

Neural Network Inversion (NNI) in Aspen SeisEarth™

Predict Rock Property Volumes from Seismic Attributes Using Machine Learning

Neural Network Inversion is a supervised machine learning workflow for interpreters that uses a convolutional neural network to predict log properties away from existing wells.

Key Benefits

High Speed

Results are acquired in a fraction of the time required by traditional amplitude inversion methods, eliminating lengthy timelines.

Easier Operation

Inversion can easily be performed by an interpreter without the need for a Quantitative Seismic Interpretation (QSI) specialist. The user is guided step-by-step through *Data Selection > Training Set Creation > Training > Propagation*. All available information is pulled from well logs and seismic, used to train the neural networks and estimate an operator at the well location.

Built-in QCs

Quality control measures are generated at each step of the workflow to: Validate the input data, verify the training set, ensure the training is converging, evaluate the contribution of each of the attributes, and check the workflow results at the well locations prior to generating the full volume. These measures allow the user to select optimum input attributes and parameters to obtain high-quality results without overfitting input data.

Integration

NNI is implemented in the AspenTech® interpretation application, running on the Aspen Epos™ data management infrastructure. Aspen Epos data services offer interoperability and data exchange with other AspenTech products as well as third-party databases and applications. Collaborative work can be shared quickly and directly, without the need for additional space or time-consuming duplications.

Key Capabilities

- Usability: New intuitive, user-guided interface
- Data analysis tool: Access to parameter testing
- Numerous QCs: Crossplot correlation QC, crossplot between input logs and predicted logs QC, crossplot correlation and RMS error for test wells QC, and attribute contribution table
- Training auto-stopping
- Workflow report
- Option to chain with other workflows for interpreters

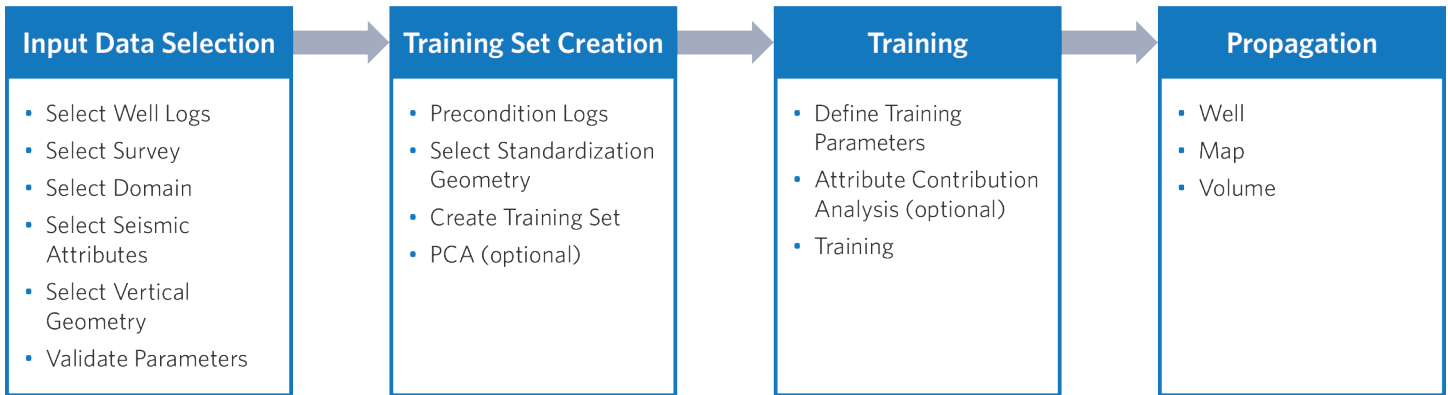


Figure 1. The Neural Network Inversion workflow is a user guided, four-step process available from Integrated Canvas.

