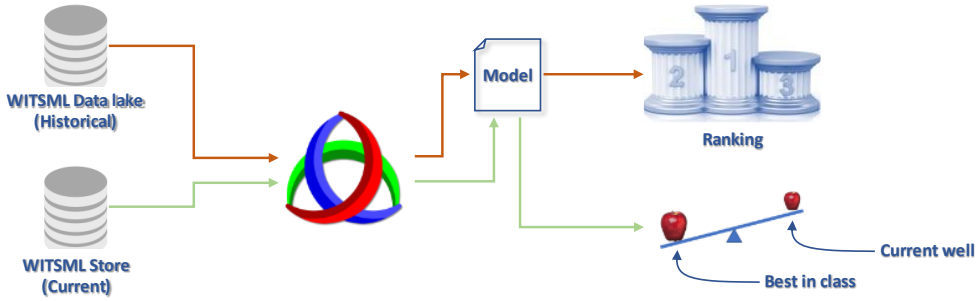
Odin

BENEFITS

- Create an objective ***index*** to represent well complexity using historical well data
- Reduce well construction cost by proper planning and mitigating risks
- Deliver more wells by significantly shortening execution time
- Quickly identify factors causing performance degradation
- Quick implementation without benchmarking effort
- Support effective and interpretable comparison among the entities using sound data-driven, objective methodologies
- Seamless data collection from multiple sources including WITSML stores
- Built-in depth correction and time alignment as add-ons
- Tight integration with SigmaStream's YellowHammer aggregation
- Rich visualization and configurations screens provided by SigmaStream's HummingBird engineering visualizer

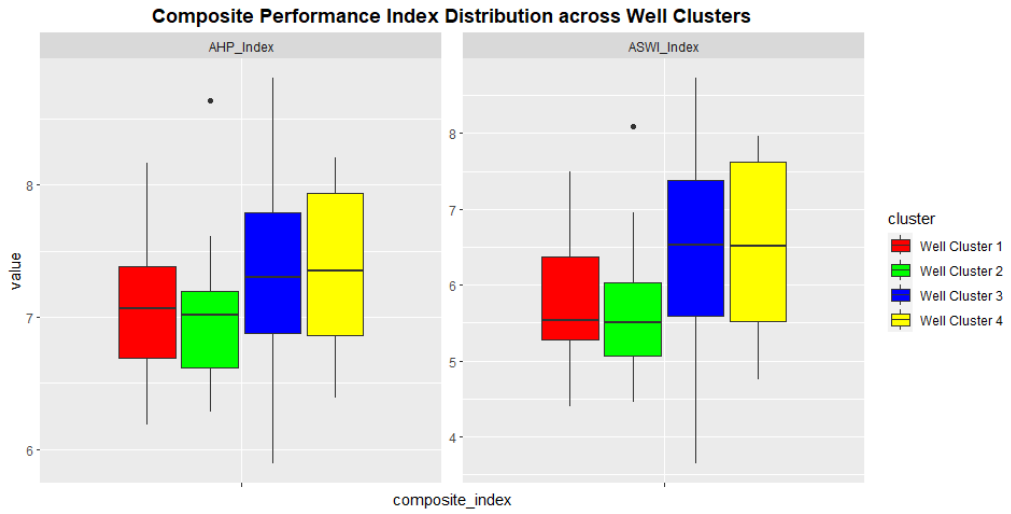
Overview

Odin is a multi-objective framework powered by AI designed to compare and rank wells. It utilizes a **Composite Performance Index** (CPI) to evaluate complex entities such as drilled wells and enables operators to assess and compare drilling performance within a specific field or across multiple fields. Additionally, Odin supports well planning, helping reduce costs and accelerate execution times to improve overall well construction.



