu
Research areas: Systems
Doost-Mohammady is currently serving as the technical lead for the Rice RENEW project (Reconfigurable Eco-system for Next-generation End-to-end Wireless). He continues to build on his expertise in wireless systems architecture.

Naomi J. Halas, Stanley C. Moore Professor
halas@rice.edu
Research areas: Optics and Photonics, Quantum Engineering
Dr. Halas' group harvests solar radiation for energy applications and researches nanoparticle use in cancer therapy. She designs and fabricates optically responsive nano structures, nanophonotics, and plasmonics.

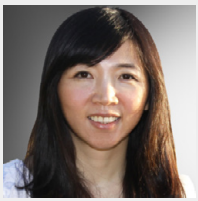
Kevin Kelly, Associate Professor
kkelly@rice.edu
Research areas: Optics and Photonics
Dr. Kelly is interested in imaging and spectroscopy at the nanoscale, and in understanding the role of mathematics in image acquisition and interpretation. Other interests include Scanning Probe Microscopy, Electronic Materials, Compressive Infrared and Hyperspectral Imaging.

Caleb Kemere, Associate Professor
caleb.kemere@rice.edu
Research areas: Neuroengineering
Dr. Kemere is researching memory manipulation for the greater good (treating PTSD) and Deep Brain Stimulation (DBS) for treatment of diseases like Parkinson's. He is interested in building interfaces with memory and cognitive processes; model-based signal processing; and low-power embedded systems.

Edward Knightly, Sheafor-Lindsay Professor
knightly@rice.edu
Research areas: Systems
Professor Knightly's research interests are design and in-the-field demonstration of new mobile and wireless networks and systems, including mission-driven autonomous drone networks, wireless security, and networked spectrum access in UHF, 60 GHz, THz, and visible light.



Junichiro Kono, Professor
kono@rice.edu
Research areas: Optics and Photonics, Quantum Engineering
Professor Kono is a leader in optical studies of condensed matter systems and photonic applications of nanosystems, including semiconductor nanostructures and carbon-based nanomaterials.



Yingyan Lin, Assistant Professor
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Research areas: Computer Engineering, Data Science
Dr. Lin's research interests include embedded machine learning; Energy-efficient/real-time machine learning systems for resource-constrained platforms.

Lan Luan, Assistant Professor
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Research areas: Neuroengineering, Quantum Engineering
Dr. Luan's research focuses on the development of multimodal neural interfaces that combine the state-of-art electrical, optical and other technologies to monitor and manipulate brain activity.

Gururaj Naik, Assistant Professor
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Research areas: Optics and Photonics, Quantum Engineering
Dr. Naik's research focuses on light and heat management for clean energy: thermophotovoltaics and photovoltaics; materials for plasmonics and metamaterials; large-area nanofabrication and integration.

Michael Orchard, Professor
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Research areas: Data Science, Systems
Dr. Orchard's research focuses on image and video modeling and compression.

Ankit Patel, Assistant Professor
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Research areas: Data Science, Neuroengineering, Systems
Dr. Patel's work and research involves Probabilistic Theories of Deep Learning from first principles; Neurally-inspired learning and computation; Medical Imaging Diagnosis; Reverse-engineering neocortex; and Deep Learning for Particle Physics.

Xaq Pitkow, Assistant Professor
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Research areas: Neuroengineering, Systems
Dr. Pitkow's research is on theories of neural computation in animal brains. Topics include probabilistic inference, control theory, nonlinear dynamics, population codes including analyzing behaviors of animals playing video games; designing animal virtual reality environments; stimulating and analyzing computation in neural networks.

Jacob T. Robinson, Associate Professor
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Research areas: Data Science, Neuroengineering, Optics and Photonics
Dr. Robinson is currently interested in developing nanofabricated devices to study the structural and functional dynamics of living neural circuits.

