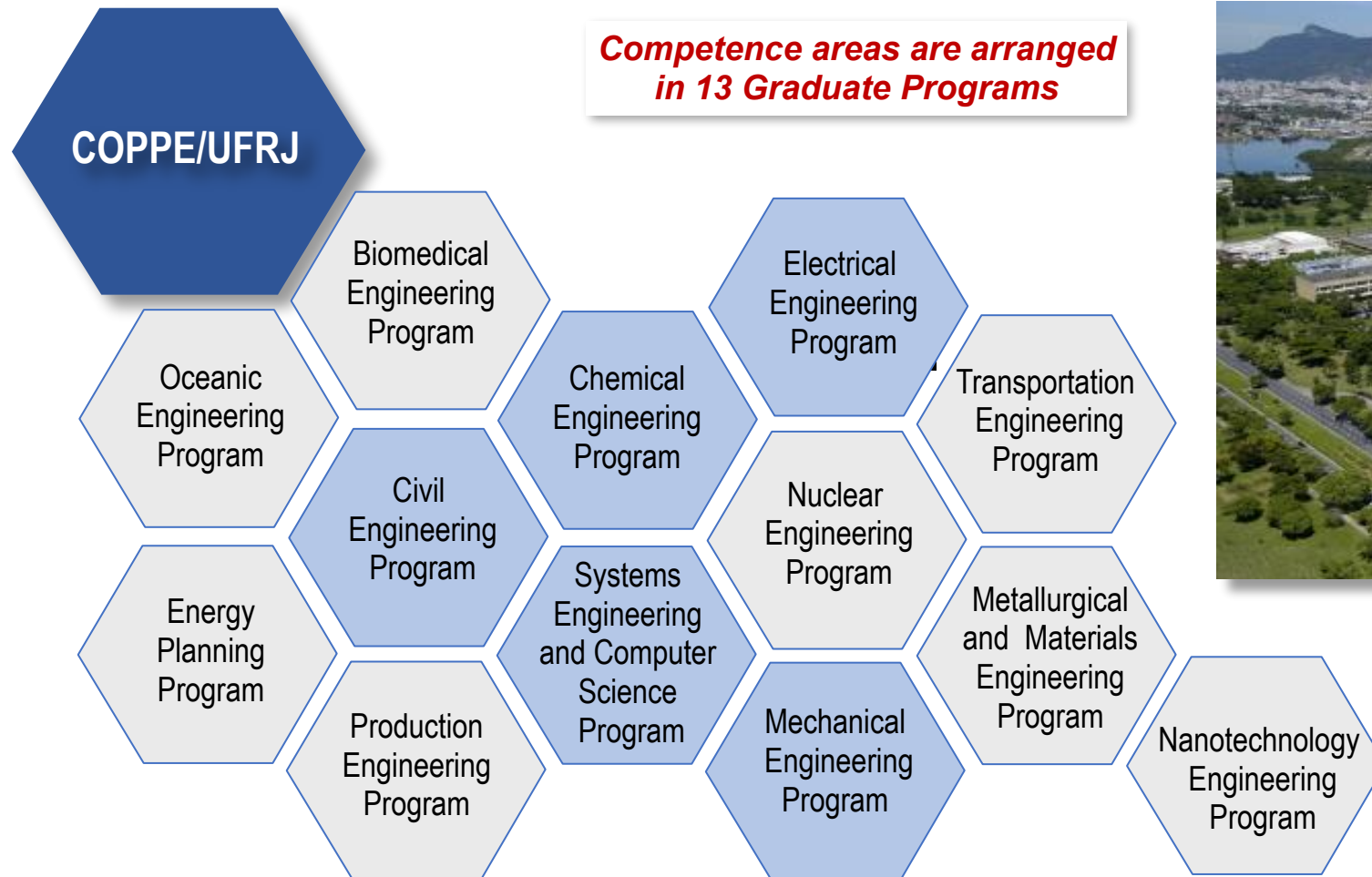


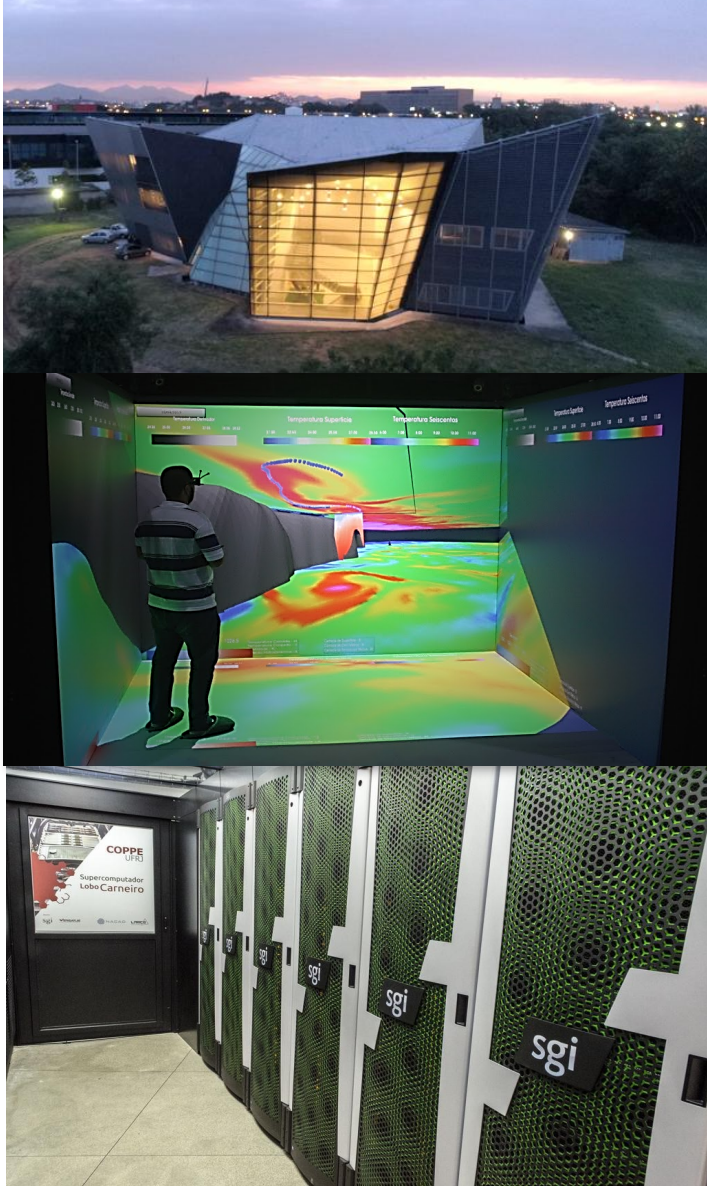
The Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering – COPPE/UFRJ



Est. 1963 - COPPE is a pioneer in bringing together Academia and Society!!!

Interdisciplinary Area of Computational Engineering and Science

