From Insight to Foresight:
Knowing How to Apply Artificial Intelligence in the Oil and Gas Industry*

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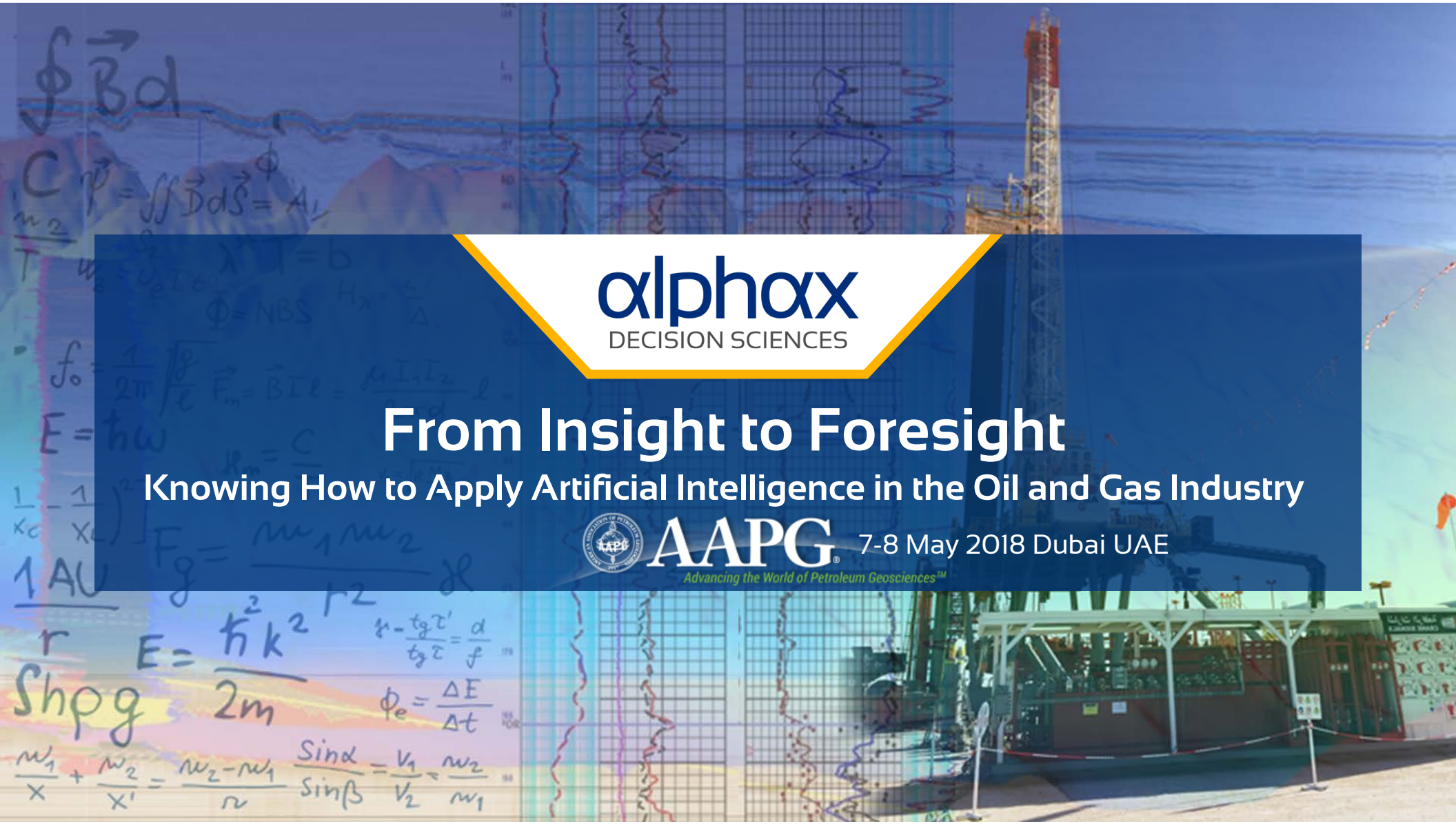
Abstract

We are in an era where digital technologies are developing at exponential rates and transforming industries wholesale. The confluence of machine learning advances, accelerated growth in acquired data, on-demand computing such as cloud infrastructure, and other advances in automation and robotics are causing an industrial revolution that some term “Fourth Industrial Revolution”. Given that all these transformative technologies are now available and rapidly reinventing other industries, why is the rate of adoption in the oil and gas industry so slow? How can we best utilize these advances to stop drowning in data and instead transform this data into information and knowledge in order to enable secure and intelligent automation in oilfield operations? We outline some of the structural challenges facing the oil and gas industry, and describe a few of the solutions that have been developed to help companies in the industry. These include applications from the subsurface in geophysics, completions design, and production.

