
2022–2023 HILDEBRAND DEPARTMENT ENDOWMENT IMPACT REPORT

Expertise Passion Innovation

POWERING THE FUTURE OF ENERGY



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





The Path Ahead



You need look no further than our laboratories and classrooms to find the expertise, passion and innovation that is fueling the energy industry's transition toward plentiful, reliable and affordable energy sources for the world. Our world-class faculty is developing new technologies to produce more oil and gas while mitigating associated emissions. The research and applications from their collaborations with government agencies and corporate partners are on the leading edge of energy. Ever student-focused, our faculty members also continue to create new subsurface engineering courses and content to ensure that our graduates remain in high demand.

As I end my eight years as UT PGE chair, I am optimistic about the future of our department and our industry. We remain focused on providing the best engineers to the oil and gas industry, as well as creating leaders to meet reduced carbon demands for the future. Just as we have long been the world's foremost experts in hydrocarbons, we also lead the way in geothermal energy; methane emissions reduction; carbon and hydrogen storage; rare earth elements; energy-related data science; and other critical subsurface research areas.

I have full confidence that we will continue to thrive under the leadership of new chair Matthew Balhoff — in large part because of the generous funding from the Hildebrand endowment. As we work to keep UT PGE a premier program at the forefront of education and technology, we know we have the support to continue training energy leaders who will find solutions for the world's growing energy appetite while addressing demands for a reduced carbon footprint and continued environmental stewardship.

Hook 'Em!

Cockrell Family Chair in Engineering #17

“Competing in the Energy AI Hackathon was both an amazing opportunity and an intriguing challenge.

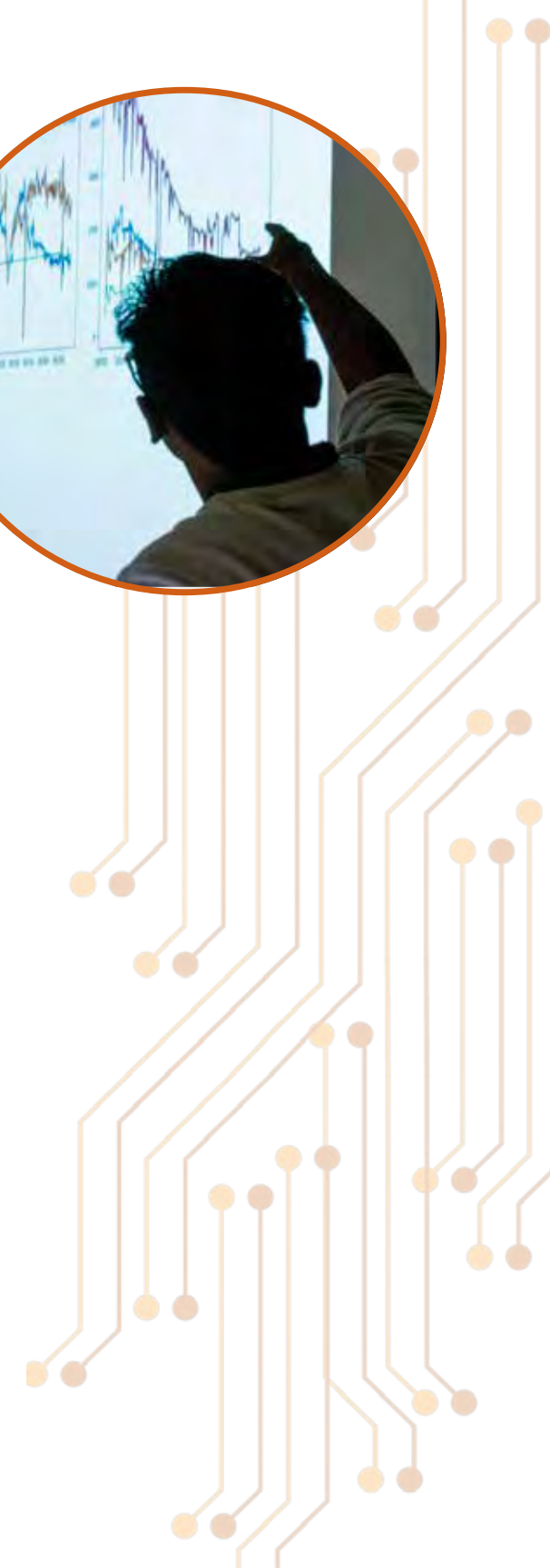
We used machine learning to make predictions for a time series analysis problem with incomplete data that evaluated the failure or function of a group of ESPs over a 30-day span. I learned a tremendous amount about data cleaning, feature engineering and machine learning models that I know will set me apart as I begin my career.”

