

Online Learning of 4D Seismic Data for Real Time Reservoir Management

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***Abstract** — Oil production strategies are developed under strong uncertainty conditions mainly pertaining to the geological and petro-physical characterization of the reservoir. These uncertainties are typically reduced by obtaining static and dynamic information about the reservoir behavior. Seismic surveys are an integral component in the reservoir characterization process. They are used to estimate properties of the earth's subsurface via reflected seismic waves. Seismic data analysis in general and 4D seismic more specifically, involves computationally expensive data acquisition, data processing and data analysis. In addition to the complex processing steps involved in seismic analysis, the amount of data collected and involved during processing is huge (ranging between 100GB to few TB) which makes the problem computationally too expensive especially in 4D seismic analysis where real-time analysis is crucial. 4D seismic surveys are 3D surveys carried out at different times over the producing life time of a field to better understand reservoir properties, improve reservoir management and predict online how the hydrocarbons are moving through the reservoirs as production proceeds.*

With the enhancements in hardware technology, machine learning and computing methods such as Map/Reduce, the interest in cloud computing and deep learning has increased in the past decade. This proposal aims to investigate a novel distributed framework for deep learning of 4D seismic data based on a Map/Reduce paradigm and online learning as a step towards efficient reservoir management. The acquired information will be integrated into a decision making framework for maximizing oil production and consequently increasing project profitability and managing associated risks.