Digital Hub: Associated Laboratories



NACAD: High Performance Computing Center

NTT: Technology Transfer Center

LAMCE: Laboratory of Computational Methods in Engineering

LRAP: Advanced Oil Recovery Laboratory

LPS: Signal Processing Laboratory

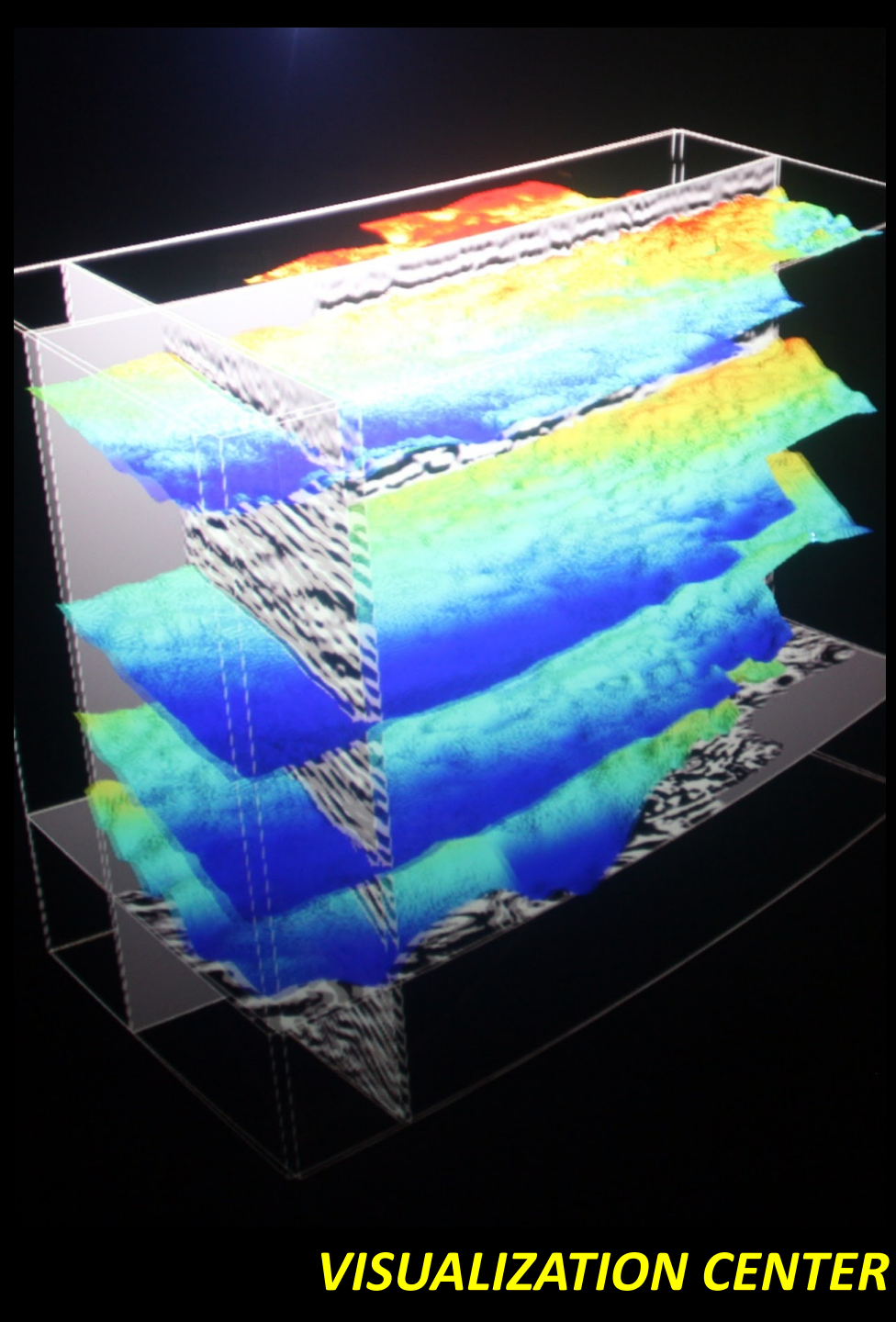
SMT: Signals, Multimedia and Telecommunications