Overcoming data silos in traditional data infrastructure requires a novel approach to cloud infrastructure that respects user access, data privacy and data residency requirements of companies. The step of assessing data for quality and for reasonable diversity and variation in order to answer questions posed by oil and gas companies can be quite profound. This critical step prevents companies from spending lots of non-productive time and money trying to develop and tune artificial intelligence/machine learning algorithms to produce answers that are simply not available in the data. Further, getting the data in a suitable form to apply artificial intelligence/machine learning can be quite involved. We illustrate the above challenges by several subsurface examples, and then describe the implementation of solutions. What we will show is that the oil and gas digital highway presently has data traffic jams preventing it from moving at the speed of light. Removing these traffic jams offers decision makers the opportunity to move from insight to foresight – looking out in front, instead of the rearview mirror, to drive change.



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From Insight to Foresight

Knowing How to Apply Artificial Intelligence in the Oil and Gas Industry

AAPG
Advancing the World of Petroleum Geosciences™

7-8 May 2018 Dubai UAE

Artificial Intelligence is driving the Fourth Industrial Revolution

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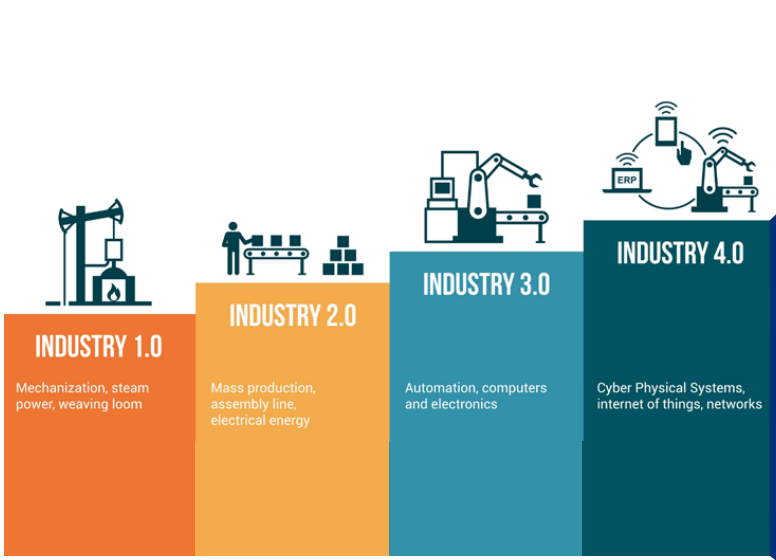
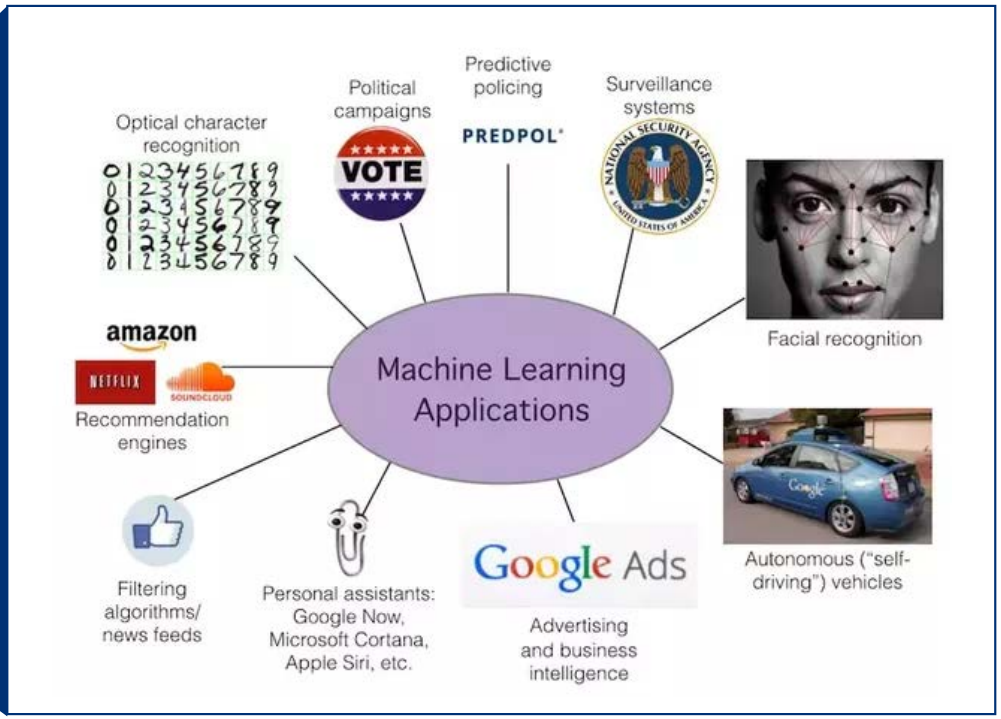


Artificial Intelligence drives how computer systems monitor and prescribe actions to physical systems



WHY ISN'T IT MORE PREVALENT IN OIL & GAS?

