Appendix A1. Geological model parameters used to train ML model.

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| **№** | **Parameter name** | **Description** | **Unit** | **Range of variance** |
| 1 | Anisotropy | Permeability anisotropy | unitless | 0.01 – 0.1 |
| 2 | Azimuth\_1 | Azimuth of variogram for the facies 1 | degrees | 10 – 60 |
| 3 | Azimuth\_2 | Azimuth of variogram for the facies 2 | degrees | 10 – 60 |
| 4 | Beta\_depth | Depth value at the right margin of velocity function | meters | 2645.2 – 2663.7 |
| 5 | Gamma\_depth | Depth value at the left margin of velocity function | meters | 2597.5 – 2615.8 |
| 6 | Beta\_poro | Porosity value at the right margin of φ(αSP) function for the facies 1 | d.e. | 0.164 – 0.2 |
| 7 | Beta\_poro\_2 | Porosity value at the right margin of φ(αSP) function for the facies 2 | d.e. | 0.164 – 0.2 |
| 8 | Gamma\_poro | Porosity value at the left margin of φ(αSP) function for the facies 1 | d.e. | 0.064 – 0.1 |
| 9 | Gamma\_poro\_2 | Porosity value at the leftt margin of φ(αSP) function for the facies 2 | d.e. | 0.064 – 0.1 |
| 10 | Corey\_O\_W | Corey equation power for oil | unitless | 3.4 – 4.99 |
| 11 | Corey water | Corey equation power for water | unitless | 0.41 – 3.4 |
| 12 | Cos\_teta | Wettability angle cosine | unitless | 0.071 – 0.997 |
| 13 | Fault\_20 | Fault conductivity | unitless | 0.0 – 0.997 |
| 14 | FWL | Free water level depth | meters | -2645.0 – -2671 |
| 15 | Krw\_Sorw | Maximum relative permeability for water | unitless | 0.102 – 0.9 |
| 16 | ln\_beta\_perm | Logarithm of permeability at the right margin of φ(αSP) function for the facies 1 | ln(mD) | 3.35 – 5.0 |

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| 17 | ln\_beta\_perm\_2 | Logarithm of permeability at the right margin of φ(αSP) function for the facies 2 | ln(mD) | 3.35 – 5.5 |
| 18 | ln\_gamma\_perm | Logarithm of permeability at the left margin of φ(αSP) function for the facies 1 | ln(mD) | -1.38 – 0.28 |
| 19 | ln\_gamma\_perm\_2 | Logarithm of permeability at the left margin of φ(αSP) function for the facies 2 | ln(mD) | -1.38 – 0.1 |
| 20 | ln\_beta\_Sw | Logarithm of water saturation at the right margin of Sw(J) function for the facies 1 | ln(mD) | -1.48 – -3.18 |
| 21 | ln\_beta\_Sw\_2 | Logarithm of water saturation at the right margin of Sw(J) function for the facies 2 | ln(mD) | -3.18 – -2.0 |
| 22 | ln\_gamma\_Sw | Logarithm of water saturation at the left margin of Sw(J) function for the facies 1 | ln(d.e.) | -0.39 – 0.3 |
| 23 | ln\_gamma\_Sw\_2 | Logarithm of water saturation at the left margin of Sw(J) function for the facies 2 | ln(d.e.) | -0.46 – 0.6 |
| 24 | ln\_beta\_Swl | Logarithm of residual water saturation at the right margin of Sw(k) function for the facies 1 | ln(d.e.) | 2.9 – 3.3 |
| 25 | ln\_beta\_Swl\_2 | Logarithm of residual water saturation at the right margin of Sw(k) function for the facies 2 | ln(d.e.) | 2.8 – 3.3 |
| 26 | ln\_gamma\_Swl | Logarithm of residual water saturation at the left margin of Sw(k) function for the facies 1 | ln(d.e.) | 3.6 – 4.0 |
| 27 | ln\_gamma\_Swl\_2 | Logarithm of residual water saturation at the left margin of Sw(k) function for the facies 2 | ln(d.e.) | 3.6 – 4.0 |
| 28 | ln\_gamma\_Swcr | Multiplier to get Swcr from Swl | ln(d.e.) | 1.0 – 1.2 |

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| 29 | Major | Major range of the variogram (facies 1) | meters | 517 – 7984 |
| 30 | Major\_2 | Major range of the variogram (facies 2) | meters | 509 - 7989 |
| 31 | Minor | Minor range of the variogram (facies 1) | meters | 300 - 1999 |
| 32 | Minor\_2 | Minor range of the variogram (facies 2) | meters | 300 - 1993 |
| 33 | Prop\_f | Facies proportion (1)/(2) | unitless | 70 – 95 |
| 34 | Shift\_facies | Average porosity value shift in the porosity distribution (Facies 1) | d.e. | -1 – 0.1 |
| 35 | Shift\_facies\_2 | Average porosity value shift in the porosity distribution (Facies 2) | d.e. | -1 – 0.1 |
| 36 | Vertical | Rang of the vertical variogram (facies 1) | meters | 1 – 25 |
| 37 | Vertical\_2 | Rang of the vertical variogram (facies 2) | meters | 1 – 25 |