INTERPORE Research Spotlight

Center for Subsurface Energy and the Environment at The University of Texas at Austin

https://csee.engr.utexas.edu/

The Center for Subsurface Energy and the Environment (CSEE) is an organized research unit in the Cockrell School of Engineering created to foster the development of interdisciplinary programs in subsurface energy and the environment.

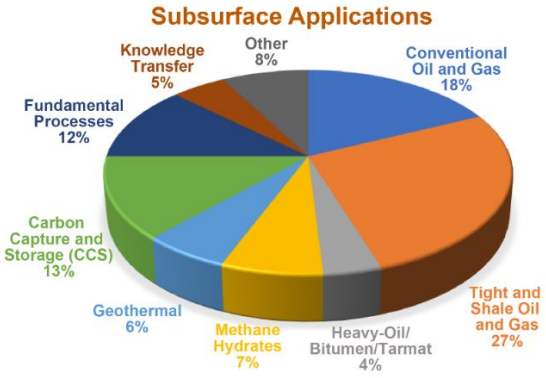
The CSEE vision is to be the premier academic research organization in all facets of subsurface energy. Through our leadership and technology innovation, we will enable energy security that balances environmental impact and affordable resources.

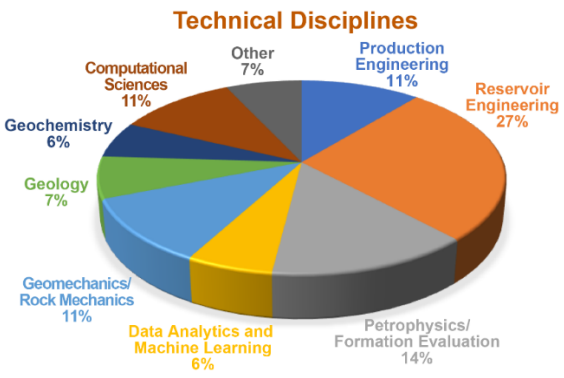
The CSEE mission is to:

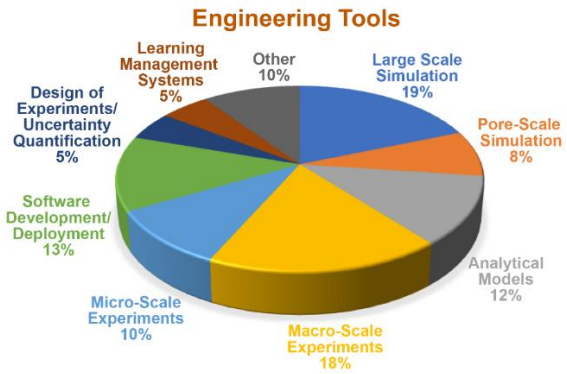
- encourage and develop interdisciplinary research in subsurface energy as well as other areas related to the environment,
- provide educational opportunities for graduate students,
- provide an organizational structure for funding new areas of research, and
- conduct meetings, symposia, and workshops on research topics and provide a mechanism for technology transfer.

Research Programs

We have categorized the content of our research programs along three different dimensions: subsurface applications, technical disciplines and engineering tools. The following charts show the distribution of all our research along these dimensions:



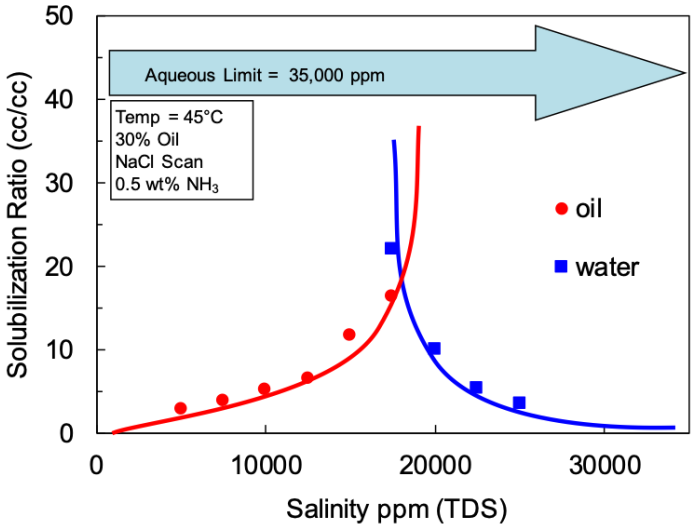




Following are summaries of some of the research programs in CSEE. For a complete coverage of all research programs please visit **https://csee.engr.utexas.edu/**

Chemical Enhanced Oil Recovery

The goal of this research program is to conduct research to improve displacement efficiency, sweep efficiency, and scale-up by cost effective chemical enhanced oil recovery processes.

