

Towards Real Time Seismic Feature Analysis for Bright Spot Detection: A Distributed Approach

Yara Rizk, Hmayag Partamian, Mariette Awad*

Department of Electrical & Computer Engineering

Bright spots have been the primary approach to identify hydrocarbon bearing formations. Specifically, threedimensional (3-D) seismic texture analysis has been employed to identify such locations of interest. However, raw seismic data are large in volume and require a plethora of preprocessing techniques before meaningful information can be extracted. Hence, bright spot detection from seismic data is a computationally expensive problem. In this paper, we implemented distributed feature extraction workflows of two-dimensional (2-D) and 3-D statistical and texture features for bright spot detection and achieved at least 9× speed up on a cluster of 12 workers. We also applied a 2-D continuous wavelet transform to the seismic images before feature extraction, which resulted in clearer bright spot images. Support vector machines, k-nearest neighbor, and extreme learning machines (ELM) classifiers were trained on the imbalanced 2-D and 3-D feature sets. ELM, known for its fast training time, achieved the highest f-measure of 91.5% on some 3-D seismic F3 block volume data, from the offshore of The Netherlands (North Sea) available on the OpenDtect software, which motivates follow-on research.