LEAD/GSCAR: Simulation and Control in Robotics

Lab3D: Virtual Reality Lab

LENS: Software Engineering Laboratory

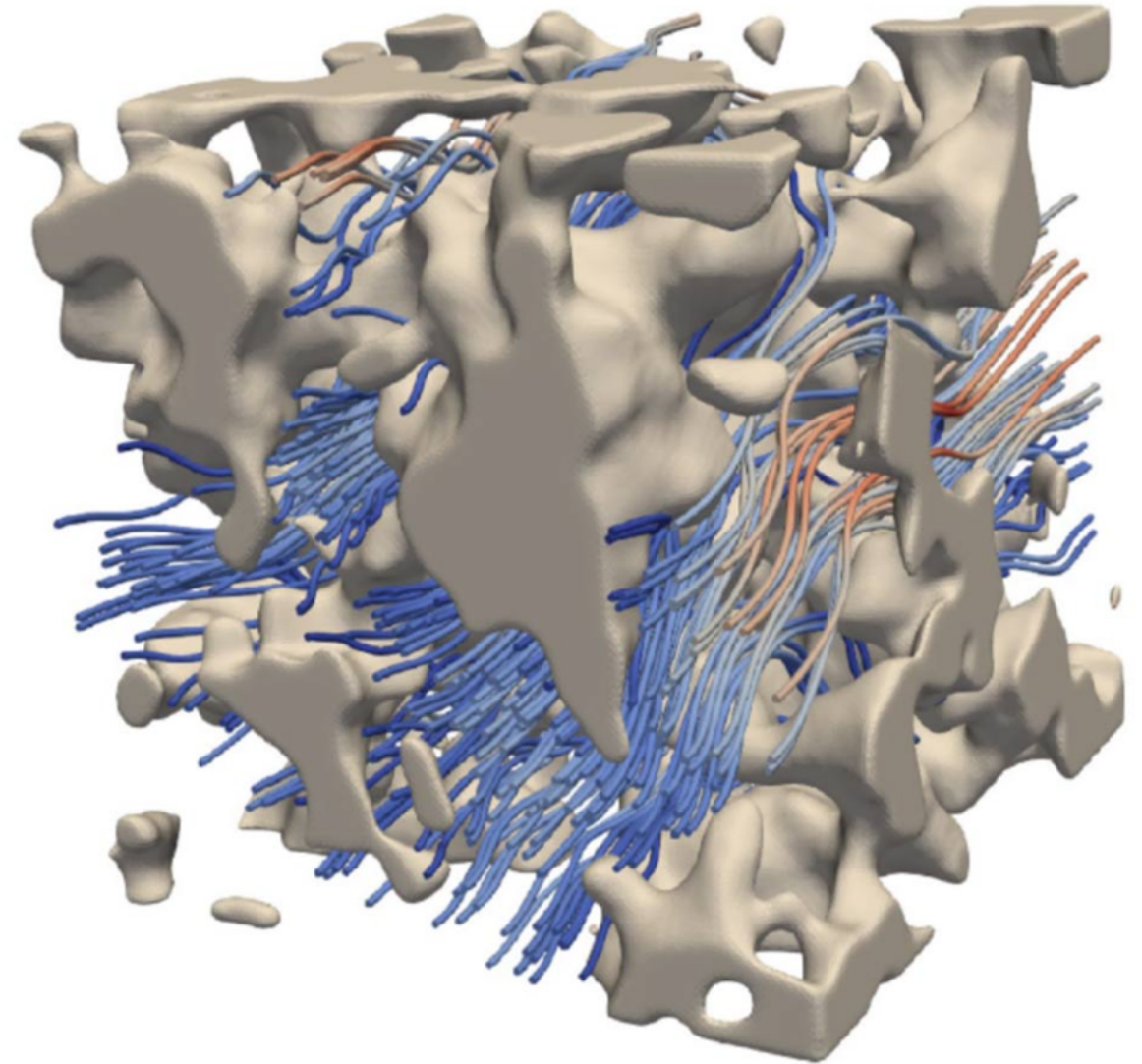
LADES: Laboratory of Solutions for Process Control and Optimization



