Elevating the Subsurface

Unleashing Generative AI's Impact

Ikon SCIENCE

Introduction

In the months since the commercial launch of ChatGPT, Generative AI has seamlessly integrated into the collective consciousness. While the roots of GenAI extend back to deep learning endeavors in the 1960s, it is the latest, highly accessible iteration that has rapidly propelled the technology into the forefront of public awareness, sparking a fervent race among tech enterprises and regulatory bodies to both innovate and regulate. Simultaneously, individuals across diverse industries find themselves in a state of curiosity, excitement, and trepidation as they contemplate the implications of this technology on their professional trajectories.
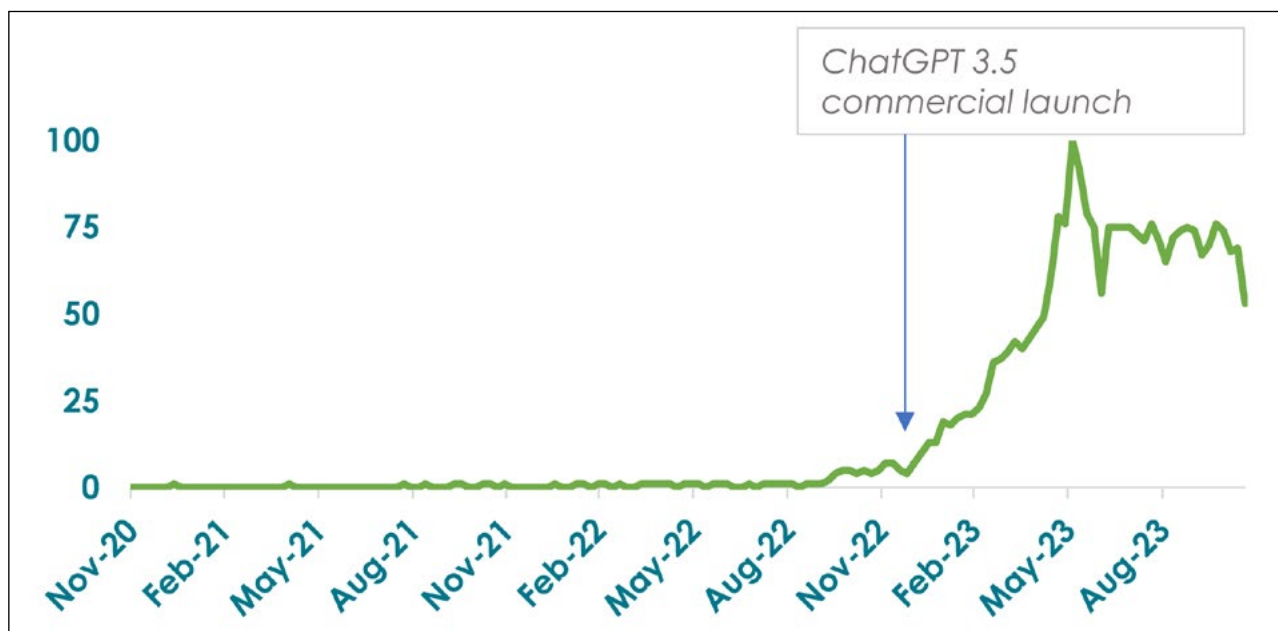
The frequency of searches for 'Generative AI' on Google has surged since the release of ChatGPT 3.5[1]

Understanding GenAI – In Brief

Generative AI represents a specialized branch of machine learning that excels in assimilating existing knowledge and producing novel outputs based on that information. This technology is adept at tasks such as media creation and engaging in conversations with speech patterns resembling human communication.

The proliferation of GenAI

Although Generative AI has existed for some time, the advent of pre-trained Large Language Models has significantly enhanced both the performance and accessibility of this technology for the general user. Pre-trained models like ChatGPT have harnessed extensive datasets from across the internet, empowering users to leverage these models for specific requests and tasks, building upon the foundation laid by these expansive models.

