

What's New in SubsurfaceAI 2024.2

November 19, 2024

Starting from 2024.2 release, we will provide “What’s New” summary in each of 21 modules available in this release. More modules will likely be added in the future release.

subsurfaceAI is a machine learning infused software platform that empowers faster workflows for the whole subsurface team in the energy and CO2 sequestration industry.

Module 1: Multi-Scale Database

1. Well top editing in well information window and well properties window
2. SeisWare project import into subsurfaceAI (Seismic, well objects, T-D curves, horizons, and culture data).
3. New well list function
4. Calculate thickness from well tops
5. Add an easy way to adjust well log alias order
6. Support importing well top and top properties file format exported from geoSCOUT
7. Export strata-grid to Eclipse grid: support Facies Classification grid
8. Export arbitrary section as 2-D segy
9. Support importing well top properties and well formation attributes in a separate ASCII file for existing well top and well formations

Module 2: Integrated Visualization Environment

1. Well tops tree structure change and top visibility control by selected wells or well groups (Major enhancement)
2. Add option to link base map and 3-D window
3. User-define geometry grid for selected objects (for visualizing objects without seismic data in section view)
4. Define and change display order of objects displayed on base map
5. Be able to edit layers and add new object type in the display order template of base map and seismic section window

Module 3: Well Log Data Analysis and Prediction

1. Add resampling well log function in well log filtering and calculation
2. Improvements of elastic modulus calculation and log normalization including the order of logs used is based on alias table now

Module 4: AI for Core Photo Interpretation and Property Prediction

1. Derive facies image classification and facies proportion curve from core photo
2. Calculate facies proportion curve from facies image classification

Module 5: Geologic Correlation of Well Logs

1. Well tops are now listed immediately under the top “Wells” folder, and you can still control and filter well tops by wells.

2. New visualization controls of well tops based on well groups are provided for well tops in visualization windows
3. You can calculate thickness of a well top with any other well tops, the true or apparent thickness will be listed as a well top property. Isochore maps can be interpolated with all our interpolation algorithms in a user defined polygon area.
4. “Data analysis” of any well top properties, such as “thickness” or imported well top properties.

Module 6: Formation Property Modeling & Prediction

1. Well interval property modeling
 - Automatically calculate thickness when defining interval, zone, or formation objects
 - Build strata-grid and interval grid from well top and well interval (formation)
 - Extract well top attributes and make training data on interval grid
 - Build property grid for well top attributes on interval grid

Module 7: Near Wellbore Heterogeneity Modeling and Upscaling

In version 2024.2 core plug data conditioning is an option in the near-wellbore property modeling (e.g., porosity and permeability models). You can make cross plots of real core plug measurements and synthetic core plug data to validate the property modeling with core plug conditioning.

Module 8: 2-D & 3-D Seismic Interpretations

1. Smart eraser for horizon picking in base map window
 - Erase horizon by correlation coefficient using a sliding bar
 - Erase horizon by picking origin (manual or non-manual)

Module 9: Volume Interpretation and Advanced Visualization

1. Define and display fault group filter by fault statistics (dip, azimuth and size)
2. Calculate fault dip and azimuth volumes from fault probability volume
3. Add new tracking method “dip and azimuth as control” for fault points and surface auto and manually extraction
4. Sort fault stick point by Z value

Module 10: AI for Seismic Interpretation

1. AI server and AI resource management tool supports SQL server
2. Indicator in subsurfaceAI client end to know AI server usage info (busy status)
3. Support AI server with dual graphics card in one computer system
4. Support AI server on Linux (Ubuntu 20.04) and run AI server as service on Linux (Ubuntu 20.04)
5. Project-based AI resources access management and AI tree
6. Lock and reserve AI server for usage
7. Add a size filter for converting facies predictions to labels
8. Export AI label in H5 format
9. Export AI label to 3-D volume