VISUALIZATION CENTER

AI Skills

- **Computer Vision**
- **Natural Language Processing**
- **Signal processing**
- **Metaoceanographic models**
- **Physics-aware machine learning**
- **Virtual and augmented reality**
- **Internet of Things (IoT)**
- **Digital twins**
- **Robotics and drones**
- **Assisted Manufacturing**



Program in Digital Technologies for O&G and Renewables (PRH 04)

40+ faculty

7 Graduate Eng. Programs

7 Undergraduate Eng. Departments

	PEC	PEE	PEQ	PESC	PEM	ECI	ECA	EP	EC
Petroleum Systems	●							●	
Reliability, Integrity, Maintenance		●	●	●	●			●	
Process Modeling, Simulation, Control and Optimization			●	●	●		●		
Artificial Intelligence	●	●	●	●		●			●
Reservoir Engineering	●		●					●	
Computational Geophysics and Petrophysics	●				●			●	
Computational Engineering and Data Sciences	●	●	●	●	●	●	●		●
Control, Automation and Robotics		●			●		●		●
Instrumentation and IoT		●		●		●	●		●

Center of Excellence in Artificial Intelligence for Renewable Energies - CEAIRE



MINISTRY OF
SCIENCE, TECHNOLOGY,
INNOVATION AND COMMUNICATIONS



□ Brazilian Institutions of Science and Technology



□ International Institutions



□ Companies



WG 1

WIND
ENERGY



WG 2

SOLAR
ENERGY



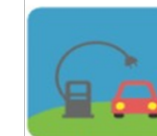
WG 3

BIOGAS
ENERGY



WG 4

HYDROGEN
ENERGY



ARTIFICIAL
INTELLIGENCE (AI)

MACHINE
LEARNING (ML)