Overview of the Subsurface in 2024

Over the past decade, the landscape and composition of subsurface departments within the energy industry have undergone profound transformations. Drastic reductions in hydrocarbon prices in 2014 and 2020 led to substantial workforce downsizing, with many seasoned professionals exiting the industry.

Headcount in the upstream sector has dropped by **33%** since **2014**[2]

2014   2023
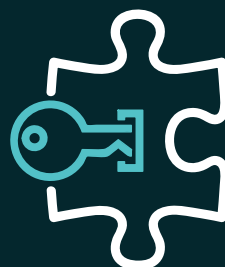
Filling the skills gap considered a 'key priority' by 35% of executives[3]

The focus of subsurface activities has evolved as well, with traditional exploration taking a backseat. Instead, emphasis has shifted toward near-field discoveries and optimizing production from existing reserves as companies seek to bolster cash flow for strategic growth and share buy-back initiatives.

The rising influence of renewable energy and carbon capture has introduced novel challenges and workflows to subsurface departments. Legacy assets are being re-evaluated for their storage potential for hydrogen and carbon.
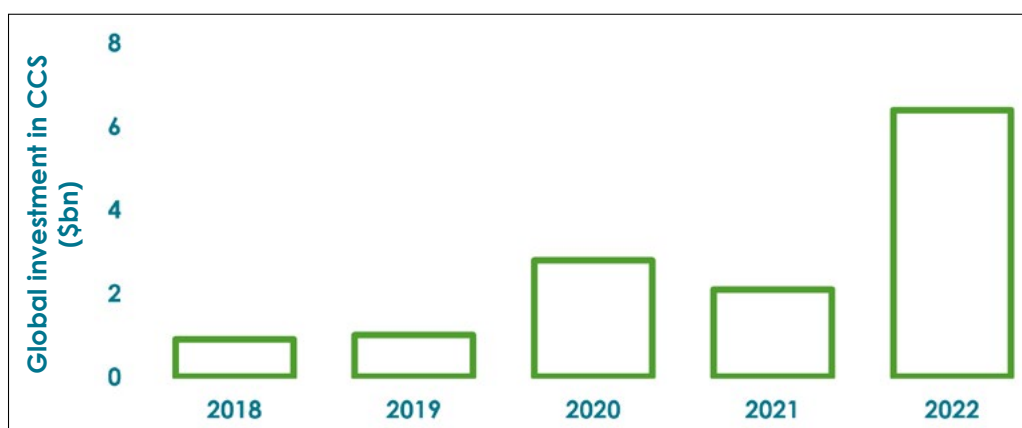
Global investment in CCS reached record levels in 2022 and is set to increase in 2023[4]

These shifts in organizational and departmental priorities have necessitated a recalibration of focus for subsurface experts. Heightened pressures on asset optimization have propelled a drive for real-time updates to subsurface models, aligning with the influx of new and diverse data types.

New-venture groups, established to identify strategic acquisitions for hydrocarbon production or carbon management, face the challenge of providing regional appraisals, often relying on data exclusively sourced from public channels. The utilization of such data demands substantial time for aggregation, processing, and vetting before it can be effectively employed.

The combination of reduced workforce and data-intensive workflows has created an organizational imbalance, where critical decisions may be based on incomplete datasets or unproven assumptions due to a shortage of resources for necessary technical workflows within stipulated timeframes.

The scarcity of readily accessible, high-quality data has long been a known challenge in our industry. Previous attempts to address this issue through automated data flows have faltered, primarily due to the requirement for dedicated resources, a lack of flexibility at an enterprise scale, and the intricacies of retrieval techniques.

