# Report : SVM, KNN, RF trained on LLB-10

Training well: LLB-10

Test well: LLD-14, LLA-2

Keterangan:

* Layer by layer threshold (%):persentase prediksi minimal pada suatu formasi agar formasi tersebut dinyatakan mengandung hidrokarbon

Kolom fitur:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Feature Set | DRHO | GR | SR | MR | DR | NPHI\_corr | RHOB\_CORR | PEF |
| Feature 1 | Yes | Yes | No | No | Yes | Yes | Yes | No |
| Feature 2 | Yes | Yes | No | Yes | No | Yes | Yes | Yes |
| Feature 3 | Yes | Yes | No | Yes | No | Yes | Yes | No |
| Feature 4 | Yes | Yes | No | No | No | Yes | Yes | No |
| Feature 5 | Yes | Yes | Yes | No | Yes | Yes | Yes | No |
| Feature 6 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| Feature 7 | Yes | Yes | Yes | Yes | No | Yes | Yes | No |

Kolom .LAS

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Feature Set | DRHO | GR | SR | MR | DR | NPHI\_corr | RHOB\_CORR | PEF |
| LLB-10 | DRHO | GR | LLS | ILM | RT | NPHI | RHOB\_CORR | PEF |
| LLD-14 | DRHO | GR | ILS | ILM | RT | NPHI | RHOB\_CORR | PEF |
| LLA-2 | DRHO | GR | SFLU | - | RT | NPHI | RHOB\_CORR | PEF |

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# Feature 1: ['DRHO','GR','DR','NPHI\_corr','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 1 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.944048 | 0.909283 | 0.937665 | 0.883176 |
| SK-KNN | 1 | 0.915612 | 0.950244 | 0.884033 |
| SK-RF | 0.999061 | 0.934599 | 0.962261 | 0.910311 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9093 | 0.8832 | 0.0261 | 2.87% |
| SK-KNN | 0.9156 | 0.884 | 0.0316 | 3.45% |
| SK-RF | 0.9346 | 0.9103 | 0.0243 | 2.60% |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLA-2\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9093 | 0.888 | 0.0213 | 2.34% |
| SK-KNN | 0.9156 | 0.8777 | 0.0379 | 4.14% |
| SK-RF | 0.9346 | 0.887 | 0.0476 | 5.09% |

## LLD-14 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.8832 | 0.884 | 0.9103 |
| Prediction Duration (seconds) | 0.2395 | 0.0196 | 0.0199 |
| Precision (Class 0) | 0.93 | 0.94 | 0.95 |
| Recall (Class 0) | 0.94 | 0.93 | 0.95 |
| F1-score (Class 0) | 0.93 | 0.93 | 0.95 |
| Support (Class 0) | 3066 | 3066 | 3066 |
| Precision (Class 1) | 0.53 | 0.53 | 0.64 |
| Recall (Class 1) | 0.5 | 0.57 | 0.65 |
| F1-score (Class 1) | 0.51 | 0.55 | 0.64 |
| Support (Class 1) | 435 | 435 | 435 |
| Accuracy (Overall) | 0.88 | 0.88 | 0.91 |
| Macro Avg Precision | 0.73 | 0.73 | 0.79 |
| Macro Avg Recall | 0.72 | 0.75 | 0.8 |
| Macro Avg F1-score | 0.72 | 0.74 | 0.8 |
| Weighted Avg Precision | 0.88 | 0.89 | 0.91 |
| Weighted Avg Recall | 0.88 | 0.88 | 0.91 |
| Weighted Avg F1-score | 0.88 | 0.89 | 0.91 |
| Confusion Matrix (True Negatives) | 2876 | 2847 | 2904 |
| Confusion Matrix (False Positives) | 190 | 219 | 162 |
| Confusion Matrix (False Negatives) | 219 | 187 | 152 |
| Confusion Matrix (True Positives) | 216 | 248 | 283 |

