Using Machine Learning to Simplify our Interactions with Other Disciplines

Presented by David Gray, P. Geoph.

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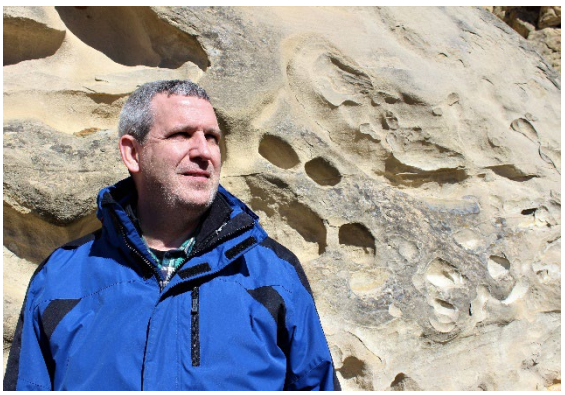
Abstract: Twenty years ago, when I was with Veritas, I was working on a project involving multi-component reservoir characterization of an Oil Sands play. We had produced 24 attributes from a 3C-3D and each of them would tie Vshale logs along a few lines of the 3D, but then along other lines they wouldn't. Looking for a solution, I fed all 24 attributes into a Machine Learning (ML) algorithm and produced a Vshale volume. I was surprised by the response of the E&P company geologists, who understood this Vshale from seismic volume that I was showing them and started talking about what it meant geologically. I'd never before seen any reaction like this with seismic attributes. They were doing geologic interpretation right off my images. This Vshale wasn't perfect though. I couldn't get the seismic to match 3 of the 30 Vshale logs. When this discrepancy was shown to the E&P petrophysicist, they noted that those 3 Vshale logs had been calculated differently than the other 27. The ML had picked this up because the seismic was consistent while the log calculations weren't. These observations made me realize that ML is a fantastic tool for translating geophysical information to something that other disciplines can understand, and that geophysical data is extremely useful for identifying problems with other data because it is ubiquitous and consistent. I also realized that we are uniquely positioned as Geo (for Geology) Physicists (for Engineering) to do this kind of translation.

Since then, I have used ML extensively in my work. For example, I have used it to predict production and microseismic event densities from seismic attributes in shale plays. I have used ML to predict elastic logs from reliable logs like gamma ray to narrow down the wells our Oil Sands petrophysicists needed to examine to 24 from over 600. I used it offshore to show that what our seismic data could predict was porosity-height and that our geophysicists were interpreting the right attribute to do so. I have used it to predict various logs, including a Butler equation log that we came up with for Oil Sands. And, I have used it to predict NPV (Net Present Value). This talk will show some examples of converting geophysical data to forms that other disciplines (geology, petrophysics, engineering, and management) can understand.



Biography: David Gray frequently lectures on geophysics and has presented over 100 papers at various technical conferences and luncheons. His career has included positions at Geomodeling, Nexen, Veritas, CGG, Subsurface Dynamics, Ikon, and CNOOC. As well as holding several patents, he has made notable contributions to quantitative seismic interpretation, seismic geomechanics, and seismic fracture characterization. David received a Bachelor of Science degree in Honors Geophysics from the University of Western Ontario (1984) and a Master of Mathematics degree in Statistics from the University of Waterloo (1989). He is Senior Vice President Integrated Solutions at Geomodeling, and currently a member of SPE, SEG, CSEG, EAGE, and APEGA.