Supporting material for the manuscript entitled

**“Advanced Modeling Techniques for Predicting Gas Holdup in Bubble Columns Using Machine Learning**

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Studies involving the highest number of parameters for gas holdup in bubble columns

by (Abro, Yu et al. 2021),

by (Akita and Yoshida 1974),

by (Hikita, Asai et al. 1980)),

Studies examining the impact of pressure on gas holdup:

Grover et al., (1986) (),

Jin et al., (2013) ().

A screenshot of a graph

Description automatically generated

Figure S 1) Parplot before removing 9 samples of liquid viscosity

A diagram of a heat map

Description automatically generated with medium confidence

Figure S 2) Heatmap before removing 9 samples of liquid viscosity

Table S 1) Coefficients for the linear regression with feature engineering model

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|  |  |  |  |

| Validation curves | Learning curves | Models performance |
| --- | --- | --- |
|  | A graph of a training  Description automatically generated  Figure S 3 |  |
| A graph of a test error  Description automatically generated  Figure S 4 | A graph with a green line  Description automatically generated  Figure S 5 | A graph of a line with red dots  Description automatically generated  Figure S 6 |
| A graph with a blue line  Description automatically generated  Figure S 7 |  |  |
| A graph of a graph  Description automatically generated with medium confidence  Figure S 8 | A graph of a training score  Description automatically generated with medium confidence  Figure S 9 | A graph of a graph with red and blue dots  Description automatically generated  Figure S 10 |
| A graph of a graph  Description automatically generated  Figure S 11 | A graph of a training curve  Description automatically generated with medium confidence  Figure S 12 | A graph with red and blue dots  Description automatically generated  Figure S 13 |
| A graph of a test error  Description automatically generated  Figure S 14  A graph of a graph  Description automatically generated  Figure S 15 | A graph of a training scale  Description automatically generated with medium confidence  Figure S 16 | A graph of a graph with red and blue dots  Description automatically generated  Figure S 17 |
| A graph of a graph  Description automatically generated with medium confidence  Figure S 18  A graph of a graph  Description automatically generated  Figure S 19  A graph of a graph  Description automatically generated  Figure S 20 |  |  |

A graph of colored dots

Description automatically generated with medium confidence

Figure S21