—ASHLEY GARLAN (BSPE 2025)

Energy AI Hackathon

Twenty teams competed in the Hildebrand Department’s third annual Energy AI Hackathon last January, spending 36 hours solving a challenging multivariate energy problem designed by architects Elnara Rustamzade (PhD PE 2024) and Ruoyu Wang (MSPE 2023). 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 Pycz and Associate Professor John Foster drew about 100 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.





Research Professors

When Dr. Arvind Ravikumar joined the Hildebrand Department, he brought with him a multidisciplinary approach to solving one of science's and society's most pressing questions — how global economies can usher in sustainable energy development in the face of climate change. As a research associate professor funded in part by the Hildebrand endowment, he studies these issues with a team of graduate students in his Sustainable Energy Transitions Lab.

Dr. Ravikumar has received \$13 million in grants from the U.S. Department of Energy (DOE) and partner groups for three projects focused on methane emissions mitigation. He also established and co-leads the new Energy Emissions Modeling and Data Lab (EEMDL) with \$50 million in support from industry partners to address the growing need for accurate, timely and clear accounting of greenhouse gas emissions across global oil and natural gas supply chains.



“Reducing methane emissions from the oil and gas supply chain is a critical component of global climate action and air quality improvement.”

My team is leading the way by employing an interdisciplinary approach that integrates field work, modeling and policy analysis to solve this critical energy issue.”

—RESEARCH ASSOCIATE PROFESSOR
ARVIND RAVIKUMAR



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 potential faculty 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.

"In my research on carbon dioxide mineralization with Professor Kishore Mohanty, I am working to convert dissolved CO₂ into carbonates by reacting it with alkaline industrial waste products, such as fly ash.

The goal is to lower the overall cost of a carbon capture unit, thus making it more affordable for industries and power plants to install such units and also implement a safer sequestration method."

—CYNTHIA OEIYONO (PHD PE 2027)



“Graduate funding from the department has been essential for my progress because I don’t have other means of funding, like company sponsorships or private scholarships.

With this support, I’ve been able to hone my coding, data analysis and problem-solving skills through my research computing fracture properties using fiber optics data and modeling the fractures using the finite element method (FEM) and extended finite element method (XFEM).”

—JAVIER GUERRERO (PHD PE 2025)



GRADUATE SCHOLARSHIPS AND TEACHING ASSISTANTSHIPS

CONTINUED

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) International Annual Technical Conference and Exhibition, the Society of Petrophysicists and Well Log Analysts (SPWLA) International Student Paper Contest, Chevron’s National Engineering Week Competition, and the Clean Energy Education and Empowerment (C3E) Symposium. This robust graduate research program in unconventional, enhanced oil recovery, 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.





Professors of Practice

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

The Hildebrand Department's newest professor of practice, Alberto Lopez Manriquez, joined the faculty last fall after more than two decades in the oil and gas industry specializing in the characterization and simulation of unconventional reservoirs, completion operations, drilling design, pore pressure prediction, and field development. He is an expert technical reviewer for Elsevier's *Journal of Petroleum Science and Engineering* and served as a mentor for the Society of Petroleum Engineers for six years.

Lopez Manriquez teaches Resource Economics and Valuation and Geosystems Engineering Design and Analysis, in addition to helping coordinate undergraduate recruiting activities. No stranger to the Forty Acres, he received his PhD in Petroleum Engineering from UT Austin in 2003.



“I use my vast experience working in the petroleum industry to adapt course notes, examples and problems to have an important level of similitude with real conditions.

With this approach, students get early exposure to situations they will encounter once they become active participants in industry. Telling a story that is relevant to the subject is crucial for capturing students' imaginations and bringing the subject matter to life.”

**—ASSOCIATE PROFESSOR OF PRACTICE
ALBERTO LOPEZ MANRIQUEZ**

“The objective of the Switch International Energy Case Competition to address energy poverty resonates profoundly with my personal experiences.”

Belonging to a country where around 40 million people have no access to electricity, I am familiar with its challenges and impact on daily life. I firmly believe in the transformative power of youth to drive substantial change, and through this competition, we are amplifying our impact worldwide.”