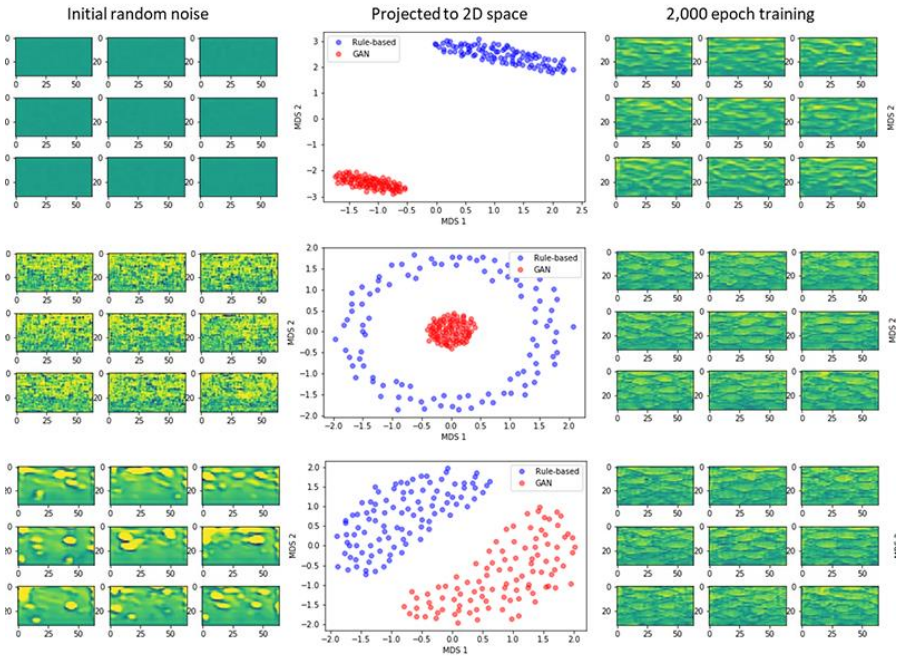


For more information visit **https://csee.engr.utexas.edu/research/industrial-affiliates-projects/chemical-enhanced-oil-recovery**

Digital Reservoir Characterization Technology (DIRECT)

The DIRECT research program aims to develop novel technologies, practical workflows, demonstrations and documentation to enable subsurface data analytics and machine learning. The research goals are to combine best-practice and cutting-edge technology in reservoir spatiotemporal characterization and modeling, real-time drilling control, production data integration and forecasting, reservoir petrophysical

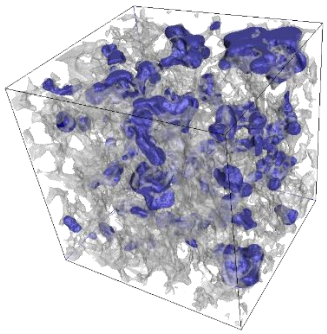
measures and geophysics with emerging technology in big data analytics and machine learning to optimize well trajectory and resource recovery.



For more information visit **https://csee.engr.utexas.edu/research/industrial-affiliates-projects/digital-reservoir-characterization-technology-direct**

Digital Rock Petrophysics

The Digital Rock Petrophysics research program develops new methods of petrophysical characterization, data preservation, and simulation automation based on multiscale imaging of porous materials and relating them to laboratory and field measurements. This research includes the creation of a rock catalog based on Digital Rocks Portal (**https://www.digitalrocksportal.org/**) that hosts benchmarks for machine/deep learning rock characterization algorithms and relates digital rocks petrophysics results with measurements, well log interpretation and field observation.



