2023–2024 HILDEBRAND DEPARTMENT ENDOWMENT IMPACT REPORT

Beyond the Surface

A YEAR OF EXCEPTIONAL DISCOVERY IN ENERGY

The University of Texas at Austin
Hildebrand Department of Petroleum and Geosystems Engineering
Cockrell School of Engineering

<< Read more about Dr. Balhoff's vision for UT PGE

Unrivaled Excellence

When I became chair of the Hildebrand Department of Petroleum and Geosystems Engineering (UT PGE) last year, I spent those first months meeting with faculty and staff, hosting town halls for students, and connecting with alumni and industry leaders. With their invaluable input, I launched my vision for the department: *We will shape the world's energy future through innovative education and research in sustainable subsurface energy production and storage.*

As you'll see in this report, we are already making great strides. We've secured groundbreaking research funding for carbon capture, hydrogen, rare earth elements and more. Our renowned faculty continues to earn recognition for excellence in both research and teaching. We offer students unparalleled experiences like our Energy AI Hackathon and popular Sustainable Energy minor, and full-time job placement for our graduates is near 100 percent.

We're immensely grateful for generous support like that from the Hildebrand endowment. Thanks to you, we remain at the forefront of energy research and education — and every UT PGE engineer who walks across the stage at graduation is prepared to undertake the critical work of providing reliable, affordable and sustainable energy for the world.

Lois and Richard Folger Leadership Chair
Bank of America Centennial Professorship in Petroleum Engineering

“The most rewarding aspect of the Energy AI Hackathon was being able to complete an entire machine learning model with my team, which I had never done before this event.

Having the opportunity to solve a real-world oil and gas problem using data analytics has brought me even closer to achieving my goal of becoming a data-science-oriented energy engineer.”

—OSCAR ROMAN (BSPE 2025)

Energy AI Hackathon

Twenty-five teams competed in the Hildebrand Department’s fourth annual Energy AI Hackathon last January, spending 36 hours solving a challenging multivariate energy problem designed by architects Elnara Rustamzade (PhD PE 2025) and Fehmi Özbayrak (MSPE 2024). Students used open-source Python and R to code their proposed solutions under the guidance of expert mentors from BP, Chevron, ExxonMobil, Pioneer and SparkCognition. A panel of data science experts from Amazon, Baker Hughes, BP, ComboCurve and Pioneer judged each team’s solution.