⅔ of Geoscientists seek to explore intelligent automation technology[3]

This pursuit of progress and dissatisfaction with existing solutions are propelling nearly two-thirds of geoscientists to explore intelligent automation through AI, ML, or other data science initiatives. The crucial question arises: How can these advanced techniques be effectively applied?
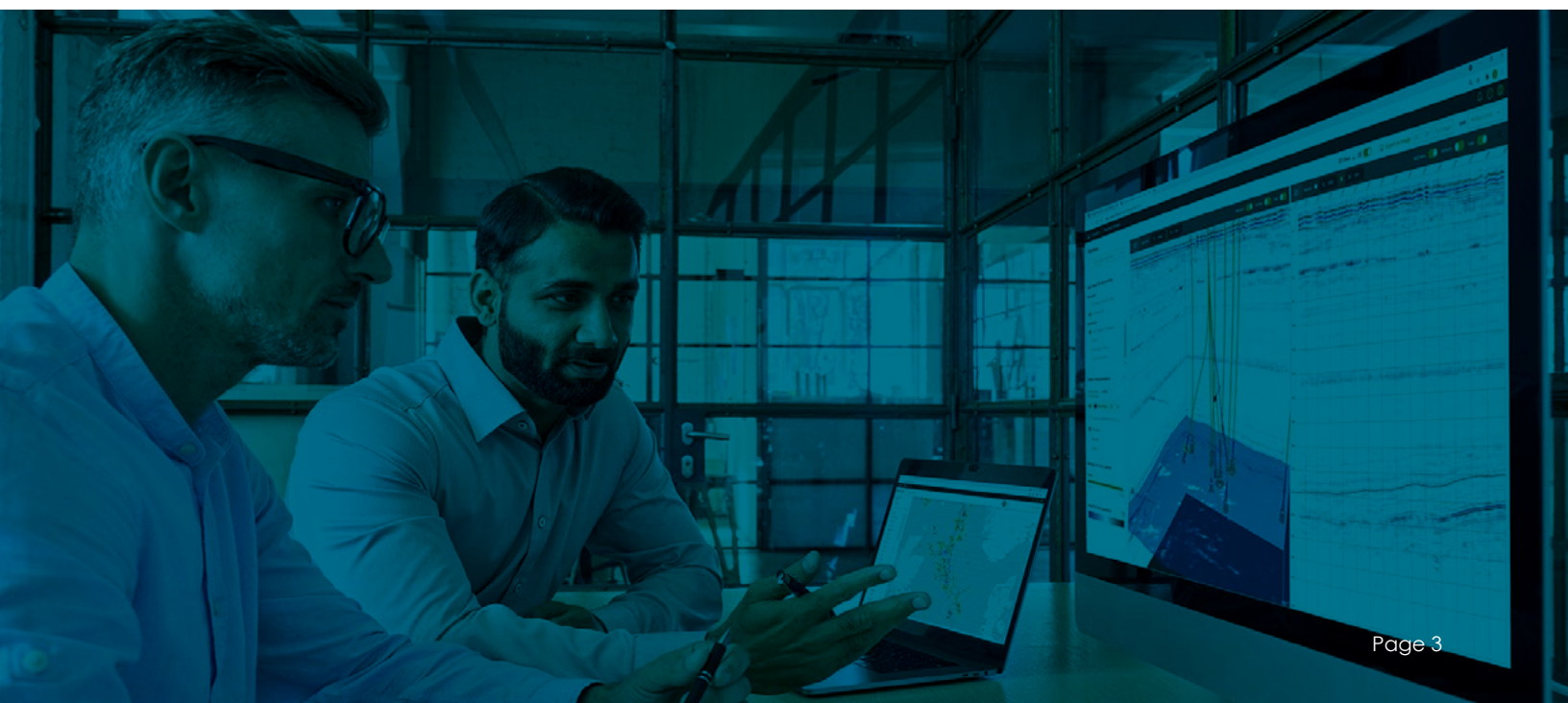
Where Generative AI Finds Application in the Subsurface

The conversational capabilities inherent in Large Language Model (LLM) based Generative AI tools make them particularly adept at reviewing extensive documentation and providing concise summaries and insights. This strength is particularly valuable for unlocking the vast troves of unstructured data accessible to most operators but often left untapped due to perceived inaccessibility.

