Sirenn™

Terra3E

Simulator Reservoir Neural Network

Sirenn (Simulator Reservoir Neural Network), plug-in of Petrel*, is a very powerful and flexible tool to build proxy models of reservoir simulators. The proxy models are developed using artificial neural networks, a technique that has been expanding rapidly in petroleum engineering applications, as in other fields requiring huge computer power (aerospace (flight simulation), defense (missile guidance) or security (face recognition)).

Sirenn can be used for many applications: the Well Placement Optimization, Field Development Scheduling, History Matching with Multiple Models, Global Optimization of Oil Production Systems, Screening and Designing Improved Oil Recovery Methods.
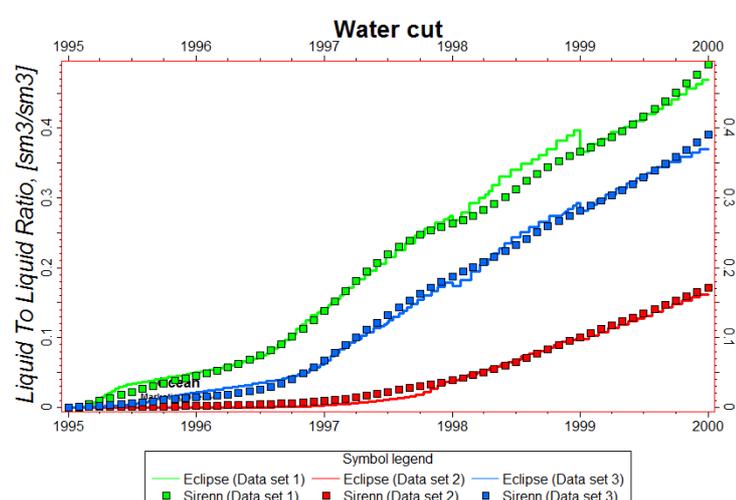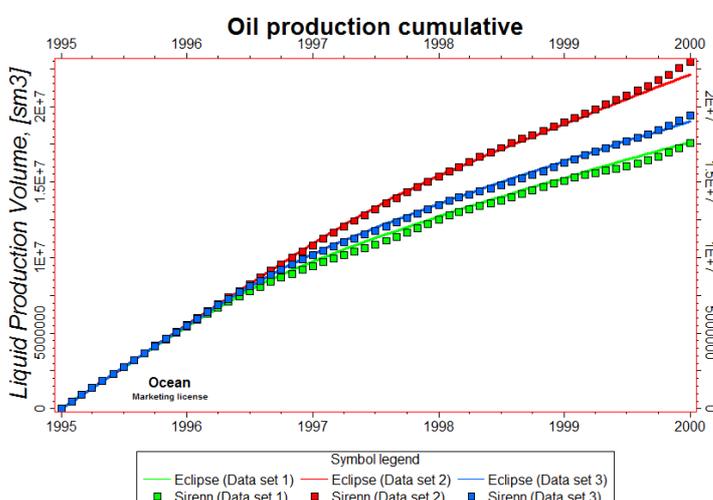
As all these procedures related to Reservoir Engineering realized generally with base in a very large number of reservoir simulations which can yield slow developments and large computational effort, several techniques such as Spline, Neural Networks, Kriging and Experimental Design, have been presented in the literature to be used as proxies to reservoir simulator.

Neuro-Simulation techniques are the best suited approach as they are very well adapted to represent nonlinear phenomena. Sirenn shows its superiority knowing that it is possible to build neural networks which are polynomials.

Moreover, to equal accuracy, neural networks require fewer adjustable parameters than the commonly used universal approximators. Sirenn:
- provides a superior alternative to polynomials approaches which are commonly used;
- is fully integrated in Petrel (just adding a task in the "Uncertainties & Optimization" process);
- is fully parameterizable (number of hidden layer, number of neuron by layer, learning rate, etc.);
- accuracy can be controlled by the user.

Sirenn allows bypassing time consuming reservoir simulations, while maintaining a good approximation of results. This can be very useful, particularly for inverse problems, sensitivity analysis and uncertainty analysis which, all of them, requires huge amounts of reservoir simulations. With Sirenn, you will be able to handle cases that could not be handled using directly reservoir simulators.

* mark of Schlumberger

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