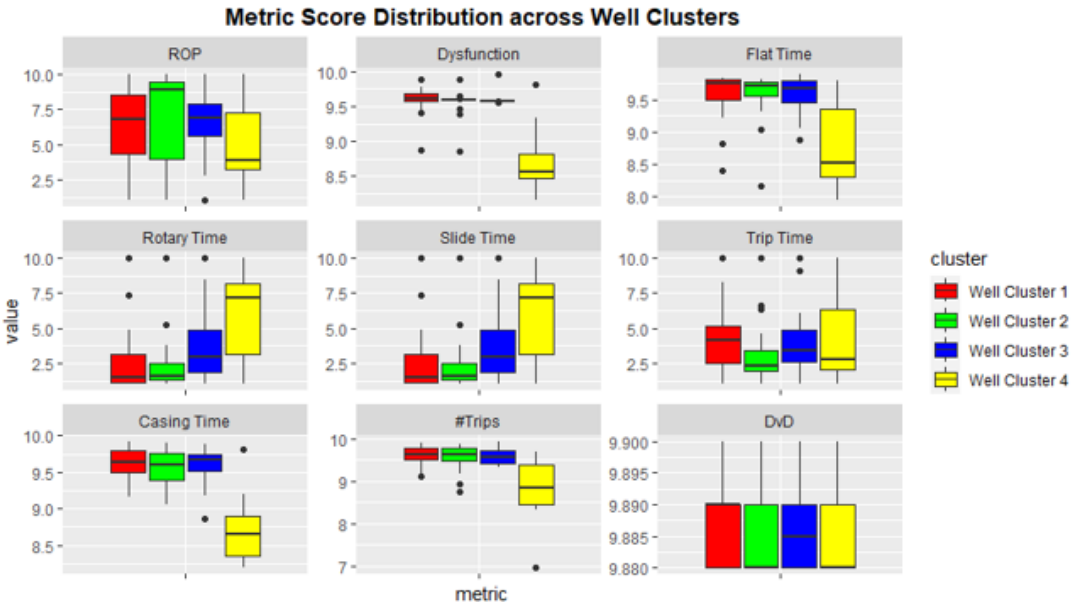
Paradigm

A multi-metric-based approach where each metric in turn depends on multiple factors, formed the basis of the implementation of Odin. State-of-the-art explainable AI (XAI) techniques helped build an analytically sound unifying scheme that supports easy roll/unroll for macro/micro-level analysis. The methodology embeds data normalization to render parameters comparable across wells. Users can choose between a generic and additive Analytic Hierarchy Process (AHP) or a SigmaStream proprietary multiplicative Attribute Score Weighted Index (ASWI) approaches to derive the CPI.



Differentiators

The XAI-based Odin is both a strategic and a tactical tool that can provide operational guidance for an ongoing well. The CPI is simpler to use and interpret than a battery of individual indices and is easier to track over time. Odin's CPI facilitates objective communication among stakeholders thus promoting accountability. This leads to effortless identification of factors affecting performance degradation. Since the ranking of historical wells is conducted offline, the implementation of a performance monitoring system can be achieved without the need for a benchmarking effort.



SYSTEM REQUIREMENTS

Server

OS: Windows
Ubuntu 14+
CentOS 6+
MacOS X

CPU: Quad-core 3.0 GHz or higher

Memory: 16 GB+

Client

Browser(s): Google Chrome Version 60.x+

MS Edge 25.x

SIGMASTREAM

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Features

The key features of Odin are:

User Selectable Performance Metrics

Currently Odin supports 9 complex metrics over which the CPI is calculated. The user has the ability to exclude metrics that don't satisfy operational and business objectives. The Odin documentation includes exhaustive explanation of what and how each one of these metrics are constructed. Odin allows the user to plugin custom metrics that comply with the Odin architectural and data interfaces.

Ranking within Cluster to allow apples-to-apples Comparison

Historical wells are classified into clusters and ranking of wells is performed within the cluster. This provides two key benefits. Comparison is conducted within homogeneous subgroups rather than across the entire population. Secondly, when monitoring the performance of a current well, the well is first associated with a similar cluster before identifying an "analog" well to be used as a yard stick.

Two approaches to CPI Calculation

At a high level the AHP approach is additive in nature while ASWI is multiplicative. Odin allows the user to choose how the CPI is calculated. The Odin documentation includes pros and cons of each approach. The choice is usually driven by the factors that classify the universe of wells into clusters.

Desirable and Undesirable Metrics

Metrics such as a flat time being undesirable is easy to understand. However, certain metrics could change from being desirable to undesirable with context or over time. Odin is both time and context sensitive and this allows the engine to compute the CPI correctly before ranking wells.

