IPLAB LLC

IPLAB LLC "Ivan Priezzhev Laboratory limited liability company" is a resident company of the SKOLKOVO Innovation Center that develops software for predicting the productivity parameters of oil and gas formations.

Company site: ***www.ivanplab.ru***

Team

CEO, Founder and owner ***Ivan Priezzhev***

- IPLAB LLC founder and owner
- More 35 years in oil and gas industry
- PhD + Doctor of science Russia – geophysical interpretation software
- 20 years in Schlumberger (Tyumen, Moscow, Houston, new technologies developments)
- Professor of Gubkin University
- H-Index = 11 ***Scholar.google***, more than 100 publications and 7 patents (5 USA+2 RUS)

Chief geophysics and geologist ***Dmitry Danko***

- PhD – new seismic inversions technologies based on model approach
- About 10 years in oil and gas industry
- Professor of Gubkin University

Chief software architect ***Andrey Nikiforov***

- Key software developer and system architect specialist
- About 10 years in oil and gas industry
- Participation in several software projects

Rock physic specialists and geologist ***Alexey Shubin***

- PhD – new seismic inversions technologies based on model approach
- About 15 years in oil and gas industry
- Professor of Gubkin University

Petrophysics and projects management ***Vasily Rudenko***

- About 10 years in oil and gas industry

Software development team

- several high-level programmers on remote contracts in Tyumen, Dubna, Moscow.

Site development and support ***Arseny Kanev***

Legal support ***Maria Yonker***

- 10 years experience

Other support ***Elena Priezzheva***

Accounting support - on outsourcing basis.

Software products of IPLAB LLC

Allow you to perform predictive inversion constructions:
* Forecast of effective thickness maps.
* Forecast of lithological and facies maps.
* Predictive-inversion constructions for cubes of elastic and rock property.
* Forecast of lithological and facies cubes.
Software products of IPLAB LLC - "Priezzhev Laboratory" are based on the use on:
* Modern machine learning algorithms, including a new generation of neural networks – Kolmogorov neural networks
* Using the theory of solving unstable problems for predictive inversion constructions-regularization by A. N. Tikhonov.
* Joint use of seismic inversion theory and neural networks.
* Building a low-frequency model using neural networks and other machine learning algorithms.
* Seismic inversion for total, angular, and azimuthal stack;
* Fracture analysis based on seismic data based on machine learning.

We use state-of-the-art innovative machine learning algorithms to process and interpret complex data of various scales and accuracy (well surveys, seismic surveys, ground surveys, and aerospace surveys). The development of technologies based on such algorithms involves the use of large amounts of input data in order to build reliable forecasts of reservoir productivity for traditional and non-traditional hydrocarbon deposits. The offered software products use builds without a teacher (classification) and with a teacher.

