Prediksi sebaran porositas menggunakan probabilitas neural network: studi kasus lapangan-x Cekungan Kutai = Prediction of porosity distribution using probability neural network: x-field cekungan kutei case study

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Abstrak

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Lapangan-X merupakan lapangan gas di Cekungan Kutai yang dikembangkan sejak tahun 1986. Reservoar lapangan-X merupakan endapan delta Miosen akhir yang berlapis, dimana dikarakterisasikan oleh formasi yang didominasi oleh lempung. Perselingan antara batupasir dan batuserpih menghasilkan heterogenitas porositas yang cukup tinggi. Salah satu metode yang efektif dalam mengatasi tingkat heterogenitas yang tinggi adalah dengan metode Artificial Neural Network (ANN). ANN menggunakan algoritma Probabilistic Neural Network (PNN) mampu mendiskriminasikan daerah yang memiliki sebaran porositas yang tinggi dan rendah dengan baik pada zona Fresh Water Sand (FWS) lapangan-X dibanding dengan metode Multiatribut linier yang cenderung merupakan nilai sebaran porositas rata-rata. Nilai korelasi hasil prediksi terhadap target menggunakan metode PNN mencapai 0.8610 dengan rata-rata kesalahan (average error) sebesar 0.0283, sementara nilai korelasi hasil metode Multiatribut linier hanya sebesar 0.7098 dengan rata-rata kesalahan (average error) sebesar 0.0398. Hasil PNN pada sayatan waktu +10 ms dari horizon FS33 berhasil mengkarakterisasikan sebaran porositas batupasir yang bersih dari lempung di bagian selatan daerah penelitian, dimana fasies pengendapan batupasir tersebut diinterpretasikan berasal dari dataran delta. Sementara sayatan waktu -10 ms dari horizon FS42, menunjukan sebaran porositas batugamping dengan fasies pengendapannya diinterpretasikan berasal dari lingkungan neritik (shelf). Dari penelitian ini, dapat disimpulkan bahwa metode PNN berhasil menggambarkan sebaran porositas batuan di zona Fresh Water Sand (FWS) lapangan-X dengan baik sehingga hasil prediksi penyebaran yang dilakukan mampu mendekati data- data sumuran.
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ABSTRACT
X-field is a gas field in Kutai Basin and it has been developed since 1986. Reservoir of X-field is a multi layered upper Miocene deltaic deposits and characterized by a shaly formation. A highly intercalation between sand & shale unit in X-field has been contributed to the heterogeneity of porosity in the area. One of the effective methods to spatially quantify such heterogeneity of porosity is by using Artificial Neural Networks (ANN). ANN with Probability Neural Network (PNN) algorithm has been successfully retained more dynamic range, high and low frequency porosity content, compare to the Multiattributes linear which is tend to show a smoothed, or more averaged prediction. The correlation value from PNN methods can be up to 0.8610 with average error is 0.0283, while correlation value from Multiattribute linear only up to 0.7098 with average error is 0.0398. The time slice of PNN result at +10ms from horizon FS33 has been clearly figured out an accumulation of high porosity in the southern area of the interval target which is indicated as a clean sand lithology based on sensitivity analysis. And such accumulation has formed a distributaries channel trend which is interpreted as delta plain deposits. Meanwhile, the time slice of PNN

result at - 10 ms from horizon FS42 has indicated a carbonate lithology which is interpreted as shelf deposits. From this study, it?s concluded that PNN algorithm as a nonlinear function has been successfully showed a better porosity distribution in the Fresh Water Sand (FWS) zone of X-field.;X-field is a gas field in Kutai Basin and it has been developed since 1986. Reservoir of X-field is a multi layered upper Miocene deltaic deposits and characterized by a shaly formation. A highly intercalation between sand & shale unit in X-field has been contributed to the heterogeneity of porosity in the area. One of the effective methods to spatially quantify such heterogeneity of porosity is by using Artificial Neural Networks (ANN). ANN with Probability Neural Network (PNN) algorithm has been successfully retained more dynamic range, high and low frequency porosity content, compare to the Multiattributes linear which is tend to show a smoothed, or more averaged prediction. The correlation value from PNN methods can be up to 0.8610 with average error is 0.0283, while correlation value from Multiattribute linear only up to 0.7098 with average error is 0.0398. The time slice of PNN result at +10ms from horizon FS33 has been clearly figured out an accumulation of high porosity in the southern area of the interval target which is indicated as a clean sand lithology based on sensitivity analysis. And such accumulation has formed a distributaries channel trend which is interpreted as delta plain deposits. Meanwhile, the time slice of PNN result at - 10 ms from horizon FS42 has indicated a carbonate lithology which is interpreted as shelf deposits. From this study, it?s concluded that PNN algorithm as a nonlinear function has been successfully showed a better porosity distribution in the Fresh Water Sand (FWS) zone of X-field.;X-field is a gas field in Kutai Basin and it has been developed since 1986. Reservoir of X-field is a multi layered upper Miocene deltaic deposits and characterized by a shaly formation. A highly intercalation between sand & shale unit in X-field has been contributed to the heterogeneity of porosity in the area. One of the effective methods to spatially quantify such heterogeneity of porosity is by using Artificial Neural Networks (ANN). ANN with Probability Neural Network (PNN) algorithm has been successfully retained more dynamic range, high and low frequency porosity content, compare to the Multiattributes linear which is tend to show a smoothed, or more averaged prediction. The correlation value from PNN methods can be up to 0.8610 with average error is 0.0283, while correlation value from Multiattribute linear only up to 0.7098 with average error is 0.0398. The time slice of PNN result at +10ms from horizon FS33 has been clearly figured out an accumulation of high porosity in the southern area of the interval target which is indicated as a clean sand lithology based on sensitivity analysis. And such accumulation has formed a distributaries channel trend which is interpreted as delta plain deposits. Meanwhile, the time slice of PNN result at - 10 ms from horizon FS42 has indicated a carbonate lithology which is interpreted as shelf deposits. From this study, it's concluded that PNN algorithm as a nonlinear function has been successfully showed a better porosity distribution in the Fresh Water Sand (FWS) zone of X-field., X-field is a gas field in Kutai Basin and it has been developed since 1986. Reservoir of X-field is a multi layered upper Miocene deltaic deposits and characterized by a shaly formation. A highly intercalation between sand & shale unit in X-field has been contributed to the heterogeneity of porosity in the area. One of the effective methods to spatially quantify such heterogeneity of porosity is by using Artificial Neural Networks (ANN). ANN with Probability Neural Network (PNN) algorithm has been successfully retained more dynamic range, high and low frequency porosity content, compare to the Multiattributes linear which is tend to show a smoothed, or more averaged prediction. The correlation value from PNN methods can be up to 0.8610 with average error is 0.0283, while correlation value from Multiattribute linear only up to 0.7098 with average error is 0.0398. The time slice of PNN result at +10ms from horizon FS33 has been clearly figured out an accumulation of high porosity in the southern area of the interval target which is

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