Data science for oil & gas
Deliver more for less, in faster timescales, while reducing environmental impact.

Energy—its sources, consumption patterns, and economic and ecological impact—has become one of the defining issues of our time. The oil and gas industry faces financial and market pressure to operate profitably, and societal and regulatory pressure to do so at minimal risk to the environment. Sometimes those initiatives feel as if they’re competing against each other. The good news is that the industry’s unprecedented volumes of data can be used to improve the processes and decisions related to oil and natural gas exploration, production, and refinement. The data volume grows daily, driven by the development of new devices to track a wider array of reservoir, machinery, and personnel performance. This creates an opportunity to empower the industry to deliver more for less, and faster, while reducing environmental impact.

Data science helps improve oil & gas businesses in these areas:

**Precision exploration and extraction**
Companies can use data science to create a clearer picture of the potential of different areas of exploration, and the volumes and lifetime production of discovered reservoirs. They can also improve the precision and efficiency of drilling, fracking, and completion approaches to ensure cost effective extraction. And they can assess the risk of each well and adjust hedging strategies to minimize unexpected losses or other complications.

**Optimized refinement and production**
By using data science to forecast demand and market prices, companies can set profit-maximizing production levels. They can also maximize labor productivity and personnel levels to avoid over- or under-staffing in refineries, plants, and in supporting departments. Data science can also optimize each step of the refinement process to improve the flow of product to market and make certain that the right capital assets are in place at the right time to streamline operations.

**Predictive maintenance of field equipment**
Data science can empower companies to predict which equipment in the field or refinery will go down before it actually happens. This gives them the opportunity to perform repair and maintenance in time to avoid operational disruptions. Picking the most cost-effective moment to conduct repairs further optimizes maintenance budgets while taking the guesswork out of planning for capital reinvestment.

$1.7T value to oil & gas industry from data-driven transformation (’16-’25)
1.2M tons of carbon reduction from same transformation
15% annual growth in oil and gas-related software patents
#1 industry among commodity industries in pace of data science hiring
Oil & gas benefits from data science:

**Drive revenue**
- Analyze upstream energy assets and processes to boost E&P success and efficiency
- Forecast production and demand to handle spikes while also avoiding idle capacity
- Shift refinery optimization to real-time to quickly adapt to production, market, and supply conditions

**Cut costs**
- Optimize asset utilization to get maximum output from capital investments
- Apply predictive maintenance to midstream infrastructure to minimize loss during transportation
- Analyze and streamline every process in the value chain to minimize costs

**Avoid risks**
- Profile EH&S risks and prescribe environmental protection measures
- Improve energy trading & risk management with smarter analysis
- Ensure pipeline integrity by integrating predictions of asset vulnerabilities with exposures

**CASE STUDY**

**Major oil and gas company increases yield by 2% while maintaining quality**

The refinement process is delicate and requires just the right mixture of elements to ensure a high-quality product and avoid damage to the equipment used. A major oil and gas company—like so many in the industry—relied heavily on its personnel’s intuition and experience to get it right. Using RapidMiner, the company switched to modelling the entire process to predict product quality based on machinery configurations. It then used the model’s insights to adjust its process continuously, making millisecond adjustments to equipment based on real-time (sub-30ms) guidance from its model. The result: a 2% increase in yield without any loss of product quality.

How RapidMiner optimizes oil & gas

The RapidMiner platform helps oil and gas companies recognize and unlock previously unseen potential for existing and new operations. Using the power of machine learning without requiring experienced data science and data engineering teams, oil and gas companies are able to be more precise with exploration and extraction, streamline production processes, and predict and prevent equipment failure to drive greater revenue, reduce costs, and avoid unanticipated risks.