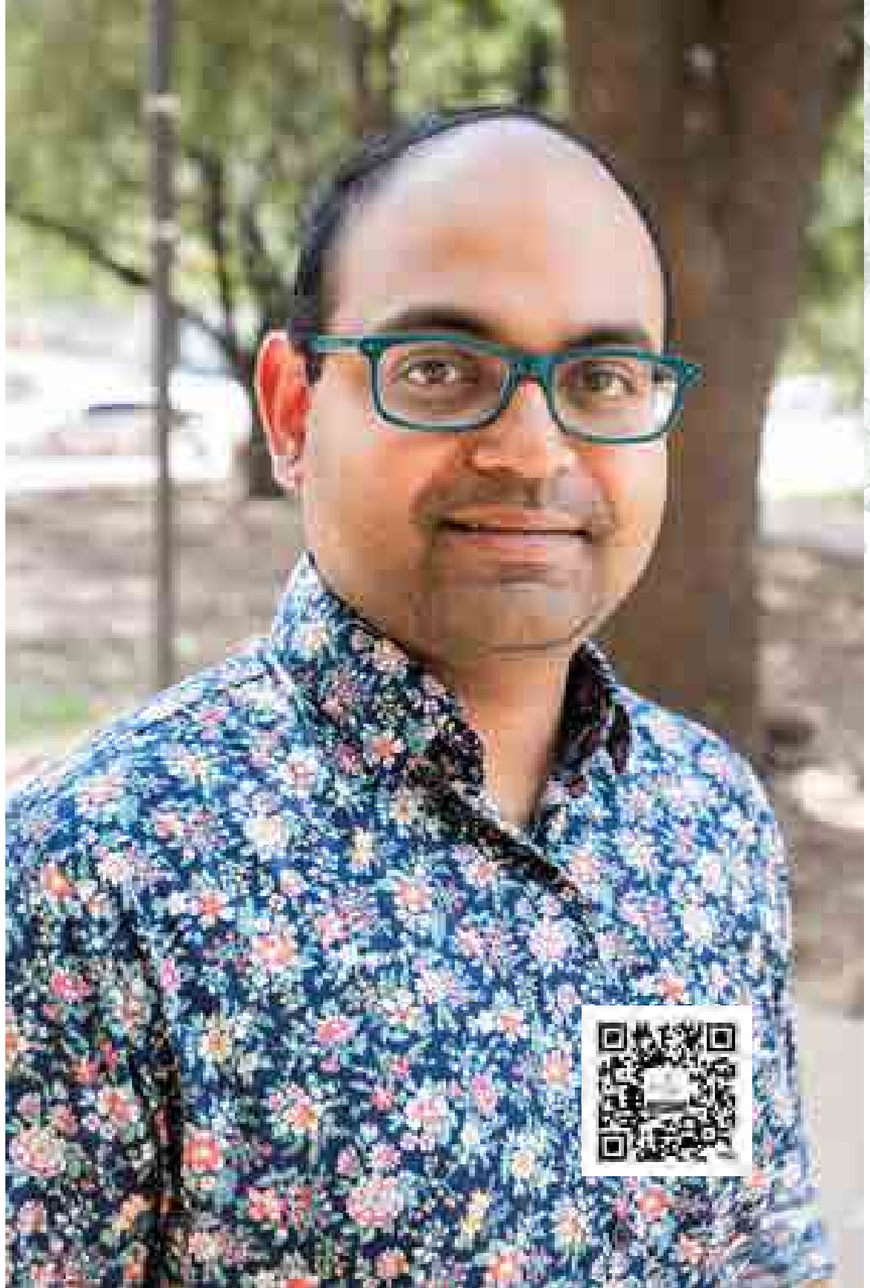
The popular annual event co-hosted by Professor Michael Pyrcz and Associate Professor John Foster drew about 160 students representing programs across The University of Texas at Austin, including the Cockrell School of Engineering, the College of Natural Sciences, the Jackson School of Geosciences and the McCombs School of Business. At least one UT PGE student and at least one undergraduate student were part of each team.

<< Get an insider's look at the Energy AI Hackathon

“Meeting methane reduction goals can be done much faster and often at a lower cost than other greenhouse gas reduction efforts.

But emissions goals are only as good as the world’s capacity to track progress toward those goals. That is the focus of my research and of my work with EEMDL — to build that capacity.”

—RESEARCH ASSOCIATE PROFESSOR ARVIND RAVIKUMAR



Research Professors

Research Associate Professor Arvind Ravikumar is codirector of the Energy Emissions Modeling and Data Lab (EEMDL), a multidisciplinary research and education initiative addressing the growing need for accurate, timely and clear accounting of greenhouse gas emissions across global oil and natural gas supply chains. EEMDL helps public and private institutions develop climate strategies informed by verified data and identify opportunities to reduce emissions.

Ravikumar’s research team includes 13 UT PGE graduate students and post-docs. He is principal investigator of “The Marcellus Methane Monitoring Project: Multiscale Measurement and Reconciliation of Methane Emissions in the Marcellus Shale Basin” and “Methane Accounting Project: Multiscale Methane Monitoring and Accounting Framework Across Oil and Gas Supply Chains,” and co-PI of “Surface-Based Methane Monitoring and Measurement Network Pilot Demonstration: Project Astra Phase II.”

<< Check out some of EEMDL's revolutionary emissions monitoring tools

“My research with Professor Carlos Torres-Verdín focuses on CO_2 storage within shale-laminated sandstone formations, employing time-lapse MicroCT imaging and fluid transport simulations.

Our ultimate goal is to optimize sequestration strategies and enhance reservoir performance, and my scholarship has allowed me to focus fully on my research.”

