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### LSTM algorithm to determine the state of minimum horizontal stress during well logging operation

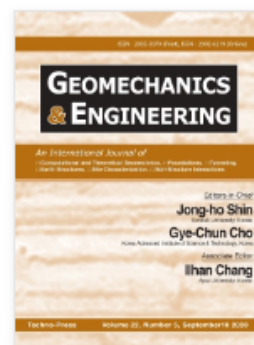
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#### Abstract

Knowledge of minimum horizontal stress ( $S_{hmin}$ ) is a significant step in determining full stress tensor. It provides crucial information for the production of sand, hydraulic fracturing, determination of safe mud weight window, reservoir production behavior, and wellbore stability. Calculating the  $S_{hmin}$  using indirect methods has been proved to be awkward because a lot of data are required in all of these models. Also, direct techniques such as hydraulic fracturing are costly and time-consuming. To figure these problems out, this work aims to apply the long-short-term memory (LSTM) algorithm to  $S_{hmin}$  time-series prediction. 13956 datasets obtained from an oil well logging operation were applied in the models. 80% of the data were used for training, and 20% of the data were used for testing. In order to achieve the maximum accuracy of the LSTM model, its hyper-parameters were optimized significantly. Through different statistical indices, the LSTM model's performance was compared with other machine learning methods. Finally, the optimized LSTM model was recommended for  $S_{hmin}$  prediction in the well logging operation.

#### Key Words

long-short-term memory; machine learning; minimum horizontal stress; optimization; well logging



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