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Pore Pressure prediction in shale gas reservoirs using neural network and fuzzy logic with an application to Barnett Shale.

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The main goal of the proposed idea is to use the artificial intelligence such as the neural network and fuzzy logic to predict the pore pressure in shale gas reservoirs. Pore pressure is a very important parameter that will be used or estimation of effective stress. This last is used to resolve well-bore stability problems, failure plan identification from Mohr-Coulomb circle and sweet spots identification. Many models have been proposed to estimate the pore pressure from well-logs data; we can cite for example the equivalent depth model, the horizontal model for undercompaction called the Eaton's model. . . etc.
All these models require a continuous measurement of the slowness of the primary wave, some thing that is not easy during well-logs data acquisition in shale gas formtions. Here, we suggest the use the fuzzy logic and the multilayer perceptron neural network to predict the pore pressure in two horizontal wells drilled in the lower Barnett shale formation. The first horizontal well is used for the training of the fuzzy set and the multilayer perecptron, the input is the natural gamma ray, the neutron porosity, the slowness of the compression and shear wave, however the desired output is the estimated pore pressure using Eaton's model. Data of another horizontal well are used for generalization. Obtained results clearly show the power of the fuzzy logic system than the multilayer perceptron neural network machine to predict the pore pressure in shale gas reservoirs.
Keywords: artificial intelligence, fuzzy logic, pore pressure, multilayer perecptron, Barnett shale.