

Machine learning and the geoscientist – A true partnership

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Abstract

Recently, there have been many technical articles about the application of Machine Learning (ML) and Artificial Intelligence (AI) to geoscience problems, and some fear that these techniques will eventually replace the geoscientist. My feeling is that these techniques make the ideal assistant to the geoscientist but will never be able to think or be creative. New ideas and creativity will always be the domain of the human geoscientist, but ML and AI algorithms can be a big help to us in our day-to-day work.

In this talk, I will illustrate these ideas using a particular type of Machine Learning algorithm, called kernel classification. I will show how kernel classification is a generalization of many popular classification techniques, such as linear and quadratic classification, kNN classification, kernel density estimation and deep neural network (DNN) classification. I will do this using a simple ten well example that includes both producing wells and dry holes, where the objective is to draw a production boundary that separates the producers from the dry holes. I will show that kernel classification can produce multiple solutions that predict a clear and exact separation boundary, all quite different, but that it is the geoscientist who must make the final decision as to the most realistic boundary, based on extra geoscience information, past knowledge, and intuition. Although it is possible to design ML algorithms that incorporate more geoscience information, it will never be possible to design an algorithm with true intelligence and intuition. That is why the geoscientist will always make the final decision.

Biography

Brian Russell holds a B.Sc. from the University of Saskatchewan (1975), a M.Sc. from Durham University (1978) and a Ph.D. from the University of Calgary (2004), all in geophysics. He joined Chevron in Calgary as an exploration geophysicist in 1975 and subsequently worked for Chevron in Houston and both Technica and Veritas in Calgary before co-founding Hampson-Russell Software with Dan Hampson in 1987. Hampson-Russell is now a subsidiary of GeoSoftware, where he is Vice President.



Dr. Russell is involved in the research of new AVO, rock physics, inversion and machine learning techniques as well as giving presentations throughout the world. He is a Past-President of both the SEG and CSEG and has received Honorary Membership from both societies, as well as the Cecil Green Enterprise Award from SEG (jointly with Dan Hampson) and the 1999 CSEG Medal. He is also an Adjunct Professor in the Department of Geoscience and the CREWES Consortium at the University of Calgary and is registered as a Professional Geophysicist in the Province of Alberta.