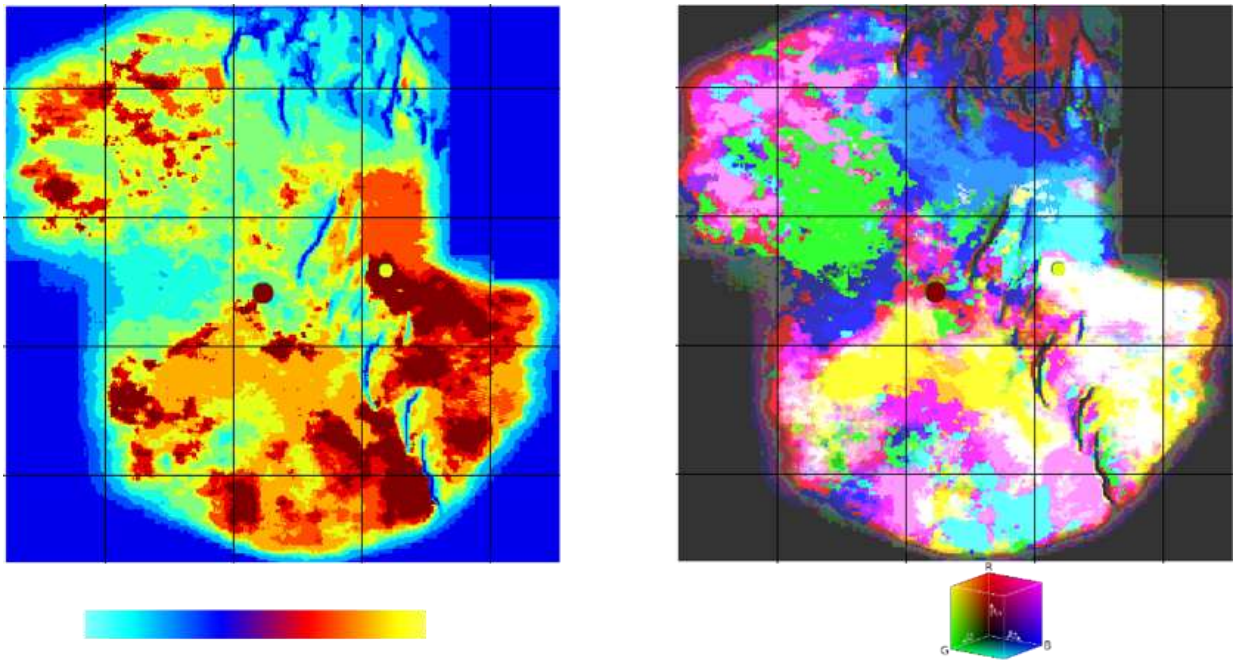

Figure 1. Comparison of results of classical seismic facies analysis based on 1D Kohonen neural networks and 3D Kohonen neural networks.

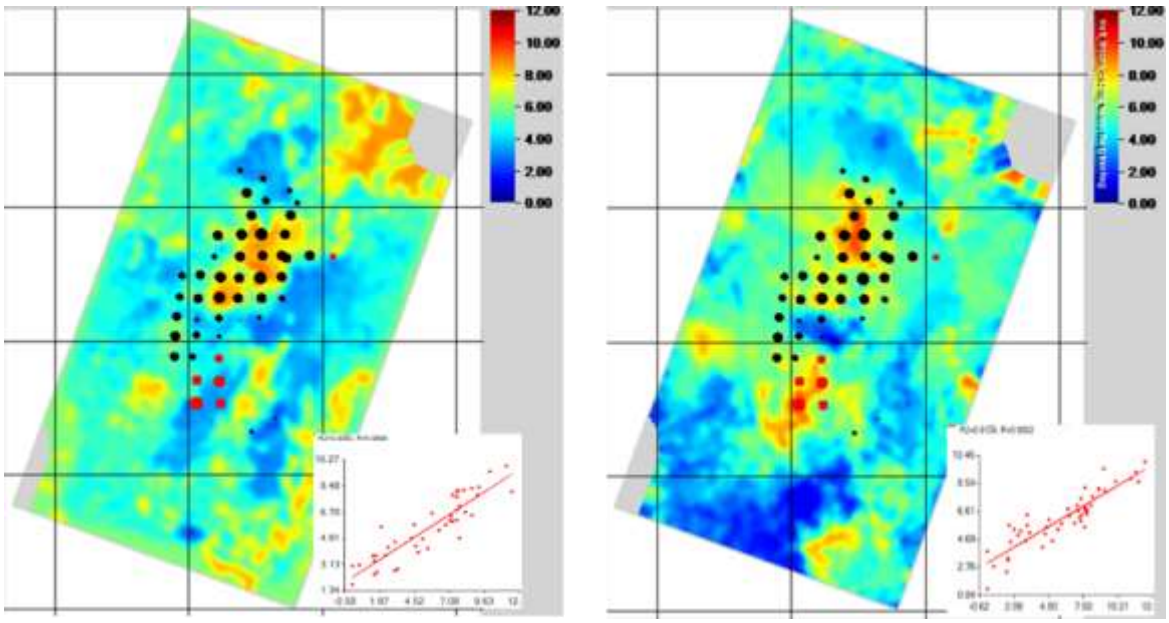

Figure 2. Forecast map of effective thicknesses using the conventional method (left) and the proposed method (right).