—NADIA MOUEDDEN (PHD PE 2026)

Graduate Scholarships and Teaching Assistantships

By offering either a full semester of assistance or supplemental aid in the form of graduate scholarships and teaching assistantships, the Hildebrand Department can more effectively attract and recruit top students. Thanks to this additional funding, graduate students can in turn focus on identifying their areas of research and connecting with faculty and industry sponsors rather than finding other means of financing their education. This generous financial support for master’s and PhD students helps ensure the department remains the world’s No. 1 petroleum engineering program.

<< Follow our graduate playlist on YouTube for more on our top-ranked program

“I have had the opportunity to develop a multiscale ML proxy model with 95 percent accuracy in predicting 30 years of field production.

I also created ‘Pyclipse,’ an automated Python-Eclipse package for static model construction, simulation execution and result analysis that reduces workflow duration by 80 percent. Thanks to Hildebrand endowment support, I was able to focus completely on these innovative projects.”

—ELNARA RUSTAMZADE (PHD PE 2025)

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Graduate Scholarships and Teaching Assistantships

As a result of this funding for graduate students, our students have the opportunity to collaborate with faculty members on innovative research that is regularly recognized at the national and international level. Our graduate students regularly present and win awards at conferences and competitions including the Society of Petroleum Engineers (SPE) Annual Technical Conference and Exhibition (ATCE), the Society of Petrophysicists and Well Log Analysts (SPWLA) international student paper contest, the American Geophysical Union (AGU) annual meeting, and the annual Geothermal Rising Conference (GRC). Our rigorous graduate research program in unconventionals, enhanced oil recovery (EOR), carbon storage, porous media, machine learning, subsurface data analytics and more continues to bolster our reputation as a global hub for oil and gas innovation.

<< Get the latest research news from the Hildebrand Department

Professors of Practice

Professors of Practice bring their professional expertise into the classroom, offering real-world insight into the energy industry that sets students apart during the job search and makes them valuable assets to their future companies from day one.

Brian Sullivan (BSPE 1976, JD 1979, *left*) is Professor of Practice for the popular Oil, Gas and Mineral Law class. Sullivan, a founding partner (now partner emeritus) at McElroy, Sullivan, Miller & Weber LLP, developed the class after surveying two dozen of his clients about what they wanted their engineers to know about oil and gas law. He approaches his class like a law school seminar, asking questions that engage students in discussion and debate.

Sullivan regularly invites guest speakers to class to talk about their jobs, the ever-changing industry, and the legal intricacies of oil and gas management in Texas. He opens speaker presentations to all department undergraduates, routinely tripling attendance: "I want to help students see the whole picture," he says.

Meet more outstanding undergraduates like Miriam >>

"Energy is intertwined in all aspects of society, and the energy business is constantly changing. As part of the next generation of engineers, I think being adaptable to those changes is crucial.

The Oil, Gas and Mineral Law class was an incredible complement to my petroleum engineering skills, and I'm now preparing to take the LSAT to become an energy attorney."

—MIRIAM CROUSE (BSPE 2025)

“Research often requires coming up with very specific experimental setups. Having a machine shop to help design and create these tools saves us so much time and effort searching for ready-made alternatives that might not fit our exact needs.

The shop is indispensable for allowing us to create, manage and ultimately promote our experimental setups to company sponsors who are always looking for innovative solutions that are not yet commercially available.”

—DANY HACHEM (PHD PE 2024)

Machine Shop

In the Hildebrand Department machine shop, machinist Ezekiel Moreno *(right)* takes drawings submitted by students and faculty and brings the plans to life. Whatever an experiment calls for — core samples, holders and plugs; accumulators; heating blocks; flange and window plates; sensor holders; sand tank inlets; and more — Moreno custom builds it from scratch. This year alone, he has created more than 220 parts and written 140 custom software programs.

“It’s exciting to be part of the phenomenal research happening in UT PGE. There is always a new challenge or skill to master,” Moreno says. “By designing and building parts for our students and professors, I hope to get their projects up and running more quickly and, ultimately, help them get closer to solving tough energy problems.”

<< Follow UT PGE on LinkedIn for more department highlights

"The overall objective of our study is to make recommendations to improve the performance of parent and child wells on University lands.

