HUB TECH IA

AI and IAGEN Application Use Case

Exploration of Seismic Images for the Identification of Fractures and Porosity Zones in Vaca Muerta, Neuquén, Argentina

Executive Summary – Application of IAGEN in Seismic Imaging Exploration in Vaca Muerta

This executive summary presents a strategic application of generative artificial intelligence (IAGEN) in the energy sector, oriented towards the interpretation automated seismic imaging to identify fractures and porosity zones in the Vaca Muerta formation. This is a key opportunity to improve the precision in the exploration of unconventional hydrocarbons, optimizing the decision-making and increasing operational efficiency in one of the main country's reserves.

Use case classification

The report classifies this application of AI according to four axes:

1. By main resource: oil and gas.
2. By activity within Vaca Muerta: information management and decision making decisions.
3. By technology: generative AI models (GANs), machine learning (CNNs, RNNs), computer vision, and data integration platforms.
4. By strategic impact: strategic decisions and data analysis.

1. Opportunities for using AI and IAGEN in the sector

AI offers advanced capabilities to automatically segment layers geological, detect hidden fractures, predict high porosity zones and generate

synthetic models of the subsurface. These tools allow for an interpretation
Faster and more accurate seismic, ideal for improving drilling planning,
estimate reserves and reduce uncertainty in areas with low seismic resolution.

2. Expected benefits

The use of AI in this context allows:

- Improve well productivity through more accurate characterization
  requires subsoil.
- Reduce operating costs by avoiding non-productive drilling.
- Accelerate decision-making through automated insights and
  real-time visualization.
- Increase efficiency in seismic interpretation, with less effort
  human and greater consistency.

3. Application of AI

The solution is based on an ecosystem of deep learning algorithms, such as convolutional networks (CNNs) for geological vision, recurrent networks (RNNs) for temporal data, and generative models (GANs) to simulate scenarios.
geological. These technologies are applied to seismic volumes and geological data.
wells to generate predictive maps, automatic segmentations and reports
Conversational. In addition, big data platforms and interfaces are integrated
Conversational tools that allow you to interact in natural language with the results of the analysis.

4. Proposed AI Agent

The report proposes the development of an Intelligent Seismic Explorer, an agent autonomous designed to assist geoscientists in image interpretation
seismic. This agent integrates five specialized modules: ingestion and standardization of seismic and well data; geological vision with CNNs and U-Net
to detect fractures and porous zones; generation of synthetic models of the subsurface in areas with incomplete data; predictive productivity analysis for estimate extraction potential; and a conversational module based on GPT-4 Turbo

that allows queries in natural language and generates executive and technical reports automatically.

This agent allows the seismic interpretation process to be fully automated, identifying areas of high productive potential, delimiting structures hidden and proposing optimal locations for new wells. Its main benefit is the ability to integrate multiple data sources in real time, Improve the accuracy of geological analysis and reduce decision-making times in the critical stages of exploration.

5. Conclusion

The implementation of AI and IAGEN for seismic exploration represents a substantial transformation in the energy industry. In the case of Vaca Muerta, It allows to reduce risks, optimize resources and maximize the use of the deposit. This innovation positions artificial intelligence as a strategic tool for more efficient, precise, and sustainable exploitation of resources hydrocarbons of Argentina.