AX-AI Software: Wells & Production

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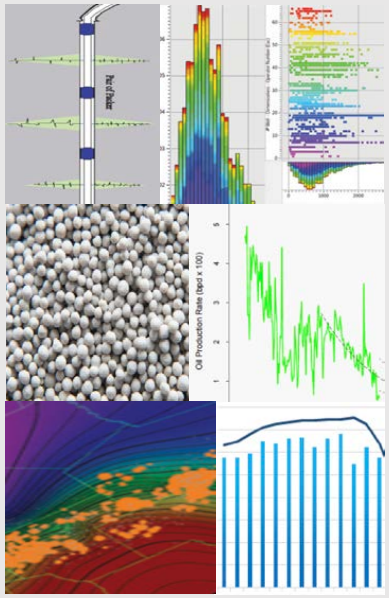
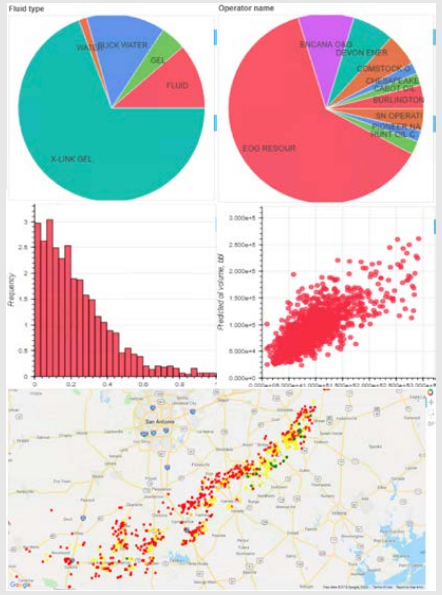
Input Parameters (sample only)
Complex Shale Plays (Haynesville, Eagle Ford)

- Horizontal wells
- Frac stage details
- 12,000+ wells
- Perforation information
- Fluid volumes
- 6 years of production history
- Proppant volumes
- 12+ operators
- Production rates



Output Metrics
Probabilistic, Prediction, Prescription Models

- ~7,500 training wells 4,500+ predicted wells
- Predicting asset clusters for sweet spot at [...]
- Predicting cumulative production at [...]
- Prescription for completion design
- Prescription for production optimization



Sweet Spot detection, Well Placement recommendation, Completion Design guidance, Cost Analysis

