From Face Detection to Fractured Reservoir Characterization: Big Data Analytics for Re-Stimulation Candidate Selection

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Motivated by techniques in robust real-time face detection, a new data-driven algorithm has been developed to analyze massive volumes of long duration production data from multistage hydraulically fractured shale gas wells, with the objective of predicting and ranking their suitability for re-stimulation treatment. Results demonstrate the viability of the proposed framework in identifying favorable candidate wells using only gas rate profiles, with improvements over type-curve approaches and traditional probabilistic classification methods.

By generalizing production data as vectorized images and mapping gas rate fluctuations into pixel intensities, a real-time face detection technique is adapted to identify favorable re-frac candidates. This is achieved using a cascade of boosted Bayesian classifiers based on a set of simple features, which promotes computational efficiency and yields probabilistic predictions.

The proposed algorithm is trained by identifying patterns in simulated data sets from hydraulically fractured wells. A dual-permeability shale reservoir model is used to generate multiple well production profiles by varying fracture and other parameters. The trained classifier is then used to discriminate re-frac candidate based on field data.