—SYED TALHA TIRMIZI (MSPE 2024), SWITCH CASE COMPETITION CO-ORGANIZER

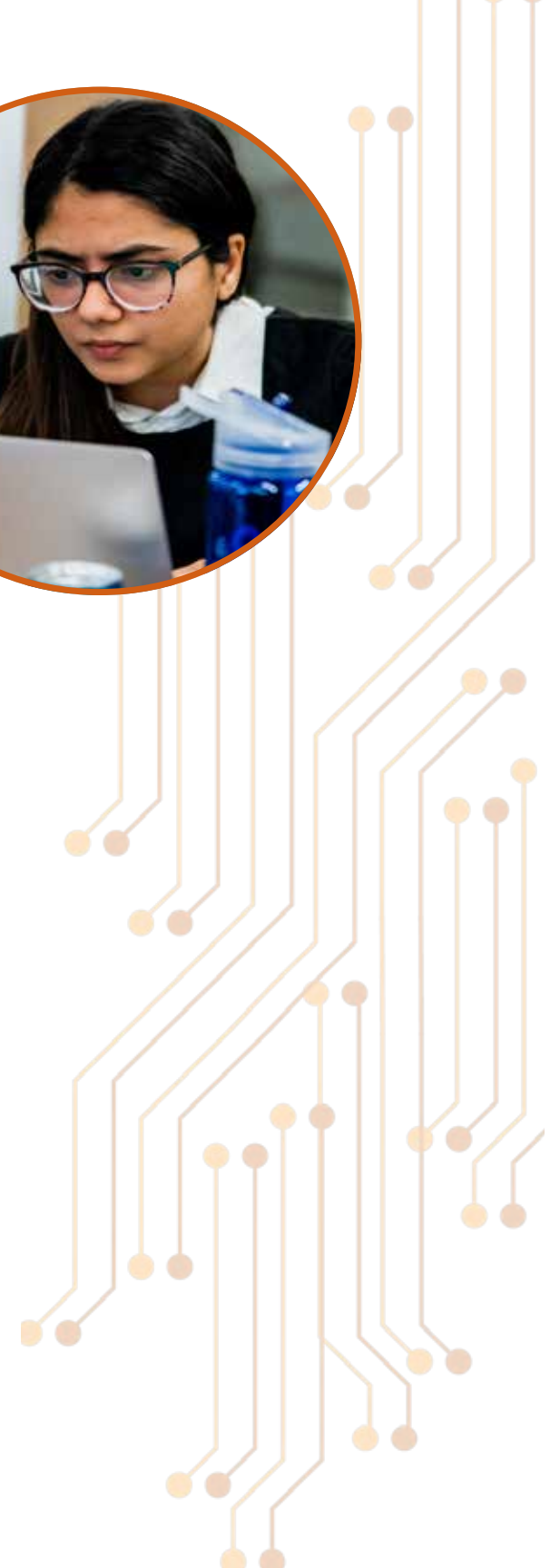


Energy Case Competition



Over the past three years, the Switch International Energy Case Competition has attracted over 2,500 university students from 43 countries — and the Hildebrand Department has been involved since the program’s inception. Some UT PGE students have helped organize the competition while others have competed in it; alumni and faculty have taken part in energy panels; and the department has consistently contributed funding for the annual competition.

The competition challenges teams to propose an energy transition plan for an underdeveloped country, taking into consideration economic feasibility, equity, health, policy, regulation, available resources, scalability, innovative technology, cultural sensitivity and environmental impact. The virtual competition gives participants from around the world the opportunity to hone their leadership skills, engage with energy nonprofits and professionals, develop research and communication skills, and obtain a deeper understanding of critical global energy issues.





“This project provided me with valuable opportunities to collaborate with researchers from Southwest Research Institute (SwRI) and gain hands-on experience conducting pilot-scale experiments at their state-of-the-art labs. Our SwRI collaborators reciprocated by visiting our own lab and our new CT scanning facilities, which broadened my knowledge and network within the field.

This experience has significantly contributed to my progress toward achieving my educational and career goals.”

—ANU RADHAKRISHNAN
(MS STAT 2023, PHD PE 2023)

Energize Program Grants



The Hildebrand Department collaborated with the Southwest Research Institute (SwRI) last year to launch the Energize Program for enhanced scientific collaboration focused on energy research, including oil and gas, renewable resources, hydrogen, carbon storage, and geothermal energy. Three UT PGE faculty members received grants in the partnership’s inaugural year.

Associate Professor David DiCarlo and Professor Maša Prodanović are leveraging traditional CO₂ enhanced oil recovery methods to investigate the stability and behavior of foam-entrapped CO₂ in high-temperature and high-pressure reservoir conditions. The goal is to improve long-term carbon storage in depleted oil and gas reservoirs.



ENERGIZE PROGRAM GRANTS CONTINUED

With funding from the Hildebrand Department's second Energize Program grant, Assistant Professor Yingda Lu and his team are studying CO₂ pipeline flow behaviors as part of a larger effort to facilitate large-scale carbon capture utilization and storage (CCUS).

"CO₂ sources and CO₂ sinks are not typically at the same locations, so CO₂ pipelines are needed to transport captured CO₂ to storage sites. There are only about 5,000 miles of CO₂ pipelines in the US and much more are needed in the future for large-scale CCUS," says Dr. Lu. "Our research will significantly advance the understanding of CO₂ flow behaviors during pipeline transportation and provide reliable simulation tools for design, operation and optimization of existing and future CO₂ pipelines."