## LLA-2 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.888 | 0.8777 | 0.887 |
| Prediction Duration (seconds) | 0.3914 | 0.0288 | 0.0286 |
| Precision (Class 0) | 0.94 | 0.94 | 0.94 |
| Recall (Class 0) | 0.94 | 0.93 | 0.94 |
| F1-score (Class 0) | 0.94 | 0.93 | 0.94 |
| Support (Class 0) | 5951 | 5951 | 5951 |
| Precision (Class 1) | 0.11 | 0.12 | 0.09 |
| Recall (Class 1) | 0.11 | 0.14 | 0.08 |
| F1-score (Class 1) | 0.11 | 0.13 | 0.09 |
| Support (Class 1) | 413 | 413 | 413 |
| Accuracy (Overall) | 0.89 | 0.88 | 0.89 |
| Macro Avg Precision | 0.53 | 0.53 | 0.51 |
| Macro Avg Recall | 0.52 | 0.53 | 0.51 |
| Macro Avg F1-score | 0.53 | 0.53 | 0.51 |
| Weighted Avg Precision | 0.88 | 0.89 | 0.88 |
| Weighted Avg Recall | 0.89 | 0.88 | 0.89 |
| Weighted Avg F1-score | 0.89 | 0.88 | 0.88 |
| Confusion Matrix (True Negatives) | 5607 | 5529 | 5611 |
| Confusion Matrix (False Positives) | 344 | 422 | 340 |
| Confusion Matrix (False Negatives) | 369 | 356 | 379 |
| Confusion Matrix (True Positives) | 44 | 57 | 34 |

# Feature 2: ['DRHO','GR','MR','NPHI\_corr','PEF','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 2 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.950432 | 0.915612 | 0.940951 | 0.896887 |
| SK-KNN | 1 | 0.921238 | 0.947053 | 0.906884 |
| SK-RF | 1 | 0.939522 | 0.960853 | 0.908598 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9156 | 0.8969 | 0.0187 | 2.05% |
| SK-KNN | 0.9212 | 0.9069 | 0.0144 | 1.56% |
| SK-RF | 0.9395 | 0.9086 | 0.0309 | 3.29% |

## LLD-14 Classification Report

# Feature 3: ['DRHO','GR','MR','NPHI\_corr','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 3 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.933627 | 0.890999 | 0.92593 | 0.892602 |
| SK-KNN | 1 | 0.902954 | 0.940574 | 0.883748 |
| SK-RF | 0.994367 | 0.921941 | 0.953342 | 0.904313 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.891 | 0.8926 | -0.0016 | -0.18% |
| SK-KNN | 0.903 | 0.8837 | 0.0192 | 2.13% |
| SK-RF | 0.9219 | 0.9043 | 0.0176 | 1.91% |

## LLD-14 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.8926 | 0.8837 | 0.9043 |
| Prediction Duration (seconds) | 0.2557 | 0.0159 | 0.018 |
| Precision (Class 0) | 0.92 | 0.93 | 0.93 |
| Recall (Class 0) | 0.96 | 0.94 | 0.97 |
| F1-score (Class 0) | 0.94 | 0.93 | 0.95 |
| Support (Class 0) | 3066 | 3066 | 3066 |
| Precision (Class 1) | 0.6 | 0.54 | 0.66 |
| Recall (Class 1) | 0.39 | 0.47 | 0.47 |
| F1-score (Class 1) | 0.47 | 0.5 | 0.55 |
| Support (Class 1) | 435 | 435 | 435 |
| Accuracy (Overall) | 0.89 | 0.88 | 0.9 |
| Macro Avg Precision | 0.76 | 0.73 | 0.79 |
| Macro Avg Recall | 0.68 | 0.71 | 0.72 |
| Macro Avg F1-score | 0.71 | 0.72 | 0.75 |
| Weighted Avg Precision | 0.88 | 0.88 | 0.89 |
| Weighted Avg Recall | 0.89 | 0.88 | 0.9 |
| Weighted Avg F1-score | 0.88 | 0.88 | 0.9 |
| Confusion Matrix (True Negatives) | 2955 | 2890 | 2960 |
| Confusion Matrix (False Positives) | 111 | 176 | 106 |
| Confusion Matrix (False Negatives) | 265 | 231 | 229 |
| Confusion Matrix (True Positives) | 170 | 204 | 206 |

