

Application of bayes' rule for lithology classification in middle miocene turbidite sand Marlin filed, gulf of Mexico

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Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=20410697&lokasi=lokal>

Abstrak

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Menampilkan data seismic dalam bentuk probabilitas merupakan cara yang umum dilakukan untuk mengikutsertakan informasi ketidak-pastian dari pekerjaan pemetaan prospek hidrokarbon. Hal tersebut memberikan interpreter peluang untuk mengukur seberapa yakin mereka terhadap prospek yang sudah dibuat dengan memanfaatkan informasi nilai 'most-probable'. Pada sisi lain, ketersediaan pre-stack data sudah sangat umum dijumpai sehingga hal ini merubah cara pandang terhadap inversi seismic yang semula hanya dilakukan terhadap data post-stack menjadi inversi pre-stack. Hal tersebut memang beralasan karena dengan inversi pre-stack, interpreter tidak hanya dimungkinkan mendapatkan informasi litologi namun juga informasi tentang fluida.

Aturan Bayes adalah merupakan bentuk lain dari probabilitas terkondisi, aturan ini telah banyak dimanfaatkan oleh berbagai disiplin ilmu seperti penginderaan jauh, peramalan cuaca, pemasaran dan ilmu medis untuk membantu dalam meminimalkan resiko saat pengambilan keputusan. Hal yang sama juga bias kita terapkan pada bidang ilmu bumi dimana keluaran dari proses inversi pre-stack dapat ditransformasi menjadi bentuk volum probabilitas dengan supervisi data sumuran.

Penelitian ini menggunakan P-impedance dan VP/VS sebagai input karena kombinasi keduanya merupakan indikator yang baik untuk memisahkan litologi maupun hidrokarbon. Dengan menggunakan supervisi dari data sumuran kedua volume tersebut kemudian di transformasi menjadi bentuk kelas most-probable: (1) shale, (2) wet sand, (3) compacted sand, dan (4) hydrocarbon sand.

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ABSTRACT

Presenting seismic data in probability form is common practice in order to assess the uncertainty in hydrocarbon prospecting. It gives interpreters the ability to measure how sure they are about prospect they dealing with by looking at most probable value. In another side pre-stack data is now commonly available; it changes the paradigm about seismic inversion from just post-stack inversion turn into pre-stack inversion. The reason is obvious, by inverting pre-stack data will allow interpreter to obtain not only lithology information but fluid as well.

The Bayes' Rule is extension of conditional probability, it has been utilizes in many disciplines such us remote sensing, broadcasting, marketing and medical science to support in decision making. Bayes' Rule is used to revise a probability value based on additional information that is later obtained. The same concept can also be applied to help decision making in hydrocarbon prospect evaluation where the output of pre-stack inversion can be transformed to probability volume supervised by well log data.

This study uses P-Impedance and VP/VS as inputs because their combination is good indicator of lithology and hydrocarbon. Using training set from well log the volumes then transformed into four most probable classes: (1) shale, (2) wet sand, (3) compacted sand, and (4) hydrocarbon sand.:Presenting seismic data in

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