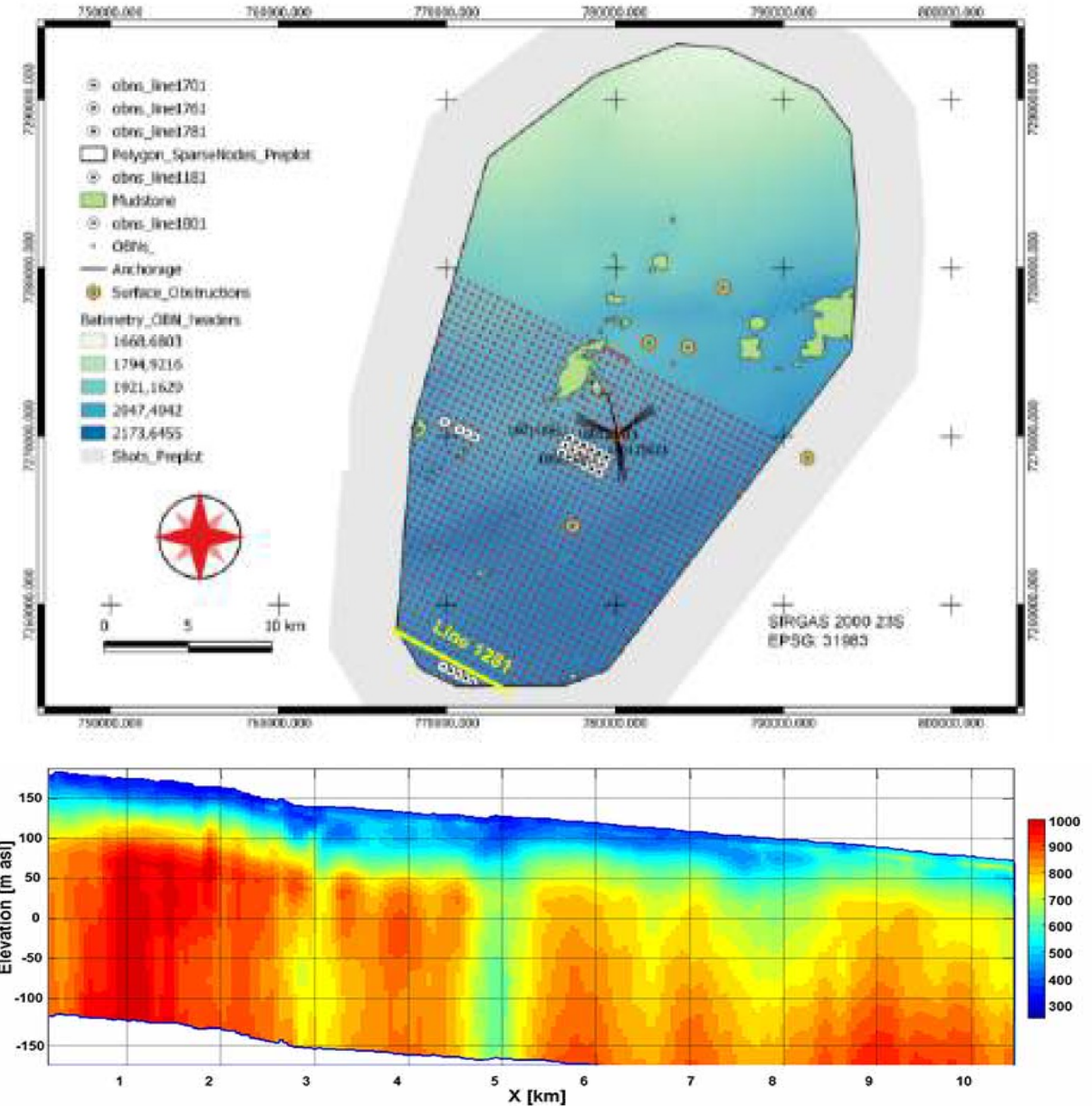
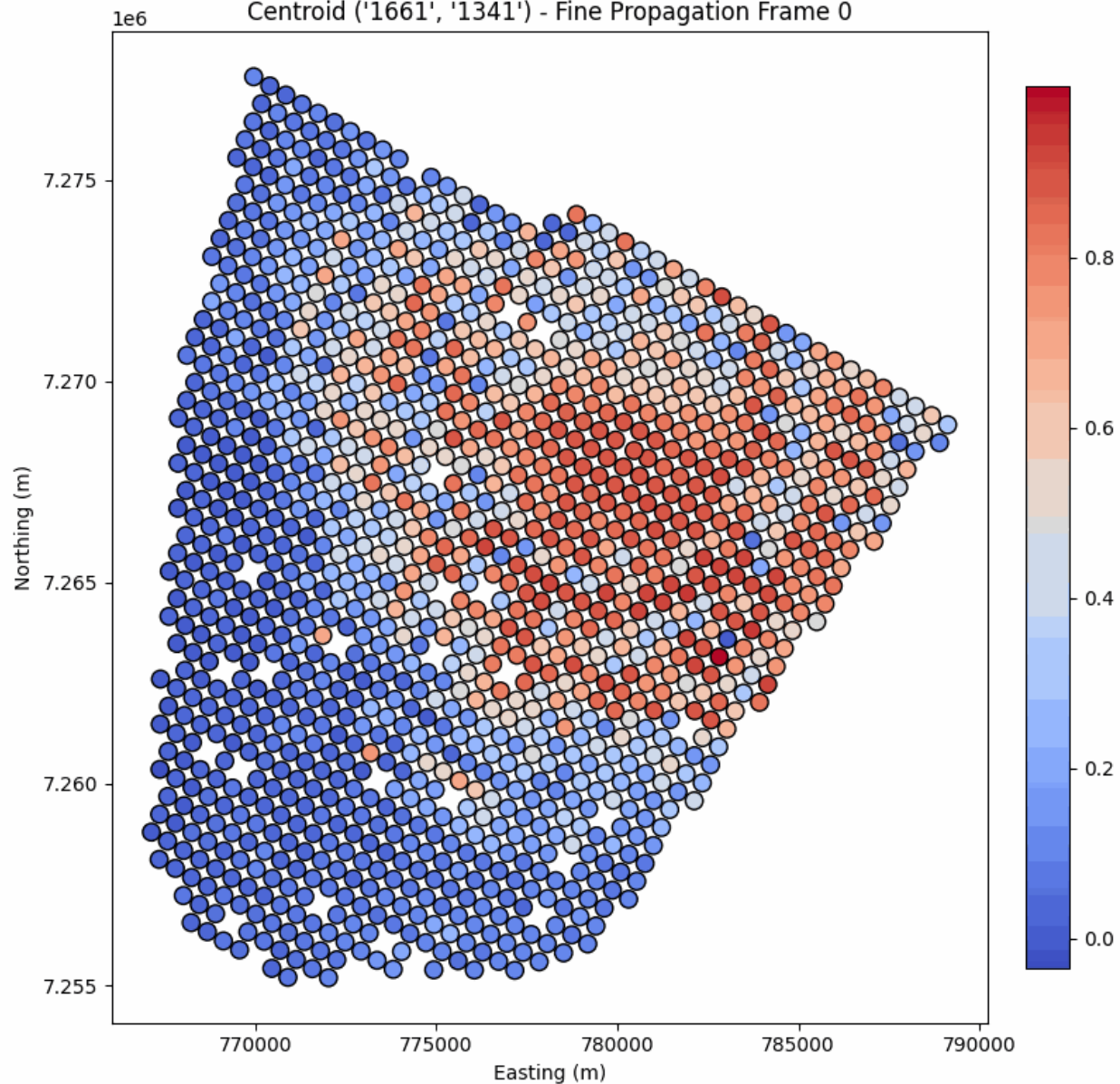
HIGH PERFOR.
COMPUT. (HPC)

DATA
SCIENCES (DS)

