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AI/MACHINE LEARNING

AI Drives Transformation of Oil and Gas Operations

While the industry is adopting the technology, one expert highlights areas where the oil and gas sector could speed up the adoption of artificial intelligence.

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Data Science and Digital Engineering

Source: GIANT7/Getty Images

Humans have long used tools to increase efficiency. From our earliest days, we used sticks and stones to break bones for defense and sustenance. Today, bits and bytes have replaced these rudimentary tools, but the goal remains the same.

Wrangling unwieldy data streams is a gargantuan task that requires sophisticated computing systems powered by artificial intelligence (AI) and genius-level algorithms. These applications consume

AI is changing the face of the oil and gas industry, bringing new possibilities to a sector once thought of as slow-moving. According to a recent Ernst & Young survey, 92% of oil and gas companies worldwide are investing in AI or planning to do so in the next 5 years. And the impact of AI is already evident, as 50% of oil and gas executives are using it to solve challenges across their organization.

By embracing AI, companies in the industry are transforming operations, from optimizing exploration and drilling to streamlining production and logistics. With advancements in machine learning, big data analytics, and automation, the oil and gas sector is seeing remarkable progress in efficiency, safety, and environmental sustainability.

Despite AI's pivotal role in the future of oil and gas operations and production, its adoption must catch up to the speed at which it's being developed and applied. However, despite AI's significant impact, its adoption rate remains slow.

"In the energy sector, we're not seeing adoption as we should," said Kumar Lakshmipathi, principal solutions architect for Amazon Web Services, at the SPE Gulf Coast Section Data Science Convention on 20 April in Houston. "Compared to other industries, this is not what we see."

Consulting firm Gartner found in a recent survey that only about half (54%) of all AI projects make it from the pilot phase to actual production. Although this marks a significant improvement from the 85% failure rate of such projects in 2018, the slow uptake presents a considerable challenge. Gartner noted that risk and confusion are often the primary reasons behind such failures.

AI is reshaping the future of operations and production, but, for the industry to fully embrace its power, it's vital to adapt quickly to the rapidly changing tech landscape. Lakshmipathi highlighted several applications, one trend, and the troubling concern he sees regarding AI and the future of energy.

Applications

In addition to applying AI to monitor and improve safety, increase operational performance, and enhance customer engagement, Lakshmipathi cited forecasting and maintenance as two areas where he sees growth opportunities.

AI for forecasting is one application that he spotlighted as having many uses—from inventory planning to work flow planning—but he said that there are still many companies that "use some form of mathematical and statistical models for [forecasting]."

Lakshmipathi said he sees endless potential for AI in maintaining equipment, facilities, and platforms.

“There's a question someone asked me. They said, ‘Do you know what oil industry executives stay awake at night worried about?’ It's not the price of oil; it’s that potential oil spill,” he said. “We want to prevent this from happening. And so predictive maintenance is absolutely key.”

Predictive maintenance—a data-driven approach that analyses the condition of a piece of equipment to predict when it will require maintenance—will save companies $630 billion by 2025, according to the survey.

“There’s so much to gain from doing it, and you can use AI to do it. Many people are just reactive—it breaks and you fix it. Or they're doing preventive maintenance. You change the oil in your car every 3 months, which is great but tremendously inefficient,” he said.

With machine learning, he said, the model can “predict a failure is going to occur, put in a work order for the repair to the people who are going to be there, and then orders the parts for them.”

He explained that an AI-powered machine learning predictive model is sensor data coming in and data coming out.

“And in the middle, you can have custom models that could be physics-based aided with machine learning.

"At AWS, we have something called Lookout for Equipment. It is a machine-learning industrial equipment monitoring service that detects abnormal equipment behavior. It is unsupervised learning,” he said. “We just feed it normal data. It figures out what's normal, so it flags it when something abnormal happens.”

A Trend and Troubling Concern

Over the past decade, the merry-go-round of digital-related terms has spun out some truly memorable ones. There's no shortage of unique and intriguing names, from Bitcoin and blockchain, big data to machine learning, and nanobots to drones. The newest one to enter the daily lingo and steal the spotlight is ChatGPT—a generative pretrained transformer.

Generative AI is a subset of artificial intelligence that involves training algorithms to generate new, original content rather than simply processing existing data. It typically involves deep learning models that combine

generating text and audio. It can benefit tasks requiring creativity or generating new ideas or designs based on existing data.

According to Lakshmipathi, generative AI, in his opinion, “is big, is here, and it’s going to impact all in a hopefully positive way.”

He noted that there are many use cases for generative AI. In one example, he shared how images of equipment with rust can be generated with AI. These images can then be used to train models to learn what rusty equipment looks like and flag it for inspection.

He does, however, have one primary concern regarding generative AI systems.

“It has a dual role. You can predict climate change with it. You can enhance the smart grid; you can find out exactly how much you're going to produce and how much you're going to consume,” he said. “You can balance it. You can track greenhouse-gas emissions; you can do it by building, by block, by city. But what’s the gotcha? There's a huge carbon footprint.”

In a 2019 paper, researchers at the University of Massachusetts Amherst described their life-cycle assessment for training several standard large AI models. They found from training that one common natural language processing model emitted 626,155 lbm of CO_2 equivalent, nearly five times a single car's lifetime emissions.

AI can be a game-changer for the oil and gas industry, and its potential to increase efficiency is immense. Companies that invest in AI can reap the rewards of cost savings, sustainability, and faster processes.

Generative AI, such as ChatGPT, carries an intense carbon footprint. While AI offers broad possibilities for the oil and gas sector, human ingenuity should also be used to mitigate risk and ensure sustainable development. Integrating solutions from humans and AI will be essential for the industry to meet future challenges.

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