Special artificial intelligence algorithms are used to identify fracture zones and hidden faults based on 3D seismic data. The use of machine learning algorithms makes it much more efficient to solve such a problem.

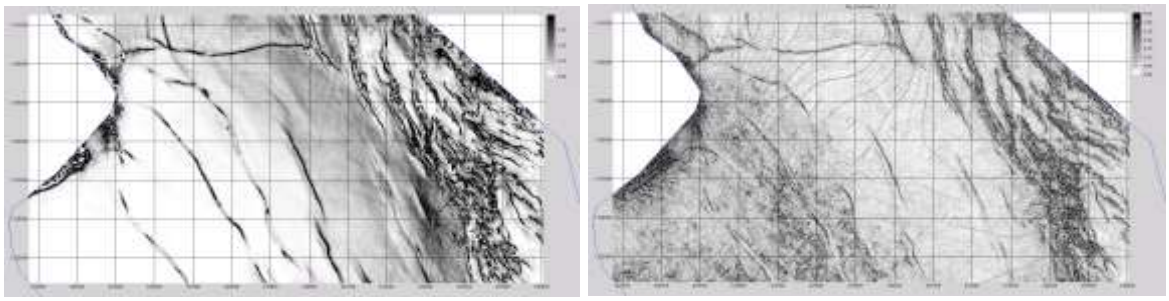

Figure 3. A comparison of the results of fracture zones and hidden faults based on the classical technology (left) and our approach (right) shows a better resolution.

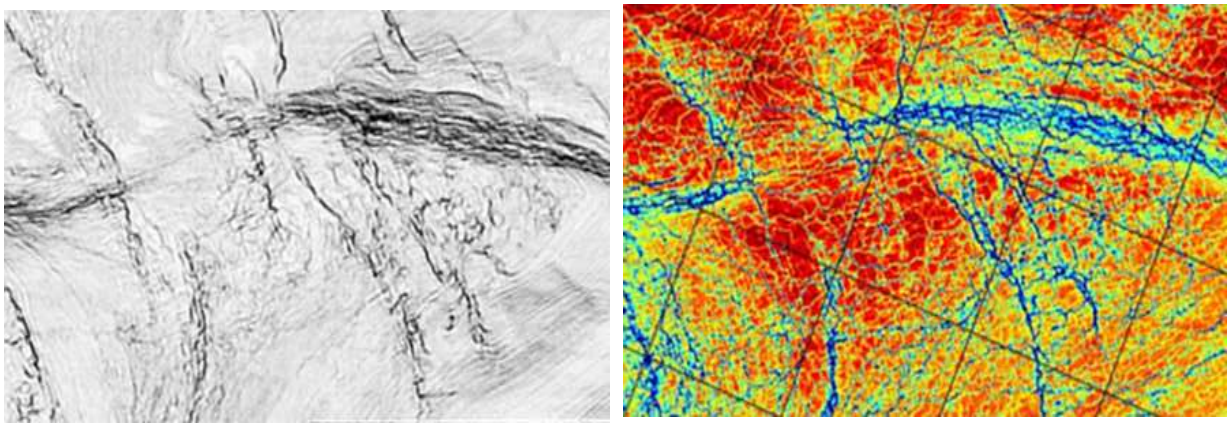

Figure 4. Compare results of the Ant Tracking (left) u Faults Simulation (right).

