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Pruned committee neural network based on accuracy and diversity trade-off for permeability prediction

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One of the most important objectives in the oil industry is to obtain accurate estimation of hydrocarbon in place before the exploration or production stages. Hence, one of the crucial parameters in order to achieve the mentioned goal is to accurately estimate the reservoir permeability. A lot of investigations have been done to predict the reservoir parameters using well log data through applying ensembles or committee machine. One of the most important drawbacks of the ensemble methods that have been used to predict reservoir parameters is that the individuals are selected only based on their accuracy level. The academic and experimental study shows that ensemble technique will be effective if their members are both diverse and accurate. In this paper, we first constructed a committee neural network with different learning algorithms and then proposed an expert pruning method based on diversity and accuracy trade-off. Pruning the individual members while preserving a high diversity among them is an efficient technique for increasing the predictive performances. Finally, we applied this proposed structure to predict permeability from well log data. The MSE and R2 values of the CM are 0.00089 and 0.939 respectively. This shows an improvement in the accuracy of predictions in comparison with the all individual members alone. The results also show that our method performs better or at least equal to the initial committee machine, in addition has no its limitations.

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