# Feature 4: 'DRHO','GR','NPHI\_corr','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 4 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.845663 | 0.749648 | 0.837308 | 0.681234 |
| SK-KNN | 1 | 0.817862 | 0.876454 | 0.705513 |
| SK-RF | 1 | 0.850211 | 0.902741 | 0.759497 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.7496 | 0.6812 | 0.0684 | 9.13% |
| SK-KNN | 0.8179 | 0.7055 | 0.1123 | 13.74% |
| SK-RF | 0.8502 | 0.7595 | 0.0907 | 10.67% |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLA-2\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.7496 | 0.7032 | 0.0465 | 6.20% |
| SK-KNN | 0.8179 | 0.7055 | 0.1123 | 13.73% |
| SK-RF | 0.8502 | 0.7863 | 0.0639 | 7.52% |

## LLD-14 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.6812 | 0.7055 | 0.7595 |
| Prediction Duration (seconds) | 1.2778 | 0.0198 | 0.0253 |
| Precision (Class 0) | 0.9 | 0.9 | 0.9 |
| Recall (Class 0) | 0.71 | 0.75 | 0.82 |
| F1-score (Class 0) | 0.8 | 0.82 | 0.86 |
| Support (Class 0) | 3066 | 3066 | 3066 |
| Precision (Class 1) | 0.18 | 0.19 | 0.21 |
| Recall (Class 1) | 0.46 | 0.4 | 0.34 |
| F1-score (Class 1) | 0.26 | 0.25 | 0.26 |
| Support (Class 1) | 435 | 435 | 435 |
| Accuracy (Overall) | 0.68 | 0.71 | 0.76 |
| Macro Avg Precision | 0.54 | 0.54 | 0.56 |
| Macro Avg Recall | 0.59 | 0.58 | 0.58 |
| Macro Avg F1-score | 0.53 | 0.54 | 0.56 |
| Weighted Avg Precision | 0.81 | 0.81 | 0.81 |
| Weighted Avg Recall | 0.68 | 0.71 | 0.76 |
| Weighted Avg F1-score | 0.73 | 0.75 | 0.78 |
| Confusion Matrix (True Negatives) | 2186 | 2294 | 2509 |
| Confusion Matrix (False Positives) | 880 | 772 | 557 |
| Confusion Matrix (False Negatives) | 236 | 259 | 285 |
| Confusion Matrix (True Positives) | 199 | 176 | 150 |

## LLA-2 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.7032 | 0.7055 | 0.7863 |
| Prediction Duration (seconds) | 2.0972 | 0.0233 | 0.02 |
| Precision (Class 0) | 0.93 | 0.93 | 0.93 |
| Recall (Class 0) | 0.74 | 0.74 | 0.83 |
| F1-score (Class 0) | 0.82 | 0.82 | 0.88 |
| Support (Class 0) | 5951 | 5951 | 5951 |
| Precision (Class 1) | 0.05 | 0.05 | 0.05 |
| Recall (Class 1) | 0.18 | 0.22 | 0.13 |
| F1-score (Class 1) | 0.07 | 0.09 | 0.07 |
| Support (Class 1) | 413 | 413 | 413 |
| Accuracy (Overall) | 0.7 | 0.71 | 0.79 |
| Macro Avg Precision | 0.49 | 0.49 | 0.49 |
| Macro Avg Recall | 0.46 | 0.48 | 0.48 |
| Macro Avg F1-score | 0.45 | 0.46 | 0.48 |
| Weighted Avg Precision | 0.87 | 0.87 | 0.87 |
| Weighted Avg Recall | 0.7 | 0.71 | 0.79 |
| Weighted Avg F1-score | 0.77 | 0.78 | 0.83 |
| Confusion Matrix (True Negatives) | 4399 | 4401 | 4952 |
| Confusion Matrix (False Positives) | 1552 | 1550 | 999 |
| Confusion Matrix (False Negatives) | 337 | 324 | 361 |
| Confusion Matrix (True Positives) | 76 | 89 | 52 |

# Feature 5: ['DRHO','GR','SR','DR','NPHI\_corr','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 5 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.976624 | 0.947257 | 0.970616 | 0.865753 |
| SK-KNN | 1 | 0.939522 | 0.969584 | 0.854042 |
| SK-RF | 0.999531 | 0.963432 | 0.979441 | 0.913453 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9473 | 0.8658 | 0.0815 | 8.60% |
| SK-KNN | 0.9395 | 0.854 | 0.0855 | 9.10% |
| SK-RF | 0.9634 | 0.9135 | 0.05 | 5.19% |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLA-2\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9473 | 0.9183 | 0.029 | 3.06% |
| SK-KNN | 0.9395 | 0.9073 | 0.0322 | 3.43% |
| SK-RF | 0.9634 | 0.92 | 0.0434 | 4.51% |