AX Data Engineering – Data Acquisition and Management

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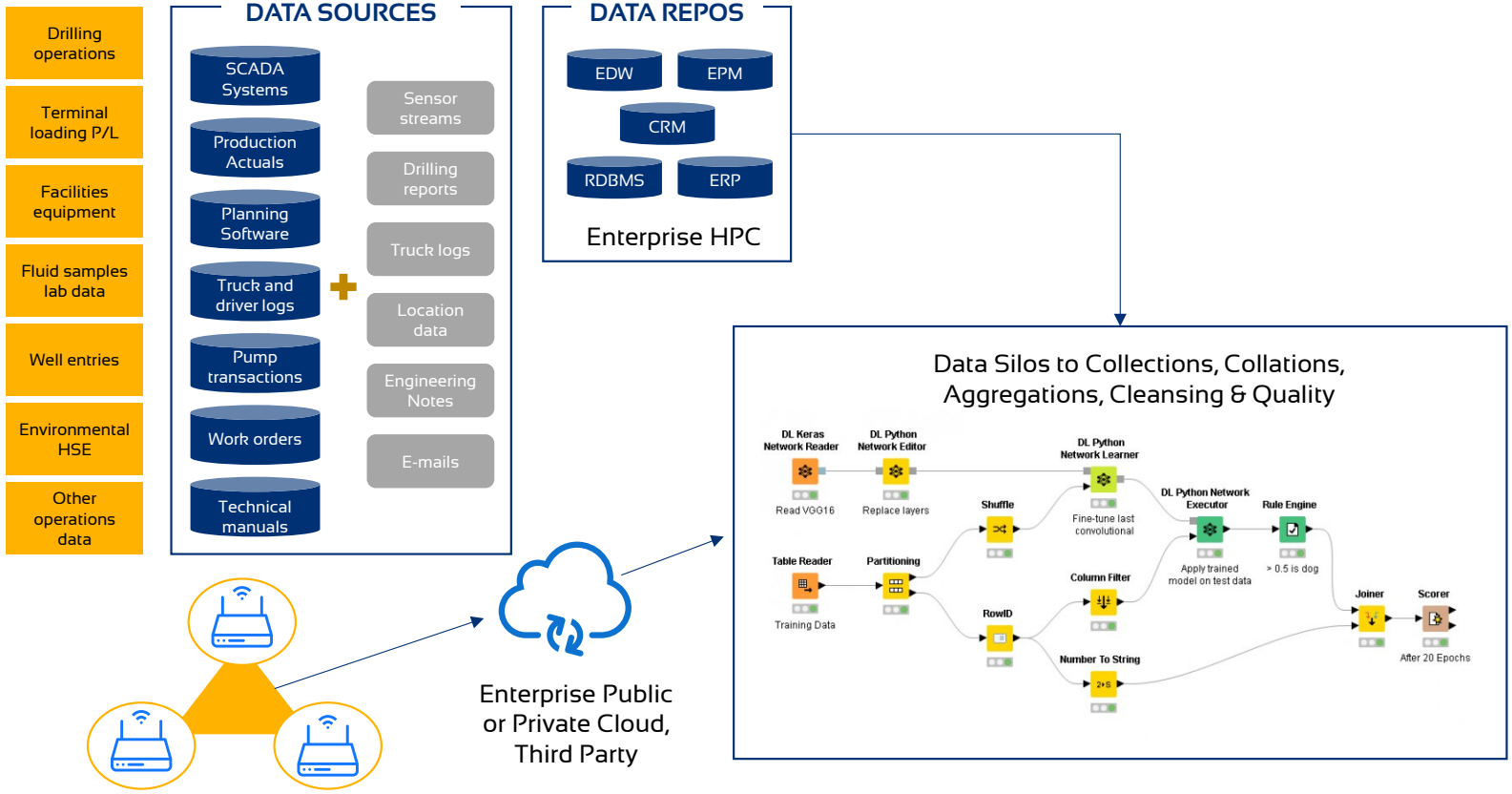
IP Protected



Interface leverages all the data available to provide maximum return on data analytics efforts

AX-Cloud – Near Un-Hackable against CyberThreats

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CLOUD ANALYTICS SERVER (CAS)

ANALYTICAL TOOLS

SPSS, python, R, sas, +ableau

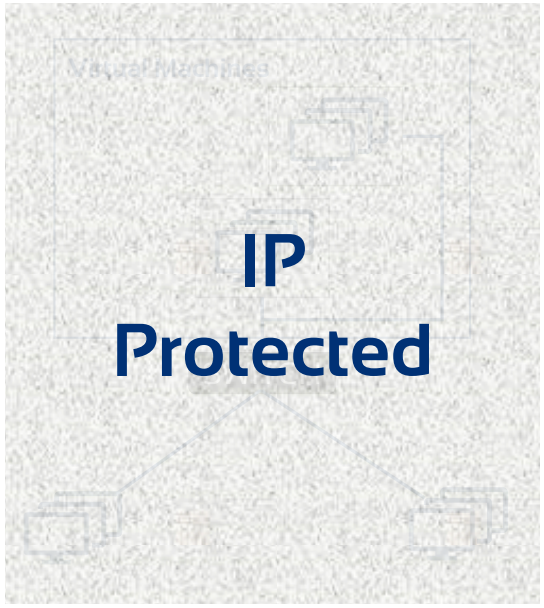
OPEN SOURCE PLATFORMS

Open for Innovation KNIME

PROPRIETY AND CUSTOM

IBM Watson, PREDIX

CLOUD TERMINAL SERVER (CTS)



External & Public security group internet access

PUBLIC OR PRIVATE CLOUD IMPLEMENTATIONS

FEATURES

- Inaccessible in non-authorized environments
- Cannot be hacked by any social engineering efforts
- Each user is authenticated
- Multi-factor authentication in place
- Solves data residency issues
- Database agnostic
- Customizable analytical software platform

"Cyber crime is the greatest threat to every company in the world"

GINNI ROMETTY, IBM's Chairman, President and CEO

Ultimate data security, secure user access, and customized analytical software stack (patent pending)

