Table 1 Model Training Data used for prediction of surface roughness.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Exp.**  **No.** | **Mean** | **Standard Deviation** | **Skewness** | **Kurtosis** | **Measured**  **Surface**  **Roughness**  **(µm)** |
| 2 | 0.00668 | 1.056894 | 0.007635 | 1.390215 | 1.071 |
| 3 | -0.00508 | 0.742455 | -0.09148 | 0.914873 | 1.417 |
| 4 | 0.020801 | 0.879877 | 0.162508 | 2.971352 | 0.306 |
| 5 | -0.00648 | 1.638528 | 0.006316 | 2.239106 | 0.535 |
| 6 | -0.00271 | 1.283376 | -0.02099 | 0.749092 | 2.280 |
| 7 | 0.012445 | 1.514366 | -0.1089 | 1.371109 | 1.801 |
| 8 | 0.013934 | 1.900397 | 0.008498 | 1.063846 | 0.5 |
| 9 | 0.012327 | 1.659724 | 0.025772 | 1.300727 | 0.4 |
| 10 | -0.00435 | 1.107117 | -0.05495 | 1.703217 | 1.064 |
| 11 | 0.00508 | 2.068755 | -0.04384 | 2.121486 | 0.549 |
| 12 | -0.000539 | 1.422151 | 0.072069 | 1.073024 | 1.45 |
| 13 | 0.005206 | 2.091073 | -0.05987 | 0.660702 | 1.529 |
| 14 | -0.00848 | 1.260697 | -0.0133 | 0.996189 | 0.3658 |
| 15 | 0.0007918 | 1.811569 | -0.1011 | 1.362719 | 1.046 |
| 16 | -0.01127 | 1.7420 | -0.0947 | 2.117454 | 0.498 |
| 17 | -0.02063 | 1.738768 | 0.012274 | 2.112489 | 0.839 |
| 18 | 0.011522 | 1.398951 | -0.01411 | 0.610845 | 0.935 |
| 19 | 0.008245 | 2.301294 | 0.006099 | 1.447963 | 0.815 |
| 20 | -0.00841 | 2.190232 | -0.12103 | 0.372387 | 1.226 |
| 21 | 0.004484 | 1.543101 | 0.041291 | 0.450179 | 1.314 |
| 22 | -0.00409 | 1.529847 | 0.042734 | 0.417985 | 0.587 |
| 23 | 0.00457 | 1.833667 | -0.01705 | 1.03485 | 1.86 |
| 24 | -0.0295 | 1.818123 | -0.03443 | 1.548223 | 0.62 |
| 25 | 0.006697 | 1.568542 | -0.0274 | 1.616081 | 0.552 |
| 26 | -0.00133 | 1.612792 | -0.07911 | 0.537847 | 1.23 |
| 27 | 0.00029 | 2.06587 | -0.00764 | 1.49813 | 0.896 |

Table 2 Data set-1 used for testing model to predict the surface roughness.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Exp.**  **No.** | **Mean** | **Standard Deviation** | **Skewness** | **Kurtosis** | **Measured**  **Surface**  **Roughness**  **(µm)** | **Predicted Surface Roughness**  **(µm)** | **Error**  **(%)** |
| 1 | 0.008123 | 0.245716 | -0.03933 | 1.013373 | 0.846 | 0.7985 | 5.6146 |

Table 3 Model Training Data-2 for prediction of surface roughness.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Exp.**  **No.** | **Mean** | **Standard Deviation** | **Skewness** | **Kurtosis** | **Measured**  **Surface**  **Roughness**  **(µm)** |
| 1 | 0.008123 | 0.245716 | -0.03933 | 1.013373 | 0.846 |
| 3 | -0.00508 | 0.742455 | -0.09148 | 0.914873 | 1.417 |
| 4 | 0.020801 | 0.879877 | 0.162508 | 2.971352 | 0.306 |
| 5 | -0.00648 | 1.638528 | 0.006316 | 2.239106 | 0.535 |
| 6 | -0.00271 | 1.283376 | -0.02099 | 0.749092 | 2.280 |
| 7 | 0.012445 | 1.514366 | -0.1089 | 1.371109 | 1.801 |
| 8 | 0.013934 | 1.900397 | 0.008498 | 1.063846 | 0.5 |
| 9 | 0.012327 | 1.659724 | 0.025772 | 1.300727 | 0.4 |
| 10 | -0.00435 | 1.107117 | -0.05495 | 1.703217 | 1.064 |
| 11 | 0.00508 | 2.068755 | -0.04384 | 2.121486 | 0.549 |
| 12 | -0.000539 | 1.422151 | 0.072069 | 1.073024 | 1.45 |
| 13 | 0.005206 | 2.091073 | -0.05987 | 0.660702 | 1.529 |
| 14 | -0.00848 | 1.260697 | -0.0133 | 0.996189 | 0.3658 |
| 15 | 0.0007918 | 1.811569 | -0.1011 | 1.362719 | 1.046 |
| 16 | -0.01127 | 1.7420 | -0.0947 | 2.117454 | 0.498 |
| 17 | -0.02063 | 1.738768 | 0.012274 | 2.112489 | 0.839 |
| 18 | 0.011522 | 1.398951 | -0.01411 | 0.610845 | 0.935 |
| 19 | 0.008245 | 2.301294 | 0.006099 | 1.447963 | 0.815 |
| 20 | -0.00841 | 2.190232 | -0.12103 | 0.372387 | 1.226 |
| 21 | 0.004484 | 1.543101 | 0.041291 | 0.450179 | 1.314 |
| 22 | -0.00409 | 1.529847 | 0.042734 | 0.417985 | 0.587 |
| 23 | 0.00457 | 1.833667 | -0.01705 | 1.03485 | 1.86 |
| 24 | -0.0295 | 1.818123 | -0.03443 | 1.548223 | 0.62 |
| 25 | 0.006697 | 1.568542 | -0.0274 | 1.616081 | 0.552 |
| 26 | -0.00133 | 1.612792 | -0.07911 | 0.537847 | 1.23 |
| 27 | 0.00029 | 2.06587 | -0.00764 | 1.49813 | 0.896 |