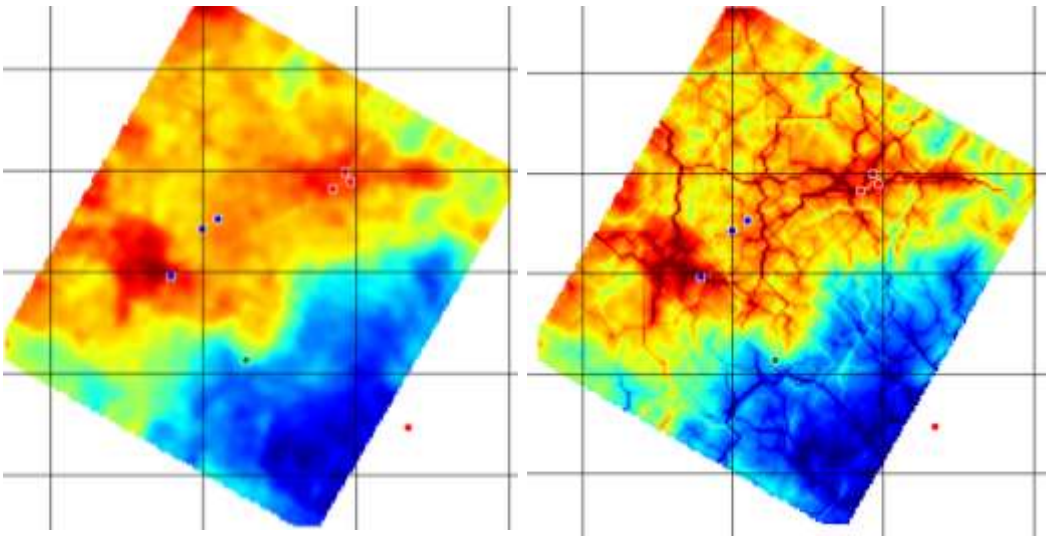

Figure 5. Faults Simulation technique example for seismic slice features detection. Left – source slice, right – slice after faults simulation..

A new technology is proposed for predictive inversion constructions of cubes of elastic, elastic, filtration-capacitance or lithofacial properties based on a new generation of neural networks constructed using fully functional Kolmogorov neurons. To build and train neural networks, a hybrid technology is used, developed on the basis of mathematical techniques set out in the Kolmogorov theorem. To stabilize neural networks, the methods of regularization according to A. N. Tikhonov were used.

The proposed technology uses a combination of neural network techniques and traditional inversion technologies in terms of building low-frequency models based on all available information-well data, structural models, speed cubes, and a seismic field.

Neural network technology of predictive inversion constructions shows a significant increase in the resolution of effective cubes built on the basis of the proposed nonlinear solutions compared to the results based on traditional inversion technologies.

Large-scale parallelization of neural network calculations with effective use of multi-core computing capabilities is possible.