We are working to evaluate the performance of these parent-child well pairs and identify the most important factors for improving and optimizing well performance in future child well locations."

—PROFESSOR MUKUL SHARMA

<< See how Dr. Sharma applies his EOR expertise to his work in geothermal energy

Hildebrand Seed Grants

Through the Hildebrand Grand Challenge Seed Grant program, UT PGE continues to facilitate robust research in unconventionals, enhanced oil recovery (EOR), carbon capture, data analytics, nanoparticle applications and more.

Innovators selected for this program receive funding to support high-risk investigations that are often difficult to fund through traditional channels. These grants not only provide crucial assistance to faculty but also encourage a focus on unexplored areas with the potential for significant social impact and follow-on matching funding.

Professor Mukul Sharma *(left)* is a recipient of one of this year's Hildebrand seed grants. His grant-funded research is focusing on "Fracture Design, Well Placement and Refracturing Strategies to Improve Parent and Child Well Performance in the Permian Basin."

Read about Dr. Lu's most recent teaching award >>

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Hildebrand Seed Grants

Assistant Professor Yingda Lu *(right)* was awarded this year's second Hildebrand seed grant with Professor Michael Pyrcz and Associate Professor John Foster. Their research is entitled "Unconventional Well Optimization based on Machine Learning."

Lu also recently concluded a two-year seed grant project on large-scale carbon capture utilization and storage that resulted in three journal papers, as well as a conference paper and presentation. "What we learned will significantly advance the understanding of CO_2 flow behaviors during pipeline transportation," he says, "and will provide reliable simulation tools for design, operation and optimization of existing and future CO_2 pipelines."

"Our goal is to develop a fast, reliable and data-driven simulation tool for unconventional well production forecasting and optimization.

When applied to a particular field, the simulator we are creating will take existing well data and regional geological settings as the input and will output optimal well spacing and well completion designs with confidence levels."

—ASSISTANT PROFESSOR YINGDA LU

“The institute gave me a new perspective on the challenges and advancements driving the energy transition — it’s exciting to see how these innovations are shaping sustainable energy practices.

My hope is to be able to present these concepts aligned with STEM standards, helping students explore potential career paths while tackling real-world design challenges in energy science itself.”

—ANTONIO GONZALEZ, TEACHER, DONNA HIGH SCHOOL

Energy Science and Technology Institute

About 20 high school STEM teachers from across Texas took part last summer in UT PGE’s 2024 Energy Science and Technology Institute (ESTI) led by Program Manager for Education, Outreach and Training Sabrina Ewald and Associate Professor of Instruction Hilary Olson. Over the course of five days, teachers participated in hands-on activities and labs, faculty-led discussions, and peer breakout sessions on energy topics including the global energy marketplace and carbon capture and storage. They also toured Weiss Energy Hall at the Houston Museum of Natural Science and the Ocean Star Offshore Drilling Rig Museum and Education Center in Galveston.

Participants also experienced ESTI’s Energy Excursions curriculum, a series of free online courses developed by UT PGE subject matter and educational experts for high school STEM students and teachers. Designed to align with Texas Essential Knowledge and Skills (TEKS) and College Board standards, Energy Excursions makes it easier for high school teachers to include energy topics in their classrooms.