## LLD-14 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.8658 | 0.854 | 0.9135 |
| Prediction Duration (seconds) | 0.1219 | 0.0204 | 0.0219 |
| Precision (Class 0) | 0.93 | 0.95 | 0.95 |
| Recall (Class 0) | 0.91 | 0.88 | 0.95 |
| F1-score (Class 0) | 0.92 | 0.91 | 0.95 |
| Support (Class 0) | 3066 | 3066 | 3066 |
| Precision (Class 1) | 0.47 | 0.44 | 0.65 |
| Recall (Class 1) | 0.54 | 0.67 | 0.65 |
| F1-score (Class 1) | 0.5 | 0.53 | 0.65 |
| Support (Class 1) | 435 | 435 | 435 |
| Accuracy (Overall) | 0.87 | 0.85 | 0.91 |
| Macro Avg Precision | 0.7 | 0.7 | 0.8 |
| Macro Avg Recall | 0.73 | 0.78 | 0.8 |
| Macro Avg F1-score | 0.71 | 0.72 | 0.8 |
| Weighted Avg Precision | 0.88 | 0.89 | 0.91 |
| Weighted Avg Recall | 0.87 | 0.85 | 0.91 |
| Weighted Avg F1-score | 0.87 | 0.87 | 0.91 |
| Confusion Matrix (True Negatives) | 2796 | 2698 | 2915 |
| Confusion Matrix (False Positives) | 270 | 368 | 151 |
| Confusion Matrix (False Negatives) | 200 | 143 | 152 |
| Confusion Matrix (True Positives) | 235 | 292 | 283 |

## LLA-2 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.9183 | 0.9073 | 0.92 |
| Prediction Duration (seconds) | 0.2338 | 0.0442 | 0.0338 |
| Precision (Class 0) | 0.93 | 0.94 | 0.94 |
| Recall (Class 0) | 0.98 | 0.97 | 0.98 |
| F1-score (Class 0) | 0.96 | 0.95 | 0.96 |
| Support (Class 0) | 5951 | 5951 | 5951 |
| Precision (Class 1) | 0.05 | 0.13 | 0.11 |
| Recall (Class 1) | 0.01 | 0.08 | 0.03 |
| F1-score (Class 1) | 0.02 | 0.1 | 0.05 |
| Support (Class 1) | 413 | 413 | 413 |
| Accuracy (Overall) | 0.92 | 0.91 | 0.92 |
| Macro Avg Precision | 0.49 | 0.53 | 0.52 |
| Macro Avg Recall | 0.5 | 0.52 | 0.51 |
| Macro Avg F1-score | 0.49 | 0.52 | 0.5 |
| Weighted Avg Precision | 0.88 | 0.89 | 0.88 |
| Weighted Avg Recall | 0.92 | 0.91 | 0.92 |
| Weighted Avg F1-score | 0.9 | 0.9 | 0.9 |
| Confusion Matrix (True Negatives) | 5838 | 5743 | 5842 |
| Confusion Matrix (False Positives) | 113 | 208 | 109 |
| Confusion Matrix (False Negatives) | 407 | 382 | 400 |
| Confusion Matrix (True Positives) | 6 | 31 | 13 |

# Feature 6: ['DRHO','GR','SR','MR','DR','NPHI\_corr','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 6 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.981881 | 0.955696 | 0.978408 | 0.864039 |
| SK-KNN | 1 | 0.955696 | 0.973714 | 0.876035 |
| SK-RF | 1 | 0.968354 | 0.982539 | 0.917738 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9557 | 0.864 | 0.0917 | 9.59% |
| SK-KNN | 0.9557 | 0.876 | 0.0797 | 8.34% |
| SK-RF | 0.9684 | 0.9177 | 0.0506 | 5.23% |

