AI in Oil & Gas Industry

A bitgrit industry case study

bitgrit

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INTRODUCTION

AI is not just a buzzword or a shiny new technology in the 21st century. It's here for real – and in the realm of oil, gas, and energy, AI has a major role to play – with applications in extraction technology and other advancements in the sector. New developments in cognitive computing, artificial intelligence and machine learning can optimize business operations, automatize processes, and make business smoother – from wells to wheels. Here, we examine what these applications of AI are in the context of the oil and gas industry.

Representative examples of Artificial Intelligence use cases in this industry include -

1. Intelligent Robots

Robots designed with AI capabilities for hydrocarbon exploration and production, to improve productivity and cost-effectiveness while reducing worker risk.

2. Virtual Assistants

Online chat platforms that helps customers navigate product databases and processes general inquiries using natural language.

3. Data Dashboards and Visualizations

A dashboard portraying BOEPD against working dates, along with color-coding of production, sales, budget etc. can be used to help forecast surpluses or shortages.

GENERAL CORPORATE USE CASES

Above are but a few representative examples of AI and RPA in this industry, but these technologies' applications are more intuitive than one may think. Certain business automation use cases that can be helpful for O&G sector are listed as follows -

- Invoice Automation
- Data Digitization
- Data Visualization using Dashboards
- Generating Automated Reports
- Employment History Verification
- Bank Statement Reconciliation
- Financial Planning
- Daily P&L Preparation

SPECIFIC USE CASES OF AI IN THE OIL & GAS INDUSTRY

AI can be employed to optimize O&G operations in almost every channel of the value chain – be it upstream, midstream, or downstream. Major applications currently deployed by the O&G industry are:

1. Oil Corrosion Risk Analysis

Corrosion by crude oil commonly causes equipment failures in this industry. Utilizing AI allows technicians to more intuitively apply knowledge on corrosion prevention based on the properties of the crude oil and the storage area – all while delivering maintenance insights to new engineers.

2. Data Analysis

The oil and gas sector operates in a massive scale globally, and quick access to data records is a vital part of maintaining smooth business processes. AI tools can help in digitizing records and automating the analysis of geological data & charts, which enable the following:

- Identification of Issues and Anomalies
- Increased Equipment Usage
- Predictive Maintenance

Oil well operators typically generate daily reports on inspection and maintenance operations at the oil field. AI technologies such as Computer Vision and Natural Language Processing can be used to extract data from these documents automatically. This data, when made available, can be fed to well-developed AI models, where results provide better insights and hints to realizing more efficient workflows. Stakeholders can also implement AI to improve overall reservoir functioning and building more strategic and informed workflows. Moreover, data regarding exploration, production, and reservoir data logs can be utilized in creating ML models for reservoir management.

3. Exploration

Oil and gas firms traditionally employ teams of divers and geological analysts to discover underwater anomalies, but the introduction of Autonomous Underwater Robotshas helped keep human employees out of harm's way. Well trained robots developed in collaboration with bitgrit specifically for this industry can collect seismic data and undergo optimization to new updates and upgrades. These robots can also be used to **detect natural hydrocarbon seeps** at the deepest depths of the ocean with high accuracy.

Other notable use cases are as follows:

4. Optimization of Valve Settings in Smart Wells to Maximize NPV

5. Machine Learning-based Rock Type Classification

6. Big Data Analysis on Well Downtime

7. Data-driven Production Monitoring

8. Reservoir Modeling and History Matching using Pattern Recognition

9. Drilling Rig Automation

10. Real-Time, Massive Information Collection and Analysis

11. Deep Learning to Improve the Efficiency and Safety of Hydraulic Fracturing

12. Provide More Intelligence at the Wellhead

13. Integrated Asset Modeling Optimization using Machine Learning based Proxy Models

In addition to the above, more use cases have come to light in recent years – with particular emphasis on the Inspection and Maintenance sectors. During inspection and maintenance, for example, the O&G sector aims to detect any anomalies that may threaten the operational integrity of O&G assets. AI can automate the assessment of inspection and maintenance results.

One can also implement AI into **surveillance systems** - O&G assets operate 24/7, requiring constant surveillance. For instance, an O&G pipeline normally has sensors to detect any oil leakage, which must be monitored constantly by operators. AI can optimize inspection and maintenance plans; machine learning algorithms allow for increased automation in the knowledge engineering process, replacing much time-consuming human activity with automatic techniques that improve accuracy or efficiency by discovering and exploiting irregularities in data. In essence, AI can solve the problems faced by manual assessment.

SPECIFIC USE CASES OF RPA IN THE OIL & GAS DOMAIN

Robotic Process Automation (RPA) is used to perform processes such as data gathering, reporting, matching and reconciliation, along

with more, complex multi-faceted processes such as period-end closes. Price fluctuation affects almost every entity in the oil and gas supply chain; and companies try to control costs by optimizing operational performance. The key here is to leverage emerging technologies to increase operational efficiency in all operations, therefore increasing ability to respond to fluctuation.

1. Upstream

Finding New Sources of Oil - Oil companies depend on data from seismic surveys for finding oil sources, but these surveys do not provide a clear picture of rock formations as underwater currents and other factors affect the images. This makes the data yielded "noisy data." AI systems can be used to reduce the time needed to produce clearer images bringing the search process time down to only a few weeks and thus can screen more locations very quickly to pick the best ones for drilling.

