Application of K-means Algorithm to Werner De-Convolution Solutions for Depth and Image Estimation

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Abstract

One of the most popular techniques for computer-assisted solution estimate for magnetic and gravity field data is Werner de-convolution. The approaches frequently produce erratic results and may not always forecast the maximum number of the geologic entity that produces them due to the intrinsic instability of potential field data. This led to the application of the K-means machine learning algorithm to further enhance the detection of the geologic potential field-generated bodies. Two substances that resembled dikes were combined to form a synthetic magnetic model. Random noise was added to the synthetic data, to make the solutions a bit more complex. Werner's de-convolution technique was applied to the synthetic model to generate solutions. K-means unsupervised machine learning algorithm was applied to the generated solutions created by the synthetic data. The clustering result shows a good spatial correspondence with the geologic model, and the method was able to estimate the precise location and depth of the dike bodies. The proposed method is entirely data-driven and has proven to work in the presence of noise. When good choices are made for the k-mean clustering parameter, it is a useful machine learning tool that can cluster Werner solutions and predict the number of geologic bodies that produced such solutions. This will enhance how subsurface structures are characterized, especially in places of complex geology where human intelligence may be limited.