Decision Science for Unconventional Reservoirs

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What Is Decision Science?

Decision Science augments Physics with Machine Learning and Software Engineering
Machine Learning

Separate Signal from Noise in Complex Data

- Branch of statistics designed for big data
- Computers learn from data and write their own programs
  - Rather than follow explicit instructions programmed by humans

1. HBR July 2015

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Digital Twin

Software that Represents Physical Assets

'OAG 14-24' Design Dashboard

Alternative Well Design: Alternative Design 6

Reservoir: Middle Bakken
Stage Count: 33
Completion Type: P&P
Percent Sand / Ceramic: 40.0%
Proppant 1 Type: 40/70 Sand
Proppant 1 Vol/Stage: 43.400
Proppant 2 Type: 20/40 Ceramic
Proppant 2 Vol/Stage: 69.300
Proppant 3 Type: --
Proppant 3 Vol/Stage: 0
Fluid Type: Hybrid
Fluid/Stage: 2.356
Max Treatment Pressure: 9,100
Max Treatment Rate: 36.7

EUR: Baseline = 405,341 | Alternative = 497,839
Cumulative Production: OAG Prediction vs. 5 Closest Offset Production Wells

Well Cost

Baseline: $6,193,329
Alternative: $7,451,163
Total NPV: $4,530,139
Baseline: $8,155,367
Total IRR: 23.14%
Alternative: 34.26%
Maximize Data Value for Each Business Objective

**DATA**
- Align data with business objective

**LEARN**
- Turbocharge the math behind current data and workflows

**OPTIMIZE**
- Act on insights generated by ML

**Identify a high value business problem**

- Trivialize creating a single data set from data across your organization
- Minimize cycle time with codeless interface and large-scale compute
- Software combines with Machine Learning to deliver actionable insights

**ML Combines with Physics to select the best data**

**ML Combines with Software to provide actionable insights**
Business Value

Interactively Optimize NPV & IRR

- $500 Billion annual upstream spend
- U.S. wells $4M – $15M each
- Minimize costs & analysis cycle time

Machine Learning is helping U.S. oil companies:
- 10% completion cost reduction per well
- 25% more accurate production forecasts
- 90% faster than reservoir simulation
Best Practices

Transform data into decisions and operational improvements that can be measured on a balance sheet

- Start with a business problem
- Define success metric(s)
- Measure the value of your data
- Apply analytics that maximize success metrics
- Create trust with transparency & control
- Optimize ML for insights & accuracy
- Optimize Workflow for cycle time