For more information visit **https://csee.engr.utexas.edu/research/industrial-affiliates-projects/digital-rock-petrophysics**

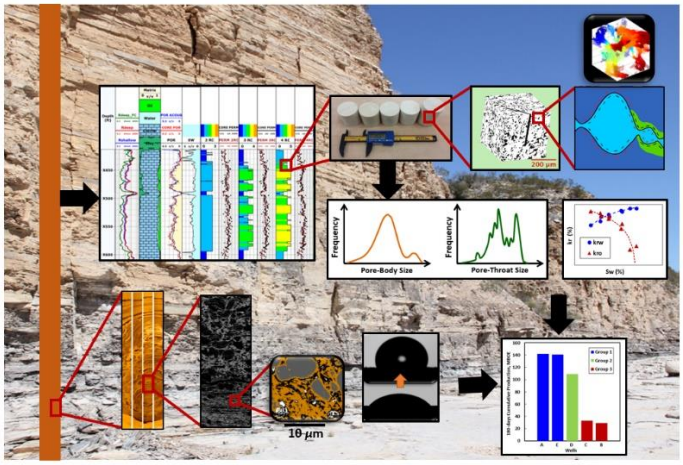
Fracture Research and Application

Understanding and successfully predicting, characterizing, and simulating reservoir-scale structures are the aims of the Fracture Research and Application program.. A key aspect of the program investigates mechanical and chemical processes and interactions over a range of scales. The goal is improved prediction of sub-seismic scale heterogeneities that influence fluid flow.

For more information visit **https://csee.engr.utexas.edu/research/industrial-affiliates-projects/fracture-research-and-application-consortium**

Multi-Scale Rock Physics for Unconventional and Carbonate Reservoirs

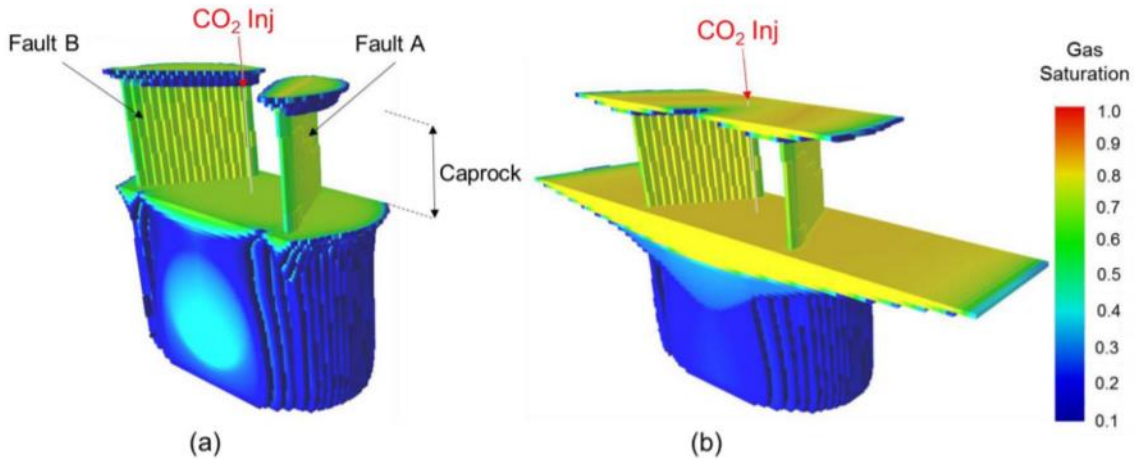
This research program focuses on developing advanced methods and workflows for integrating multi-scale formation data (i.e., measured physical properties of rock-fluid systems in different scales) to enhance reservoir characterization and recovery factors in challenging formations. Examples of such formations include spatially heterogeneous, tight, unconventional (e.g., organic-rich mudrocks), and carbonate formations. The term unconventional refers to formations with complex pore/matrix structure and composition, where conventional rock physics methods fail to perform reliably. We jointly analyze the outcomes from experimental data, analytical rock physics model development, and numerical modeling to evaluate static and dynamic formation properties for reliable characterization of challenging reservoirs, with the intent to enhance production and recovery factors.



For more information visit **https://csee.engr.utexas.edu/research/industrial-affiliates-projects/multi-scale-rock-physics**

Carbon Capture and Storage

Carbon Capture and Storage (CCS) is a proposed method to reduce anthropogenic carbon dioxide in the atmosphere by capturing CO_2 emissions (e.g. from power plants) and storing CO_2 in a supercritical state in subsurface geological formations such as deep saline aquifers or depleted hydrocarbon reservoirs. A number of technical and economic challenges have prevented CCS from being a more widespread solution to reducing CO_2 emissions including, cost of capture from power plants, cost of transportation to storage sites, injection at rates that are significant, sufficient storage volume, and potential migration pathways through abandoned wells and non-sealing faults. In the Center for Subsurface Energy and the Environment (CSEE), we are providing solutions to these problems



For more information visit **https://csee.engr.utexas.edu/research/featured-research-topics/112-carbon-capture-and-storage-in-csee**