## OPTIMIZING WELL PORTFOLIO PERFORMANCE IN UNCONVENTIONAL RESERVOIRS A CASE STUDY





## AGENDA

- Data Mining Virtuous Cycle
- Data Mining: What is it?
- Data Mining: O&G Input Space
- Deterministic to Probabilistic
- SEMMA Process: Case Studies

![](_page_1_Picture_6.jpeg)

"THAT'S your Ark for the Big Data flood? Noah, you will need a lot more storage space!"

![](_page_1_Picture_8.jpeg)

# Data Mining: Virtuous Cycle

![](_page_2_Figure_1.jpeg)

"Those who do not learn from the past are condemned to repeat it."

George Santayana

![](_page_2_Picture_4.jpeg)

# Data Mining: What is it?

- Data Mining Styles
  - Hypothesis Testing
  - Directed Data Mining
  - Undirected Data Mining

![](_page_3_Picture_5.jpeg)

![](_page_3_Picture_6.jpeg)

![](_page_3_Picture_7.jpeg)

# **Data Mining: O&G Input Space**

![](_page_4_Figure_1.jpeg)

![](_page_4_Picture_2.jpeg)

## **Deterministic to Probabilistic**

![](_page_5_Figure_1.jpeg)

![](_page_5_Picture_2.jpeg)

**CASE STUDY** 

## THE SEMMA PROCESS

![](_page_6_Figure_2.jpeg)

![](_page_6_Figure_3.jpeg)

![](_page_6_Picture_4.jpeg)

## COMPLETIONS STRATEGIES

### **BUSINESS ISSUES**

Multinational operator was trying to qualify well performance in the Pinedale Anticline in western Wyoming. The environment presented several challenges because of commingled productivity from multiple fluvial sand packages in a single wellbore distributed over greater than 5000 feet of gross vertical section

### SOLUTION

Generation of a neural network that qualified the relationships between Petrophysical, Geological and Operational Parameters such that the solution could be used in both design and operational phases.

## **RESULTS AND EXPECTED RESULTS**

Data Driven model that assisted in design and operation of

- Well placement
- Stage management
- Completions design
- Proppant design

## **UNCONVENTIONAL GAS**

"Data driven models enabled us to accelerate and implement a easy to use and intuitive solution to the multivariate uncertainties inherent in subsurface environments"

**Production Engineering Advisor** 

![](_page_7_Picture_15.jpeg)

![](_page_7_Picture_16.jpeg)

#### UNCONVENTIONAL SHELL SPE 135523 TIGHT GAS WELL PERFORMANCE OIL AND GAS

![](_page_8_Figure_1.jpeg)

![](_page_8_Picture_2.jpeg)

## FORECASTING IS A COMPLEX PROCESS IN ITSELF

![](_page_9_Figure_2.jpeg)

![](_page_9_Picture_3.jpeg)

| CASE STUDY:<br>SEMMA         | SAMPLE THE DATA  |
|------------------------------|--|
| Performance<br>Platform      | Performance monitoring and Management                                    |
| Collaboration &<br>Analytics | Integrated Planning  |
|                              | SubSurface<br>Intelligence<br>geosciences                                |
| Knowledge<br>Platform        | Documentation and Compliance, Process Optimization                       |
| Information<br>Platform      | Data Aggregation, QC,<br>Storage Exploratory Data Analysis Visualization |
|                              | SAP Seisific Branch<br>Production Systems PETRA SCADA                    |

![](_page_10_Picture_1.jpeg)

![](_page_11_Figure_0.jpeg)

![](_page_11_Picture_1.jpeg)

# **Case Study**

## DATA MODIFICATION

- Traditional DCA
- Probabilistic methodology
- Well Forecasting Solution
  - Bootstrapping module
  - Clustering module
  - Data mining workflow

![](_page_12_Figure_8.jpeg)

![](_page_12_Picture_9.jpeg)

MODIFY

## **CREATE MODELS TOWARDS OBJECTIVES**

![](_page_13_Picture_2.jpeg)

![](_page_13_Figure_3.jpeg)

- 1. Cumulative liquid production
- 2. Cumulative oil or gas production
- 3. Water cut
- 4. Initial rate of decline
- 5. Initial rate of production
- 6. Average liquid production

![](_page_13_Picture_10.jpeg)

ASSESS FOR OPERATIONALIZATION

Three key goals:

- Automated and semi-automated data QC workflows
- Robust and accurate well portfolio forecasting
- Automated well surveillance with smart alert system

![](_page_14_Picture_6.jpeg)

![](_page_14_Picture_7.jpeg)

ASSSESS

### VALUE FRAMEWORK

![](_page_15_Figure_2.jpeg)

![](_page_15_Picture_3.jpeg)

## THANK YOU

![](_page_16_Picture_1.jpeg)

![](_page_16_Picture_2.jpeg)