"Engaging in this research on large-scale carbon capture utilization and storage with Dr. Lu has honed my ability to think critically and solve complex problems."

I've also acquired in-depth and specialized skills including programming, computational fluid dynamics in multiphase flow analysis and phase behavior, and CO₂ transport in pipeline fields."

—FUQIAO BAI (PE PHD 2024)



“Next semester, my geoscience students will complete a culminating project based on the design challenge ‘Filling the Energy Gap’ from the ESTI Energy Excursions curriculum.

I’m excited for them to learn about the depth and complexity of the energy transition — I think they will be as fascinated as I was!”

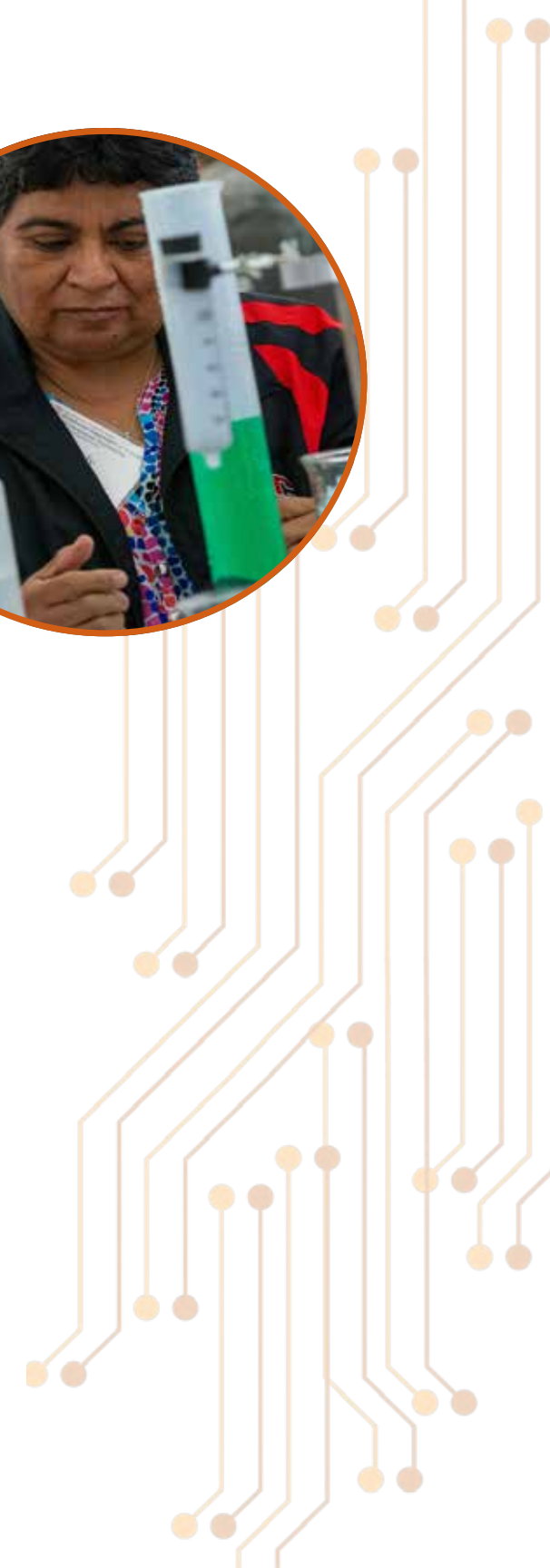
—KRISTINA LESTIK, AP CHEMISTRY AND INTRODUCTION TO GEOSCIENCE TEACHER, ROUND ROCK HIGH SCHOOL

Energy Science and Technology Institute



About 20 high school STEM teachers from across Texas took part over the summer in UT PGE’s 2023 Energy Science and Technology Institute (ESTI) led by 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 brainstorming and breakout sessions on energy topics including the global energy marketplace, enhanced oil recovery, 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.



Facts AND Figures

NO. 1 PETROLEUM ENGINEERING
PROGRAM IN THE WORLD
Quacquarelli Symonds

NO. 1 PETROLEUM ENGINEERING
GRADUATE PROGRAM
U.S. News and World Report

378

**UNDERGRADUATE
STUDENTS ENROLLED**

- 4% Black
- 24% women
- 25% Hispanic

147

**GRADUATE
STUDENTS ENROLLED**

- 25% women
- 80% international students



FACULTY

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



RESEARCH

- \$20+ million in research funding secured this year
- 9 industrial affiliate programs (IAPs) and 6 major research programs
- 270+ published journal and conference papers annually





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