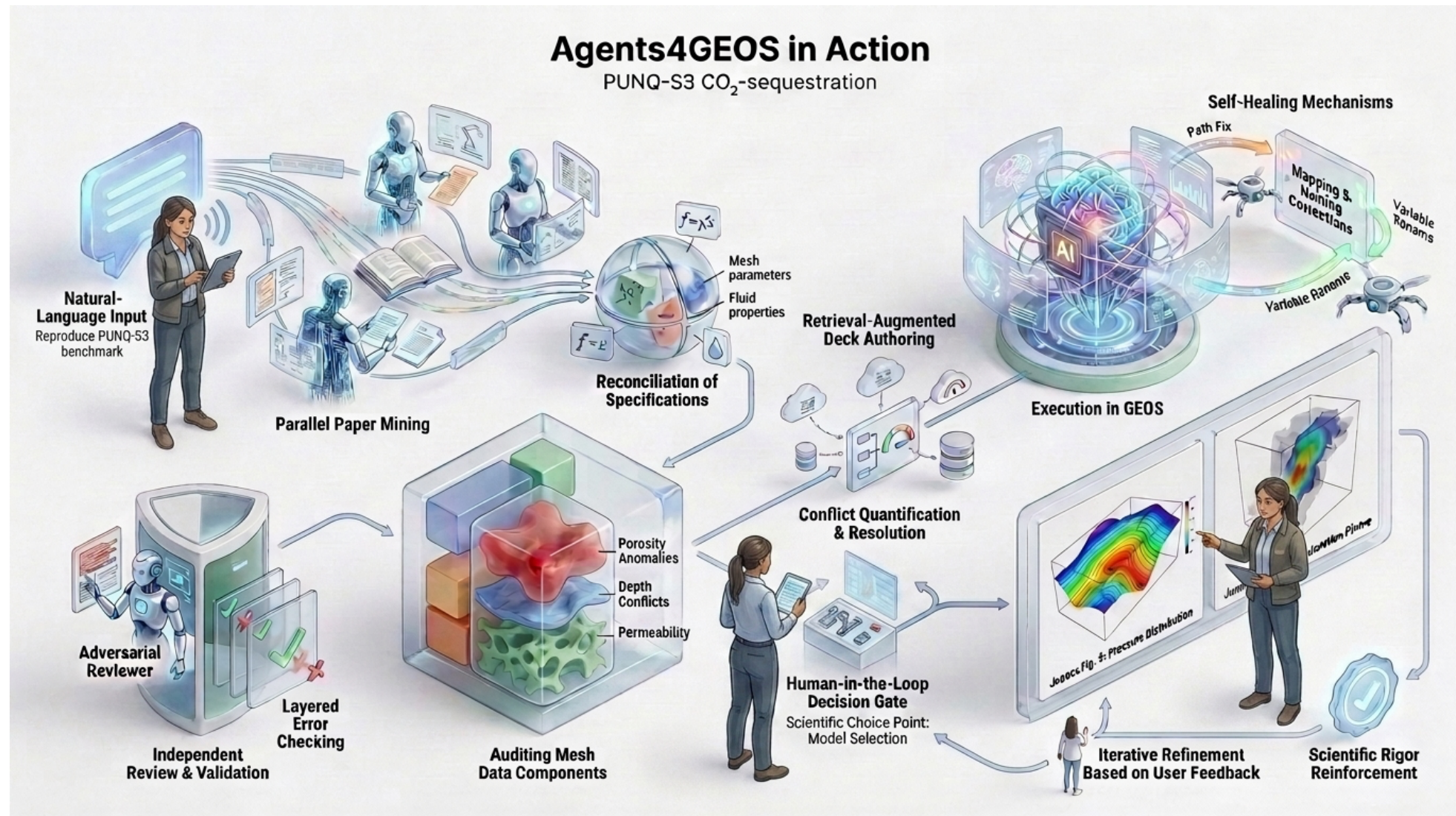
WG 0

Passive Seismic Monitoring

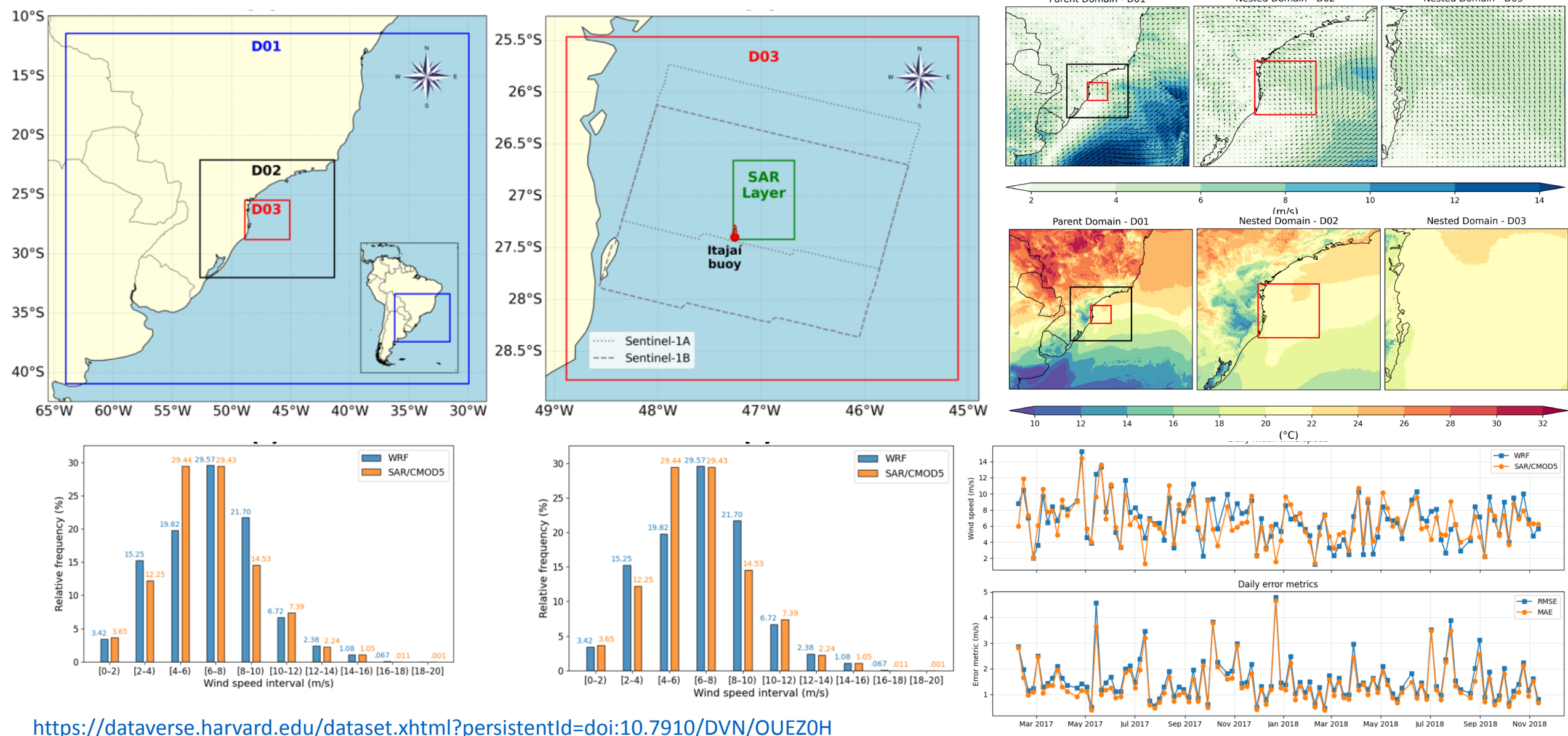
Centroid ('1661', '1341') - Fine Propagation Frame 0



GNN-based surrogate for CO₂ plume migration simulation in faulted reservoirs



A multi-resolution Southwestern South Atlantic weather dataset

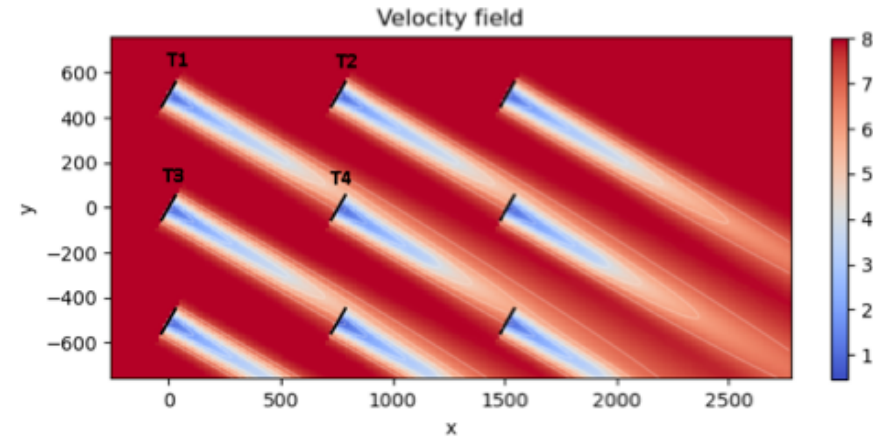


