INVERSION OF BOREHOLE RESISTIVITY MEASUREMENTS USING DEEP LEARNING

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Abstract. Borehole resistivity measurements are routinely employed to map the electrical properties of the subsurface. For geosteering applications, it is vital to interpret (invert) the recorded measurements in real time. In this work, given a set of recorded electromagnetic measurements $\mathbf{M}$, we want to predict the material subsurface properties $\mathbf{P}$. An analytical expression of the governing equation $\mathbf{I}$ that relates these variables is unknown. Nonetheless, for convenience, we express this problem as:

$$\mathbf{P} = \mathbf{I}(\mathbf{M}). \tag{1}$$

In this work [2], we investigate the possibility of using Deep Neural Networks (DNNs) to explicitly approximate $\mathbf{I}$ and rapidly invert borehole resistivity measurements. After training a DNN, we can perform the inversion in real time faster than with any other traditional inversion technique. We present the performance of the DNN using synthetic model problems. The results presented in this work are promising although the reconstruction of the Earth models using this technology still has a large room for improvement. Thus, extensive research work is still needed in the field to achieve the accuracy required by the Oil & Gas industry.

Keywords: Resistivity Measurements, Geosteering, Deep Learning

Mathematics Subject Classifications (2010): 35Q61,68T05,86-08

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