

## Machine learning-based Vs prediction

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### Summary

Vs (shear-wave velocity) is an important parameter that helps to extract rock properties such as lithology, pore fluid, and pore pressure. Together with Vp and density, Vs is also essential in seismic forward modeling and AVO analysis for litho-fluid discrimination. When Vs is not available, it is generally estimated by employing other logs (e.g., Vp, resistivity, Gamma) as inputs. The empirical regressions (e.g., Castagna et al. 1985, Han et al. 1986, Krief et al. 1990, Williams 1990, Greenberg and Castagna 1992, Xu and White 1996, and Dvorkin 2008). These empirical equations are based on specific data and so can't predict Vs precisely for a global scale. In this study, we use three machine learning algorithms of Random Forest (RF), Neural Network (NN), and Artificial Neural Network (ANN) to predict Vs for variable lithologies (e.g., loose and consolidated brine- and hydrocarbon-filled sandstones, organic-rich and organic-lean shales and tight and fractured carbonates. Comparison of machine learning-based Vs predictions and predicted Vs using the empirical relations illustrate that the machine learning algorithms significantly improve the Vs estimation. A comparison among predicted Vs using three machine learning techniques reveal that ANN prediction is more superior compared to RF and NN.

### References

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