<< Check out our innovative Energy Excursions STEM curriculum

Facts AND Figures

See why UT PGE remains the best in the world >>

NO. 1 PETROLEUM ENGINEERING PROGRAM IN THE WORLD

Quacquarelli Symonds

NO. 1 PETROLEUM ENGINEERING GRADUATE PROGRAM

U.S. News and World Report

401

UNDERGRADUATE STUDENTS ENROLLED

- 4% Black
- 22% Women
- 24% Hispanic

144

GRADUATE STUDENTS ENROLLED

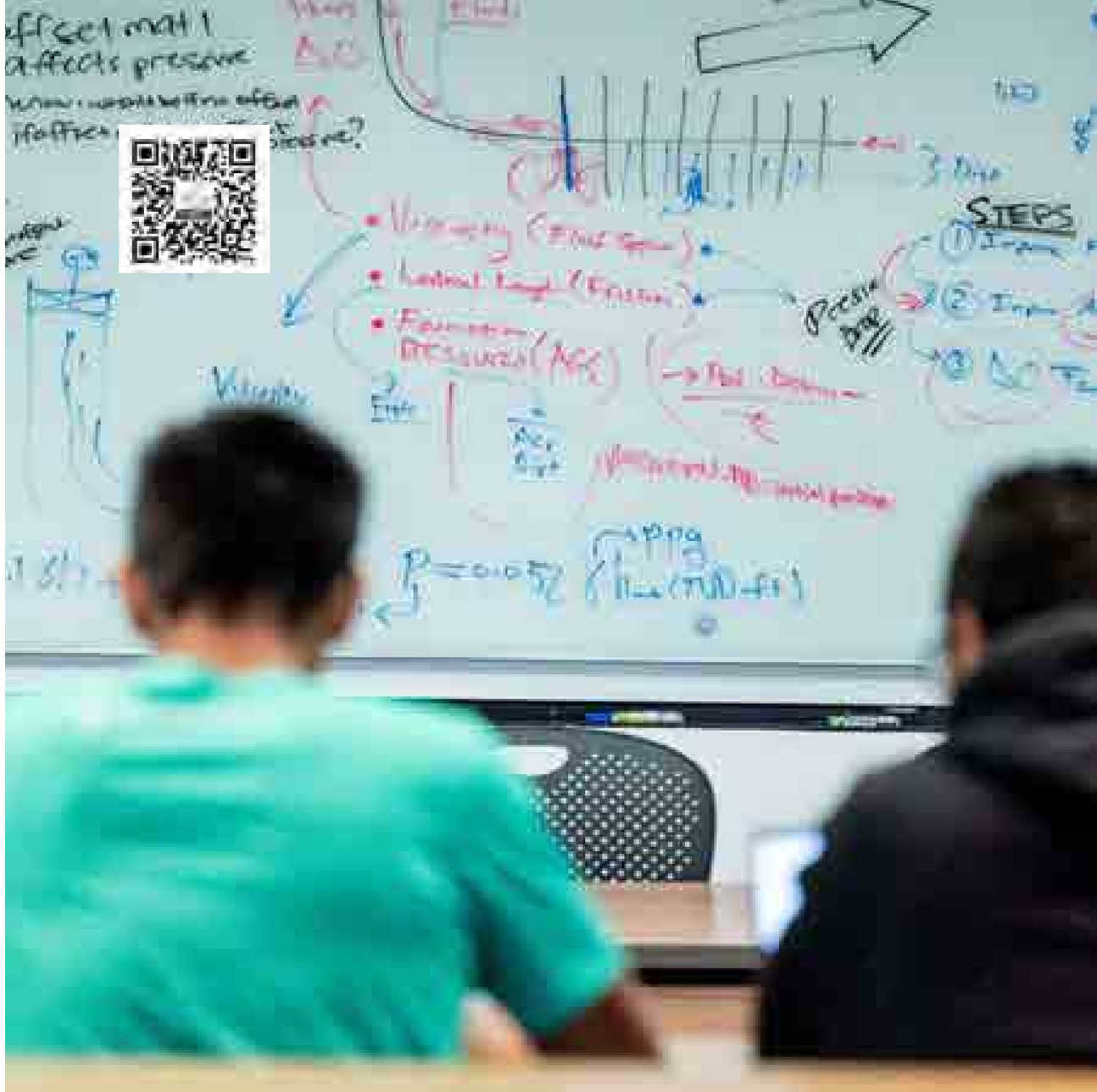
- 22% Women
- 83% International students

FACULTY HIGHLIGHTS

- 2 National Science Foundation CAREER winners
- 5 National Academy of Engineering members
- 16 Society of Petroleum Engineers distinguished members

RESEARCH HIGHLIGHTS

- $10+ million in research funding annually
- 9 industrial affiliate programs (IAPs) and 6 major research programs
- 270+ published journal and conference papers annually



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