Probabilistic Learning on Manifolds (PLoM) Method for Wake Steering Optimization under Uncertainty¹

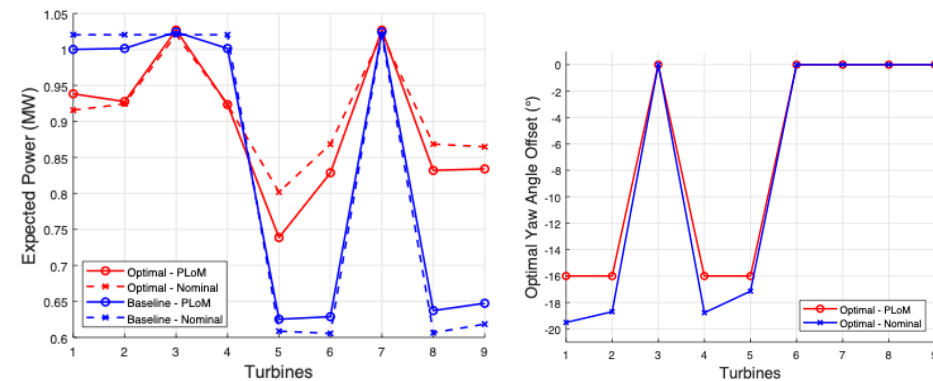
PLoM can be seen as a **supervised machine learning method**

PLoM enables analyzing wake steering optimization considering the variability of the wind conditions in the form of **uncertainties**