Specific use cases for Generative AI in the subsurface industry could encompass:

Enhanced handling of legacy documents

Generative AI revolutionizes legacy document management in the oil and gas sector, addressing the challenge of underutilized digitized archives. These repositories, housing decades of information on network drives, often remain untapped due to perceived complexities.

Through specialized Generative AI agents, metadata extraction becomes streamlined, offering insights into report origins and specific test details. Automated labeling further enhances efficiency, enabling seamless integration into machine learning algorithms.

Leveraging the vectorization process, a key component of the LLM process, content categorization may become automated, shifting from traditional reliance on pre-extracted metadata to a more dynamic classification based on document content.

Documents → LLM → Vector Mapped → Clusters Labelled
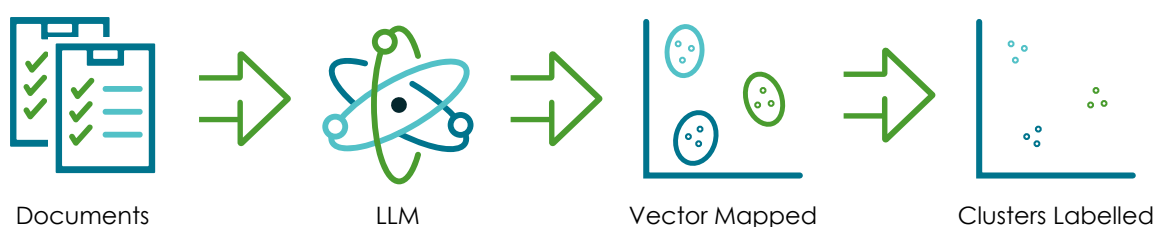
Utilizing the vectorization process employed by LLMs for bulk document categorization.

Knowledge sharing and accessibility

The renowned conversational prowess of models such as ChatGPT can be extended to the subsurface, unlocking critical insights from the multitude of documents available to operators. By providing LLM models, access to subsurface documents insights can be offered across disciplines and geological contexts. Geoscientists and engineers can pose questions or seek summarial statements about past operations and geological provenances.

Automated reporting and guidance

Generative AI's capabilities extend beyond accessing existing information; it can assist in the generation of new insights. While the realization of a 'fully-AI' geoscientist remains out of reach for now, these tools can aid in providing insights and facilitating access to ongoing projects.

Given the loss of many experienced industry experts, tasks such as interpretation review and communication of findings to other disciplines become time-intensive. Generative AI, through access to pre-existing documents, could potentially evolve to critically review interpretations as they are made, comparing them against previous versions or analogous basins and highlighting inconsistencies.

Emerging functionalities, such as those from companies like OpenAI, demonstrate Generative AI's ability to create summary charts and dashboards based on key information. The potential to automatically build reports tailored to specific requirements could revolutionize corporate data accessibility.

Transforming the Subsurface: Ikon Science's Generative AI Leap

As a leader of innovation in the subsurface for over 20 years, Ikon Science is now at the forefront of harnessing Generative AI's transformative capabilities.

