

Visual Analytics and Machine Learning Insights of Duvernay Play Drivers

Ryan F. Campbell
GLJ Ltd.

Summary

GLJ has been evaluating the Duvernay formation since its inception, blending subsurface geoscience and reservoir engineering workflows with analytics and machine learning (ML) approaches.

Visualizing Duvernay geoscience alongside engineering and production reveals compelling regional trends and play insights. This allows for an evaluation of the play's progression in recoveries and the evolution of design, completions, and spacing trends over time to optimize well performance.

Geoscience, engineering, and well performance have been integrated into ML models at the play level and sub-area/operator level. This integration has identified key drivers of well productivity, revealing commonalities, differences, and spatial variability in these drivers. The relationships between these drivers with well productivity were also investigated. Additionally, operator-level ML models provide insights into operator best practices and emerging trends.

Theory / Method / Workflow

This study employs a combination of visual analytics and machine learning (ML) to assess key drivers of well performance in the Duvernay play. The workflow integrates geoscience, engineering, and well production data to develop predictive ML models at the play-level and sub-area/operator-level. Machine learning and visual analytics are used to illustrate key drivers for the play.

Results, Observations, Conclusions

The integration of visual analytics and machine learning has provided insights into key drivers of the Duvernay play. Integrating geoscience, engineering, and production data has revealed distinct regional trends in recoveries, completions, and spacing strategies. Machine learning models have identified important drivers of well productivity, highlighting both shared and unique productivity influences across the play.

Operator-level ML models have uncovered best practices, demonstrating the impact of design decisions on well productivity. These insights support optimization efforts aimed at improving recovery efficiency and future development strategies in the Duvernay.

Novel/Additive Information

This work introduces a novel approach by combining traditional geoscience and reservoir engineering analysis with advanced machine learning techniques to analyze Duvernay play drivers. The integration of well performance data with geoscience, geospatial and engineering data has enabled a comprehensive understanding of regional trends and play dynamics.

Furthermore, operator-level machine learning provides insights into operator best practices and performance correlations, offering a unique contribution to understanding how design and operator strategies impact performance across the play.

Acknowledgements

Warren Binden (GLJ Senior Geologist) for his Duvernay geoscience subsurface and mapping contributions.