

WORKSHOP

ADVANCED TOPICS IN DATA ASSIMILATION AND DECISION-MAKING

25 -29 | MAY

OBJECTIVES

Provide participants with a comprehensive understanding of assisted history matching, data space inversion approaches, machine-learning-assisted inversion methods, and decision-making frameworks for reservoir development and management under uncertainty.

WHAT YOU WILL LEARN

- Understand and compare different assisted history matching methodologies.
- Apply data-space inversion concepts for efficient data assimilation.
- Recognize the role of machine learning models such as LSTM and autoencoders in reservoir data assimilation.
- Translate uncertainty-aware modeling results into structured development and management decisions.
- Formulate and analyze ensemble-based and multi-objective optimization problems for robust reservoir development and management.

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LECTURERS

REMUS HANEA



Remus Hanea is a Leading Advisor in Reservoir Technology (Assisted History Matching and Optimization/Decision Making) at Equinor and a Professor at the University of Stavanger. With a background in Applied Mathematics and 15 years of experience, he specializes in Uncertainty Quantification and Data Assimilation. His research focuses on robust reservoir management, Value of Information (Vol), and risk analysis.

AUREF
ROSTAMIAN



Auref Rostamian is a reservoir engineer and researcher with over 12 years of experience in reservoir simulation, data assimilation, production optimization, and uncertainty quantification. He is currently a Fellow Researcher at the University of Stavanger and holds a PhD in Petroleum Science and Engineering from UNICAMP. His research focuses on evaluating fit-for-purpose decision models in multi-objective and multi-criteria decision-making settings for reservoir management under uncertainty.

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MODULE 1: ASSISTED HISTORY MATCHING

DURATION: TWO DAYS (MAY 25-26)
09:00-12:00 | 13:00-15:00

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LEARNING GOALS

- Understand the role and challenges of data assimilation in reservoir modeling.
- Compare traditional and ensemble-based assisted history matching approaches.
- Learn how uncertainty is quantified and propagated in ensemble workflows.

TOPICS

- Introduction to history matching and uncertainty sources.
- Manual versus assisted history matching.
- Ensemble-based methods: Ensemble Information Filter(IF).
- Covariance modeling, localization, and inflation.
- Illustrative synthetic and simplified field examples.

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MODULE 2: DATA SPACE INVERSION AND MACHINE LEARNING

DURATION: ONE DAY (MAY 27)
09:00-12:00 | 13:00-15:00

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LEARNING GOALS

- Understand data-space inversion as an alternative to parameter-space updating.
- Learn dimensionality reduction techniques for dynamic production data.
- Explore coupling data assimilation with machine learning models.

TOPICS

- Motivation for data-space approaches in reservoir history matching.
- Formulation of data space inversion (DSI).
- Predictive uncertainty in data space.
- Autoencoders and latent-space representations.
- LSTM-based modeling of time-series production data.
- Coupling DSI with LSTM and autoencoders.
- Comparative examples of classical and ML-assisted DSI.

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MODULE 3: DECISION-MAKING IN RESERVOIR DEVELOPMENT

DURATION: ONE DAY (MAY 28)
09:00-12:00 | 13:00-15:00

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LEARNING GOALS

- Translate technical modeling results into actionable decisions.
- Handle multiple conflicting objectives under uncertainty.
- Apply structured decision-making frameworks.

TOPICS

- Decision context in reservoir development and management.
- Decision quality elements and uncertainty modeling.
- Robustness, sensitivity, and strategy ranking.
- Case study discussion integrating history matching results.

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MODULE 4: CLASSICAL ENSEMBLE-BASED OPTIMIZATION APPROACHES

DURATION: ONE DAY (MAY 29)
09:00-12:00 | 13:00-15:00

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LEARNING GOALS

- Formulate reservoir management problems as ensemble-based optimization tasks.
- Handle multiple conflicting objectives under geological and operational uncertainty.
- Link data assimilation outcomes to optimization and decision-support workflows.

TOPICS

- Optimization framing after data assimilation and decision-quality analysis.
- Ensemble-based optimization concepts and uncertainty propagation.
- Multi-objective optimization and Pareto-optimal trade-offs.
- introduction to EVEREST, an optimization tool.