Use Case: Leverage Machine Learning to Reduce Project Timelines and Accelerate Time to Decision

INDUSTRY CHALLENGE: Today’s global energy industry is pressured to produce accurate results under lean circumstances. Deterministic amplitude inversion workflows require several weeks of work by an experienced QSI expert to produce quality inversion results and associated rock property volumes.

ASPENTECH SOLUTION: The quick and robust NNI methodology predicts any volume of log properties from seismic attribute volumes and well logs. It can help users understand and quantify rock properties and fluid variations across their survey swiftly and accurately. These outputs can be used as input to rock type predictions, classifications and fast stochastic inversions, or to constrain reservoir property models. The NNI workflow does not require QSI expertise and reduces the project timeline compared to traditional amplitude inversion workflows.

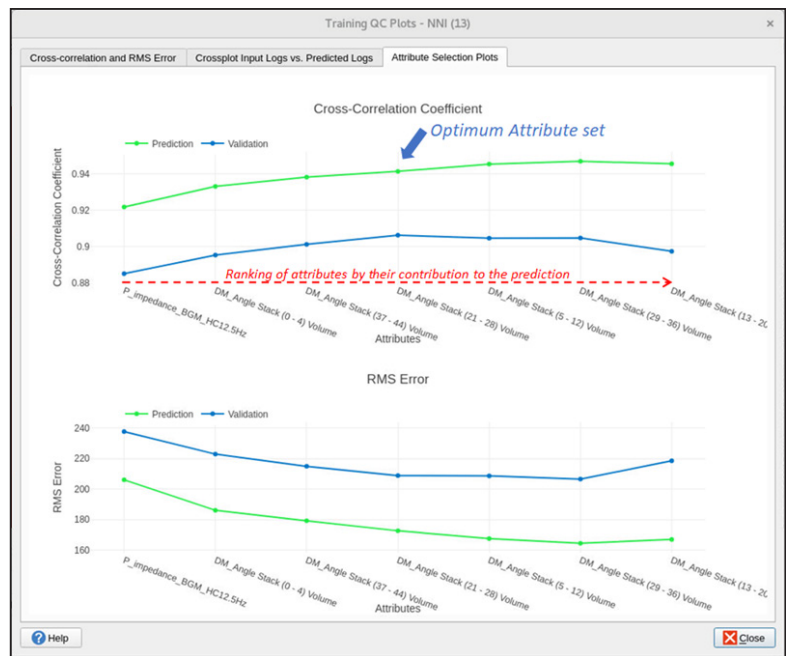


Figure 2. Attribute Contribution Analysis Tool

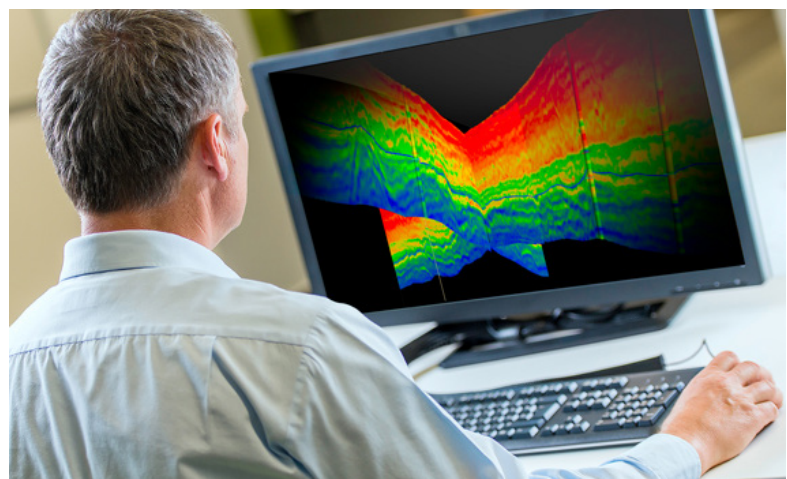


Figure 3. Chain the NNI workflow with Complex Trace Attributes workflows for on-the-fly estimations of seismic attributes or RockType Classification workflows to enrich RockType prediction input attributes.