Table 4 Data set-2 used for testing model to predict the surface roughness.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Exp.**  **No.** | **Mean** | **Standard Deviation** | **Skewness** | **Kurtosis** | **Measured**  **Surface**  **Roughness**  **(µm)** | **Predicted Surface Roughness**  **(µm)** | **Error**  **(%)** |
| 2 | 0.00668 | 1.056894 | 0.007635 | 1.390215 | 1.071 | 1.1172 | 4.31373 |

Table 5 Model Training Data for prediction of surface roughness.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Exp.**  **No.** | **Mean** | **Standard Deviation** | **Skewness** | **Kurtosis** | **Measured**  **Surface**  **Roughness**  **(µm)** |
| 1 | 0.008123 | 0.245716 | -0.03933 | 1.013373 | 0.846 |
| 2 | 0.00668 | 1.056894 | 0.007635 | 1.390215 | 1.071 |
| 4 | 0.020801 | 0.879877 | 0.162508 | 2.971352 | 0.306 |
| 5 | -0.00648 | 1.638528 | 0.006316 | 2.239106 | 0.535 |
| 6 | -0.00271 | 1.283376 | -0.02099 | 0.749092 | 2.280 |
| 7 | 0.012445 | 1.514366 | -0.1089 | 1.371109 | 1.801 |
| 8 | 0.013934 | 1.900397 | 0.008498 | 1.063846 | 0.5 |
| 9 | 0.012327 | 1.659724 | 0.025772 | 1.300727 | 0.4 |
| 10 | -0.00435 | 1.107117 | -0.05495 | 1.703217 | 1.064 |
| 11 | 0.00508 | 2.068755 | -0.04384 | 2.121486 | 0.549 |
| 12 | -0.000539 | 1.422151 | 0.072069 | 1.073024 | 1.45 |
| 13 | 0.005206 | 2.091073 | -0.05987 | 0.660702 | 1.529 |
| 14 | -0.00848 | 1.260697 | -0.0133 | 0.996189 | 0.3658 |
| 15 | 0.0007918 | 1.811569 | -0.1011 | 1.362719 | 1.046 |
| 16 | -0.01127 | 1.7420 | -0.0947 | 2.117454 | 0.498 |
| 17 | -0.02063 | 1.738768 | 0.012274 | 2.112489 | 0.839 |
| 18 | 0.011522 | 1.398951 | -0.01411 | 0.610845 | 0.935 |
| 19 | 0.008245 | 2.301294 | 0.006099 | 1.447963 | 0.815 |
| 20 | -0.00841 | 2.190232 | -0.12103 | 0.372387 | 1.226 |
| 21 | 0.004484 | 1.543101 | 0.041291 | 0.450179 | 1.314 |
| 22 | -0.00409 | 1.529847 | 0.042734 | 0.417985 | 0.587 |
| 23 | 0.00457 | 1.833667 | -0.01705 | 1.03485 | 1.86 |
| 24 | -0.0295 | 1.818123 | -0.03443 | 1.548223 | 0.62 |
| 25 | 0.006697 | 1.568542 | -0.0274 | 1.616081 | 0.552 |
| 26 | -0.00133 | 1.612792 | -0.07911 | 0.537847 | 1.23 |
| 27 | 0.00029 | 2.06587 | -0.00764 | 1.49813 | 0.896 |

Table 6 Data set-3 used for testing model to predict surface roughness.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Exp.**  **No.** | **Mean** | **Standard Deviation** | **Skewness** | **Kurtosis** | **Measured**  **Surface**  **Roughness**  **(µm)** | **Predicted Surface Roughness**  **(µm)** | **Error**  **(%)** |
| 3 | -0.00508 | 0.742455 | -0.09148 | 0.914873 | 1.417 | 1.4459 | 2.03952 |

In a similar manner, the remaining 24 experiments as well as the other two models undergo testing and training. This approach is called the "Leave-One-Out Cross-Validation" (LOOCV) method of optimization. In LOOCV, the dataset is repeatedly divided into a training set that contains all data points except one and a test set that only contains that one missing data point. To evaluate the model's performance more than once, this procedure is repeated for each data point in the dataset. The outcomes are then averaged or otherwise compiled to determine the model's overall performance. LOOCV is often used to assess the predictive power and generalization ability of machine learning models when the dataset is limited.