2. Midstream

Predictive Maintenance for Equipment - Malfunctions cost a considerable amount of money for maintenance and lead to downtime on many functional parts. Sensors can be installed to capture equipment-performance data like temperature and pressure, which can be fed into machine-learning algorithms trained on historical data. By learning which conditions preceded mechanical trips or surveillances, and by detecting abnormalities, one can prevent potential disasters or shutdowns preemptively.

3. Downstream

3.1 Logistics - Transportation involves a great deal of coordination with the involved parties in terms of scheduling, monitoring transit of assets, etc. Software robots can be programmed to communicate with forwarders to arrange shipments and update disparate systems with the details of the shipments, which allows for quicker and more efficient arrangements. These bots can also read scanned documents using OCR methods to tag shipments with vehicle number, route, destination and expected time of arrival into systems for use in real-time monitoring.

3.2 Demand and Supply Planning - Utilizing RPA, oil companies can automate the process of gathering and merging necessary information from various sources, running data cleansing tools, as well as transforming final data into actionable plans and strategies. It also helps provide and maintain necessary communication between upstream and midstream oil companies in planning exploration and production processes.

3.3 Automating End-to-End Orders - Management Process - Management processes involve manually checking millions of non-standardized documents – or documents not uniform in format or content – each year. Tools and models can be developed for document interpretation and classification. We at bitgrit can also develop RPA that processes orders, verifies discrepancies, and sends invoices customers. The process may operate with a human "in-the-loop" so that unrecognized documents are routed to a person and the bot observes the outcome, continually learning the process.

4. Oil Price Prediction

Market forecasting data and economic data can be used in conjunction with news articles and public sentiments (extracted from social media platforms) to forecast the global oil prices (commodity, futures etc.)

Many more cases can be developed specifically to the company's operation and given the rate of technological advancement in recent years, we can expect to see this sector continuing to grow.

bitgrit: AI for All

The AI industry is projected to grow to **$116 billion** by 2025.

bitgrit is a company providing a platform that levels the playing field for AI by bringing together a community of data scientists and connecting them to companies needing AI solutions.

AI COMPETITION

Affordable and novel AI solutions to complex business challenges

JOB BOARD

Access to top data scientists and AI engineers around the world

DATA VISUALIZATION

Big Data and Analytics utilization that identies market trends and increases the productivity

AI CONSULTING

AI technology adoption with conducting research and analysis, development and implementation

COMPETITION STEPS

STEP 1

Determine what problem you want solved and provide the relevant datasets

STEP 2

bitgrit uploads the problem statement and datasets to the competition platform

STEP 3

Data Scientists in the community submit quality solutions from which top results are selected

STEP 4

Utilize the best model to fulfill your business needs

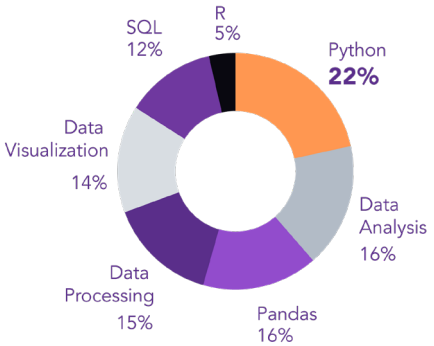
STEP 5

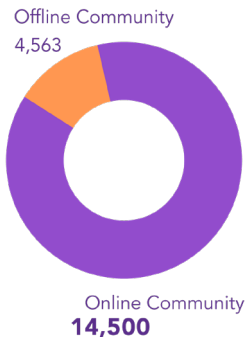
Top ranking competition member or team wins prize money

UNREALISED POWER OF AI

1. Determining possible use cases and value that can be extracted from existing data.
2. Difficulties in translating business challenges into data science problems.
3. Inability to develop, experiment and rank a variety of models rapidly.
4. Risks of providing people the access to confidential data.
5. Hassles of identifying the right talent to produce customized, extraordinary models.
6. Structuring of data and identification of relevant parameters.

20,000+ DATA SCIENTISTS - BITGRIT COMMUNITY OVERVIEW





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2. Pinpoint difficulties in translating business challenges into data science problems.
3. Overcome obstacles to develop, experiment and rank a variety of models rapidly.
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6. Structure data and identification of relevant parameters.

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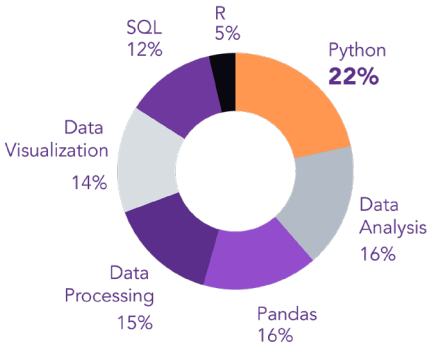

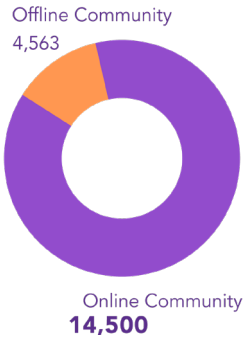

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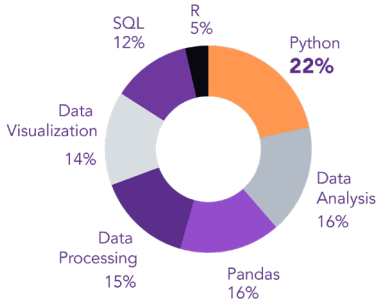

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