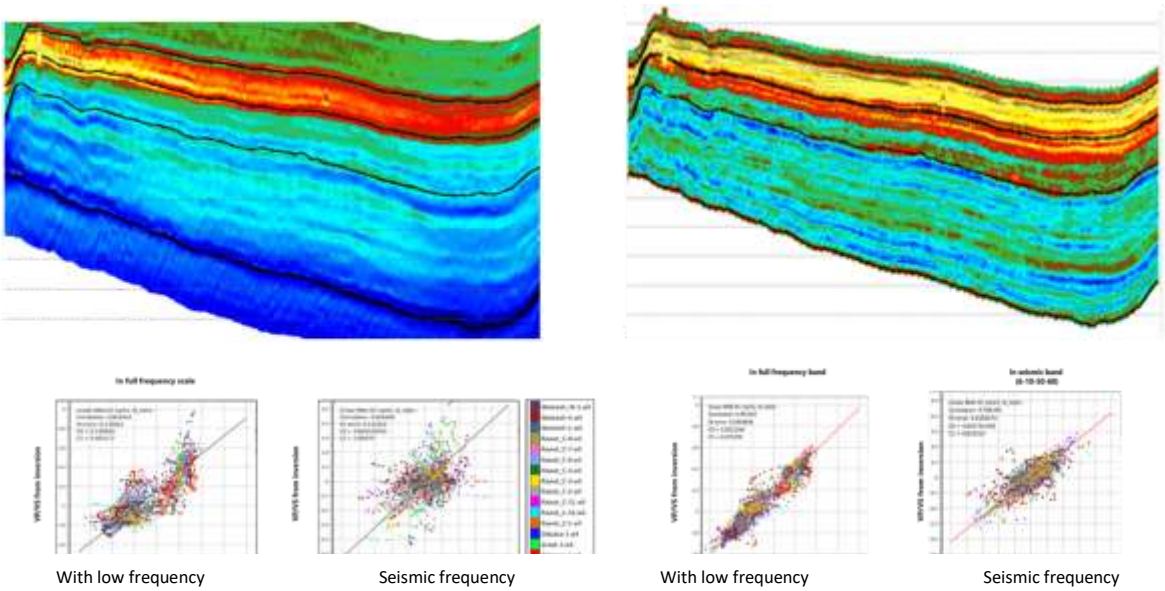

Figure. 6. Comparison of the results of the Vp/Vs forecast for the classical inversion (on the left)

and neural network forecast (right).

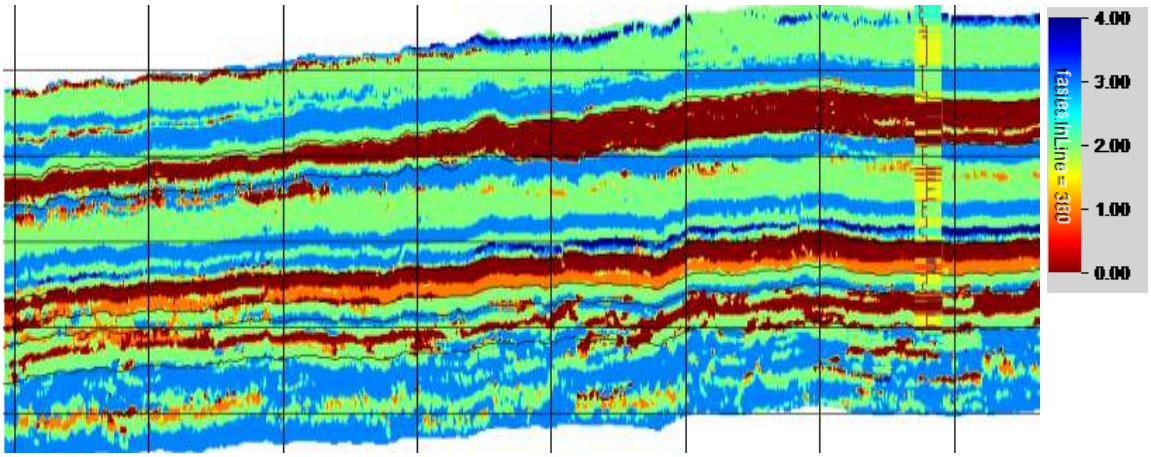

Figure. 7. An example of a neural network prediction of the distribution cube of the most probable lithological-petrophysical types.

Software products of the company IPLAB LLC is the following:

IP_Seismic standalone package for predictive inversion constructions of 2D (maps) and 3D (cubes)

IP_Connector free Petrel plugin to transferring data from/to **Petre**l to/from **IP_Seismic**

Commercial plug-ins for the Petrel (Ocean Store):
IP_Classification2D**-** IPLAB Kohonen1D/2D/3D Classification2D, Surface properties or seismic waveforms Kohonen1D/2D/3D classification.
IP_Classification3D**-** IPLAB Kohonen1D/2D/3D Classification2D, Surface properties or seismic waveforms Kohonen1D/2D/3D classification.
IP_Prediction2D- IPLAB sweet spot analysis Prediction2D. Property prediction using surface properties or seismic waveforms.
IP_Prediction3D- IPLAB Machine learning Prediction3D. Machine learning wells log prediction using seismic cubes. Included advance new generation Kolmogorov neural network with full functional activation function (lookup table for every input)

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