UQ analysis with PLoM are **much faster** than MC methods



Wind farm layout with nine wind turbines with the wind coming from the lateral direction



Power of each wind turbine

Optimal yaw angle offsets

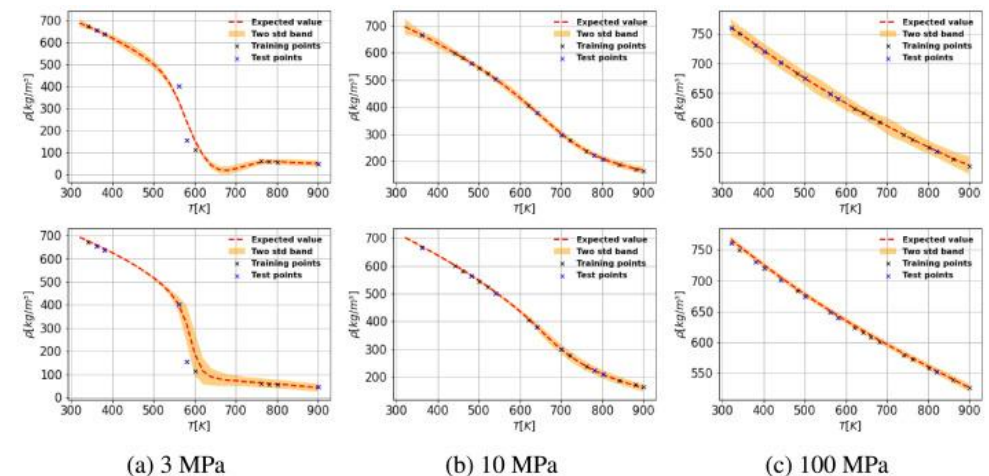
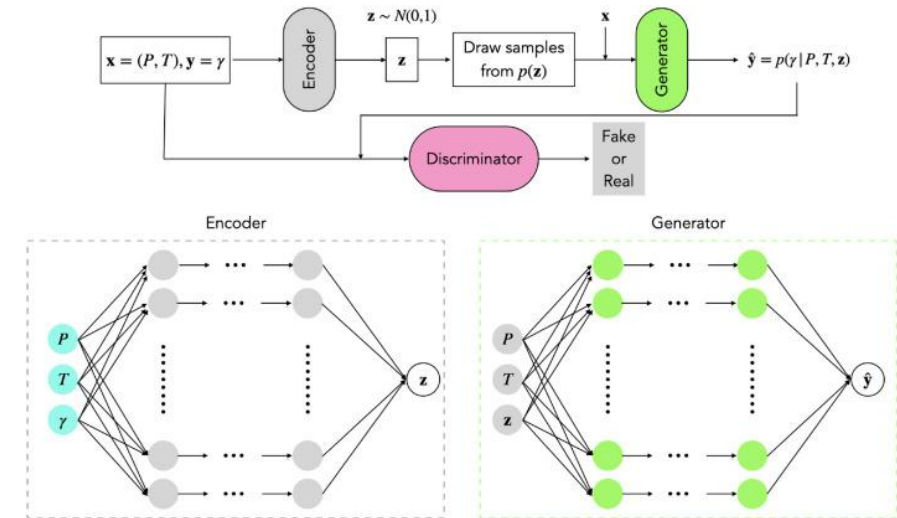
¹Almeida & Rochinha, A Probabilistic Learning Approach Applied to the Optimization of Wake Steering in Wind Farms, Journal of Computing and Information Science in Engineering, 2022

Decarbonization and Sustainability - Efficient Fuels

Biofuels operating at extreme conditions (super critical) are believed to be good alternatives to fossil fuels and might represent a substantial decrease in carbon emissions.

Biofuels performance is not well characterized and due to costs and complexity, computational models are considered important tools

Physicochemical properties (needed for simulations) of such fuels are not well understood, what could be circumvented with the intensive use of Molecular Dynamics models, **which is not feasible due to computational complexity**, but this can be alleviated by using Machine Learning Techniques.



n-Octane predictions with the GP (top) and probabilistic conditional generative models (bottom) at the pressures 3, 10, and 100 MPa

Imaginar, criar e fazer hoje o futuro da Petrobras

Oportunidades

OP2650 - HPC Acadêmico Sustentável

[Voltar](#)

**Prazo para envio de
proposta**
14/04/2025

Status
Finalizada

Área de pesquisa
Área:
Exploração e Produção de Petróleo e Gás
Natural - Onshore e Offshore

Parceira(s) selecionada(s)

- NÚCLEO AVANÇADO DE COMPUTAÇÃO DE ALTO DESEMPENHO / UNIVERSIDADE FEDERAL DO RIO DE JANEIRO / UFRJ



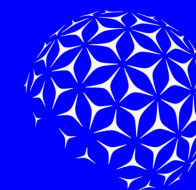
NACAD

Núcleo Avançado de Computação de Alto Desempenho



COPPE
UFRJ

Instituto Alberto Luiz Coimbra de
Pós-Graduação e Pesquisa de Engenharia



AXIA
ENERGIA