Ashutosh Sabharwal, ECE Department Chair, Professor
ashu@rice.edu
Research areas: Data Science, Systems
Dr. Sabharwal's research spans the whole spectrum of fundamental theoretical foundations surrounding the design of novel wireless networks including information theory, multiple antenna systems, coding, and computation.

Akane Sano, Assistant Professor
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Research areas: Data Science
Dr. Sano's research focuses on mobile health and affective computing. She has been working on measuring and understanding stress, sleep, mood and performance from ambulatory human long-term data and designing intervention systems.

Santiago Segarra, Assistant Professor
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Research areas: Data Science
Dr. Segarra is currently working on data science for networks, modeling, analysis, and design of networked systems. His focus includes signal processing, machine learning, optimization, and algebraic topology applied to the understanding of networks and network data.

John Seymour, Associate Professor
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Research areas: Neuroengineering
Dr. Seymour's research explores the physics of brain signals and novel devices that can record and stimulate brain activity. His interests are around the translation of neurophysiology tools, including next-generation implantable medical devices and their manufacturing methods.

César A. Uribe, Assistant Professor
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Research areas: Computer Engineering, Data Science
Dr. Uribe's research interest is the analysis of algorithms for distributed inference and social learning, and the fundamental limits of distributed optimization over networks.

Peter J. Varman, Professor
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Research areas: Computer Engineering, Data Science
Dr. Varman's current focus is on computer systems, storage and memory systems, virtualization, resource management, and cloud computing.

Ashok Veeraraghavan, Professor
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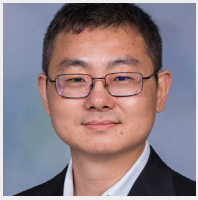
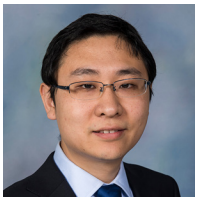
Research areas: Data Science, Systems
Dr. Veeraraghavan current works are on computational imaging, compressive sensing for imaging, signal processing and computer vision.



Chong Xie, Associate Professor
chong.xie@rice.edu
Research areas: Neuroengineering
Professor Xie's research focuses on exploring and exploiting nanomaterials/structures in biomedical applications as well as bio-nanotechnology, bio-MEMS, and neural engineering.



Kaiyuan Yang, Assistant Professor
kyang@rice.edu
Research areas: Computer Engineering
Dr. Yang's research focuses on designing low-power digital and mixed-signal circuits for future secure and low-power applications, especially the Internet of Things (IoT). He is also interested in hardware security and circuit/system design with emerging devices.

Yuji Zhao, Associate Professor
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Research areas: Optics and Photonics, Quantum Engineering
Professor Zhao's research and teaching interests are in the area of electronic materials, advanced devices, and nanotechnologies. His current research projects involve the materials science and device engineering of wide bandgap semiconductors for energy efficiency, RF and power electronics, and quantum photonics applications.

ECE Professors in the Practice

Gene Frantz, Professor in the Practice
genf@rice.edu
Research areas: Systems
Professor Frantz is a leader in the design and application of signal processing systems and the creation of new business ventures. His current work is in System-in-Package multi-chip module technologies.

Saad J. Saleh, Professor in the Practice
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Research areas: Systems
Dr. Saleh focuses on complex emergent systems, feedback control of networked systems, statistical signal processing, pattern recognition, earth science applications of signals and systems theory.

Ray Simar, Professor in the Practice
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Research areas: Computer Engineering
Professor Simar works with digital signal processors; design methodology and programming tools.

Thanh Tran, Professor in the Practice
tttran@rice.edu
Research areas: Systems
Dr. Tran focuses on high speed system interconnects, video/audio systems, downhole telemetry systems, and light-based hearing aids.

Gary Woods, Distinguished Professor in the Practice
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Research areas: Computer Engineering, Optics and Photonics, Quantum Engineering
Dr. Wood's focus is on compressive sensing, semiconductor failure analysis, and mobile health. He also works on optical probing and debugging of advanced integrated circuits.

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