## LLD-14 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.864 | 0.876 | 0.9177 |
| Prediction Duration (seconds) | 0.2146 | 0.1378 | 0.0339 |
| Precision (Class 0) | 0.94 | 0.95 | 0.95 |
| Recall (Class 0) | 0.9 | 0.9 | 0.95 |
| F1-score (Class 0) | 0.92 | 0.93 | 0.95 |
| Support (Class 0) | 3066 | 3066 | 3066 |
| Precision (Class 1) | 0.46 | 0.5 | 0.67 |
| Recall (Class 1) | 0.62 | 0.67 | 0.66 |
| F1-score (Class 1) | 0.53 | 0.57 | 0.67 |
| Support (Class 1) | 435 | 435 | 435 |
| Accuracy (Overall) | 0.86 | 0.88 | 0.92 |
| Macro Avg Precision | 0.7 | 0.73 | 0.81 |
| Macro Avg Recall | 0.76 | 0.79 | 0.81 |
| Macro Avg F1-score | 0.73 | 0.75 | 0.81 |
| Weighted Avg Precision | 0.88 | 0.9 | 0.92 |
| Weighted Avg Recall | 0.86 | 0.88 | 0.92 |
| Weighted Avg F1-score | 0.87 | 0.88 | 0.92 |
| Confusion Matrix (True Negatives) | 2755 | 2774 | 2924 |
| Confusion Matrix (False Positives) | 311 | 292 | 142 |
| Confusion Matrix (False Negatives) | 165 | 142 | 146 |
| Confusion Matrix (True Positives) | 270 | 293 | 289 |

# Feature 7: ['DRHO','GR','SR','MR','NPHI\_corr','RHOB\_CORR']

|  |  |  |
| --- | --- | --- |
| Well | Feature 7 | |
| Classification track | Layer by layer (threshold=25%) |
| LLB-10 |  |  |
| LLD-14 |  |  |
| LLA-2 |  |  |

## Accuracy Comparison Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Train | LLB-10\_Test | LLB-10\_CV | LLD-14\_Test |
| SK-SVM | 0.976249 | 0.955696 | 0.971742 | 0.891460 |
| SK-KNN | 1.000000 | 0.947257 | 0.963762 | 0.850900 |
| SK-RF | 0.999812 | 0.964135 | 0.978783 | 0.895744 |

## Generalization Analysis Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | LLB-10\_Test\_Acc | LLD-14\_Test\_Acc | Generalization\_Drop | Drop\_Percentage |
| SK-SVM | 0.9557 | 0.8915 | 0.0642 | 6.72% |
| SK-KNN | 0.9473 | 0.8509 | 0.0964 | 10.17% |
| SK-RF | 0.9641 | 0.8957 | 0.0684 | 7.09% |

## LLD-14 Classification Report

|  |  |  |  |
| --- | --- | --- | --- |
| Metric / Model | SVM | KNN | RF |
| Accuracy | 0.8915 | 0.8509 | 0.8957 |
| Prediction Duration (seconds) | 0.2407 | 0.0775 | 0.0146 |
| Precision (Class 0) | 0.94 | 0.94 | 0.95 |
| Recall (Class 0) | 0.94 | 0.88 | 0.93 |
| F1-score (Class 0) | 0.94 | 0.91 | 0.94 |
| Support (Class 0) | 3066 | 3066 | 3066 |
| Precision (Class 1) | 0.56 | 0.43 | 0.57 |
| Recall (Class 1) | 0.56 | 0.63 | 0.66 |
| F1-score (Class 1) | 0.56 | 0.51 | 0.61 |
| Support (Class 1) | 435 | 435 | 435 |
| Accuracy (Overall) | 0.89 | 0.85 | 0.9 |
| Macro Avg Precision | 0.75 | 0.69 | 0.76 |
| Macro Avg Recall | 0.75 | 0.76 | 0.79 |
| Macro Avg F1-score | 0.75 | 0.71 | 0.78 |
| Weighted Avg Precision | 0.89 | 0.88 | 0.9 |
| Weighted Avg Recall | 0.89 | 0.85 | 0.9 |
| Weighted Avg F1-score | 0.89 | 0.86 | 0.9 |
| Confusion Matrix (True Negatives) | 2876 | 2703 | 2849 |
| Confusion Matrix (False Positives) | 190 | 363 | 217 |
| Confusion Matrix (False Negatives) | 190 | 159 | 148 |
| Confusion Matrix (True Positives) | 245 | 276 | 287 |