10. Convert a facies label into another (change its ID) on the current section
11. Merge two or more facies label into a single facies label
12. Highlight facies label on the cross plot
13. Calculate AI probability volume in 45 and 135 degrees from lines when computing AI probability volume

Module 11: Seismic Attribute Calculation and Interpretive Processing

1. Structural oriented median filtering

Module 12: Seismic Attribute Analysis

1. Highlight facies label on 2-D cross plot

Module 13: Data Analysis

1. Automatic fitting of 2-D variogram models

Module 14: Rock Physics Modeling and Facies Classification

Module 15: Machine Learning for Integrating Well Data and Seismic Attributes

Module 16: Geostatistics Integration Workflow of Well Data and Seismic Attributes

1. Automatic fitting of variogram model in “Data Analysis”.

Module 17: Production Prediction and Sweet Spot Mapping

Module 18: Microseismic Data Analytics & Integration

1. Unsupervised classification of microseismic events based on user-defined input attributes
2. Calculate distance from microseismic point to the center of the stage (Distance to Wellbore)
3. Support retrieve time series data from Honeywell PHD server, data R/W on Microsoft-SQL server and SQLITE
4. Group completion curve in axis on time series window
5. Add option to use the same color to plot same type of completion data in different stages on time series window
6. New dialog to change microseismic event histogram color
7. Microseismic window usability improvements:
 - Be able to toggle well list/ group in microseismic window and control its visualization settings
 - Add “flip to right” tool for section view in microseismic window
 - Be able to control well top and well log properties in microseismic window
 - Be able to draw arbitrary section in microseismic window base map view
 - Be able to show projection polygon on base map view in microseismic window

Module 19: Static Reservoir Modeling

This is a new module in the 2024.2 release, with bulk of the functionality developed in ReservoirStudio™, without the rule-based stratigraphic modeling functions what are packaged in the module 20 described below. The module 19 is designed to build a static reservoir model using the established methods, with the following steps:

1. Make stratigraphic zone grid surfaces of key horizons.
2. Make a layer grid by interpolating more layers in each zone. The layers are inserted to each zone based on one the rules: proportional; top-conformable; bottom conformable, or parallel to a surface
3. Define wells used for training or conditioning data in geostatistical calculation of facies and property
4. Upscale well logs (facies, porosity, permeability or other continuous property logs)
5. Resample seismic attributes to the layer grid when seismic data is available
6. Data analysis. Estimate statistical distribution, trend, variogram models of each property in each facies for each zone.
7. Generate facies and property grids. Three types of methods are available for assigning cells between wells: kriging or collocated kriging; conditional simulation or co-simulation; machine learning models (neural networks, XGBoost, and Random Forest).
8. Calculate volumetrics (OOIP or OGIP) and distributions (P25, P50, P90)
9. Define a coarse grid and upscale the fine grids derived in the step 7 above.

Module 20: Rule-Based Modeling of Stratigraphic Architectures

This is a new module that used to be the core functions in ReservoirStudio. The reason to separate these non-mainstream functions as an independent module is because not every static reservoir modeling workflow would need to use these features, also these functions are designed to model specific reservoir types by mimicking their formation processes. The following reservoir types are considered in the module 20

- 1) Point bar reservoirs in meandering channels
- 2) Stacked channel stories in fluvial or upper fans
- 3) Hierarchical channel systems in deep water turbidite reservoirs

Module 21: Synthetic AI Labels for Model Training

This is a new module that is officially supported in the release of 2024.2. The module 21 is designed to generate synthetic seismic volumes from a stratigraphic grid that can be faulted by faults. User can generate multiple realizations of faults by specifying distributions of fault length, width, dip and dip azimuth, and displacements. A synthetic seismic volume is generated to a Vp volume by specifying wavelet parameters. When adding a fault surface population to the stratigraphic or any seismic volume, a fault label volume will be generated. One pair of fault label volume and its corresponding seismic volume consists of a training sample for building an AI fault detection model.