

Predicting reservoir properties using neural networks

Jonathan E Downton, CGG GeoSoftware

Summary

Through several examples, this tutorial demonstrates the utilization of neural networks to predict reservoir properties from well and seismic data. In supervised learning a statistical model is derived linking the target variable with the input features. In the geophysical reservoir context, the target is some log property such as porosity, lithology, fluid saturation or elastic property such as P-wave impedance. The input features are seismic attributes or data. The resulting model mapping the input features to the target variable can be linear or nonlinear. Given sufficient width or depth, neural networks can model any arbitrary function. Figure 1 compares the porosity estimated from a Deep Feedforward Neural Network (DFNN) and linear regression. Key considerations in designing and parameterizing neural networks, along with important quality controls are also discussed.

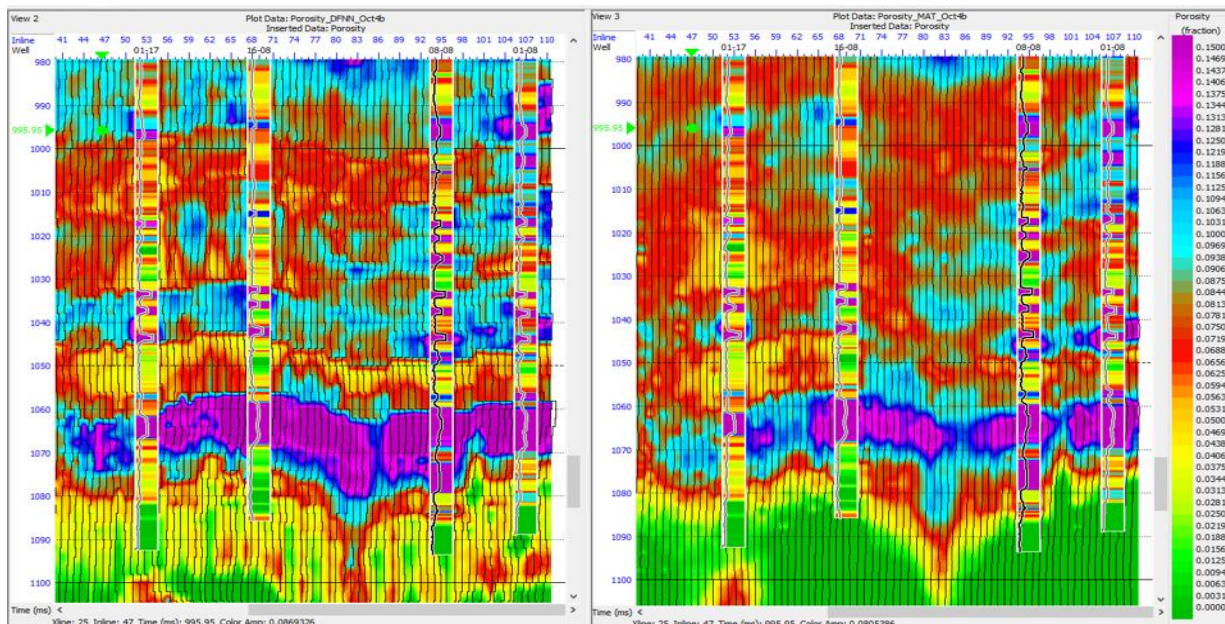


Figure 1: comparison of porosity estimated from a DFNN (left) and linear regression (right). The porosity logs are super-imposed at the well control. By including nonlinear basis functions the DFNN better resolves the porosity of the lower sand in the 08-08 well.