At the heart of this is the integration of an LLM-powered chat functionality. This tool empowers geoscientists and engineers to directly interact with their unstructured subsurface documents. Users can pose queries, receive insightful answers, and gain immediate access to the source documents providing the information. Curate's innovative design facilitates a seamless exploration of data, allowing for follow-up questions and deeper insights, while Ikon's Subsurface expertise ensures the tool is fully configured for specific subsurface queries.
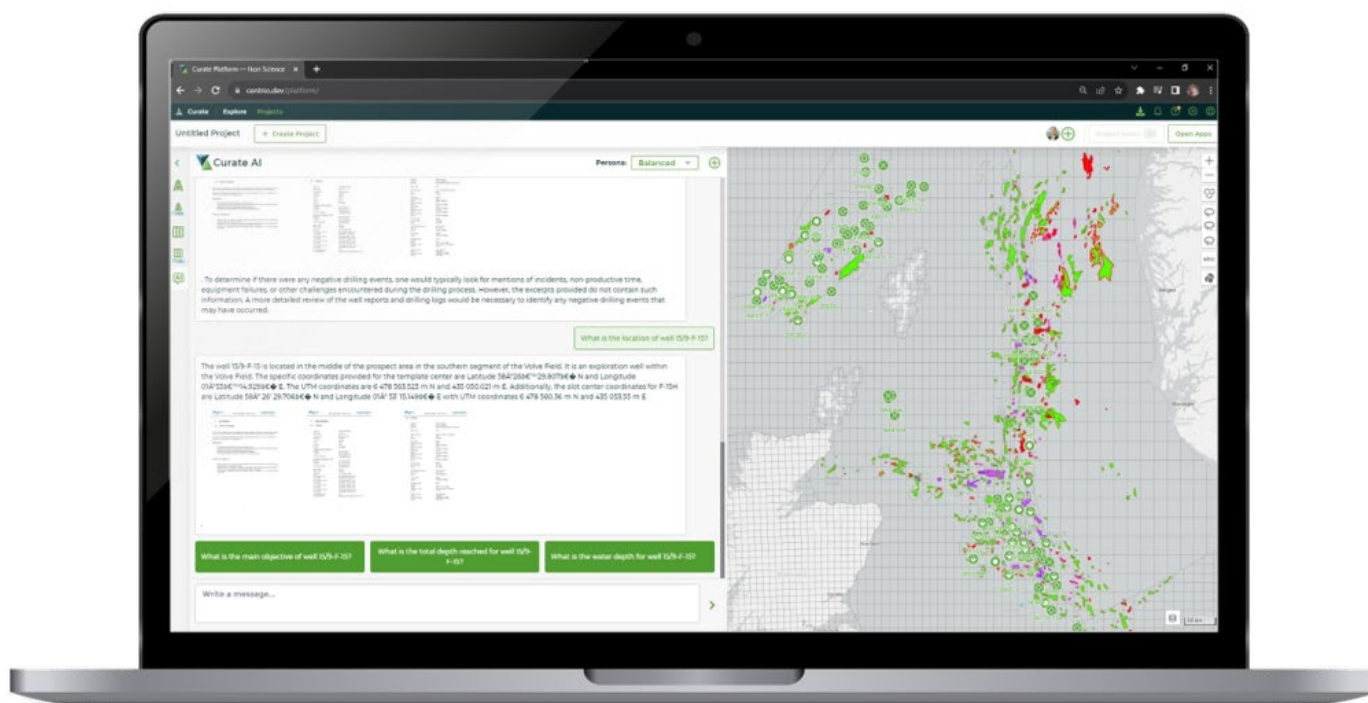
As Ikon Science continues to enhance its product portfolio, the journey of innovation with GenAI-enabled toolsets unfolds, aiming to empower the subsurface engineering and geoscience community throughout 2024 and beyond.

Ikon Science Data Solutions

Generative AI technology, exemplified by Curate Chat, holds the potential to revolutionize the roles of geoscientists and subsurface engineers, unlocking unprecedented access to pre-existing knowledge and insights. The true magnitude of these benefits, however, materializes when the underlying data is comprehensively sourced, vetted, and processed.

Ikon Science's Data Solutions specializes in the scoping, design, and implementation of digital transformation projects in the subsurface. With a track record of collaboration with major energy operators worldwide, this team ensures the seamless deployment of Curate as a full end-to-end subsurface data management platform.

Recognizing that the true power of a Generative AI chatbot is unleashed when supported by meticulous data management, Ikon Science invites you to delve deeper into our commitment to innovation and the capabilities of our data solutions teams at www.ikonscience.com.

Elevate your Subsurface IQ

▲RokDoc | **▲Curate**

Integrated Geoscience Workflows | Subsurface Data. Managed

www.ikonscience.com

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(3) Texas Oil and Gas Association – txoga.com – Job Growth Continued in Texas Upstream Oil and Natural Gas Sector in July, August 19th, 2022

(4) BloombergNEF – about.bnef.com – Carbon Capture Investment Hits Record High of $6.4 Billion

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