AX – CDAT – Determining the Viability of the Business Question

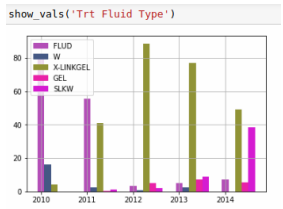
Customer Data Acceptance Test

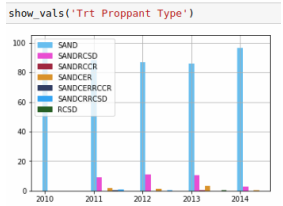
STAGE 1

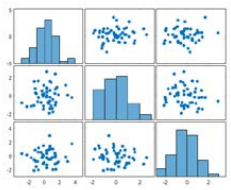
Data Formatting, and Cleansing

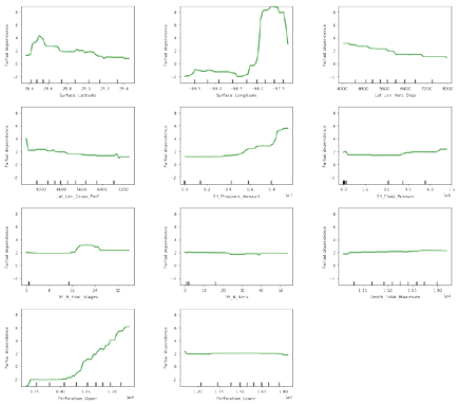
STAGE 2

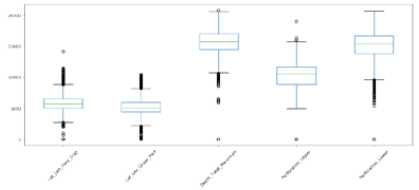
Making data viable for Machine Learning and finding predictive features

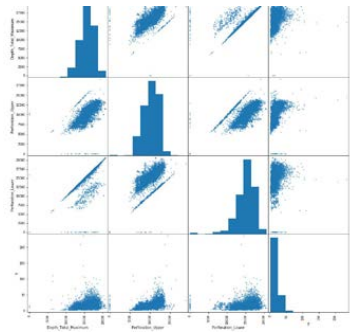


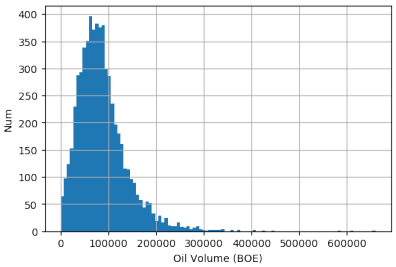


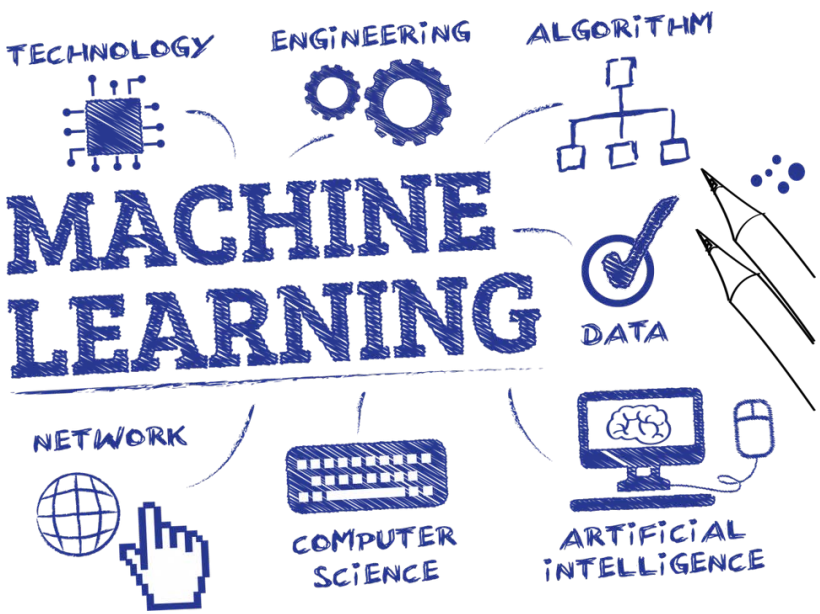












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AlphaX

develops predictive and prescriptive artificial intelligence software and cloud infrastructure solutions

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Advanced Analytics and AX-AI Software

- Geoscience Workflows e.g. Seismic, Logs
- Production Optimization
- Predicting Equipment Failure
- Optimize Completion Design and Execution
- Optimize Drilling and Well Placement

Data Engineering

- CDAT
- Privacy Analytics Software
- Custom Data Analysis
- Data Management

Software Services

- SaaS Software Development and Deployment
- Mobile Development
- Edge Device Integration