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|  | | | | |
|  | Environments | Attack Vectors | Pre-requisites | Potential Results |

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| --- | --- | --- | --- |
| **Environments** | **Attack Vectors** | **Pre-Requisites** | **Potential Results** |
| 1. Windows 10 | 1. Physical | 1. Credentials | 1. Credential Acquisition |
| 2. Window 8 | 2. Network | 2. Root Privilege | 2. Privilege Escalation |
| 3. Linux Kernal | 3. Adjacent | 3. Remote Access | 3. Remote Access |
| 4. My SQL | 4. Local | 4. Local Access | 4. Denial of Service |
| 5. Postgre SQL |  | 5. Network Access | 5. Run Arbitrary Commands |
| 6. Apache |  |  | 6. Data Access |
| 7. Apple |  |  | 7. Data Manipulation |
| 8. Samba |  |  |  |

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| --- | --- | --- | --- | --- |
| **CVE ID** | **Environments** | **Attack Vectors** | **Input Pre-Requisites** | **Output Results** |
| CVE-1999-0002 | 3 | 2, 3 | 2 | 2 |
| … |  |  |  |  |
| CVE-2000-0327 | 7 | 1, 2, 3, 4 | 3 | 3, 5 |
| .. |  |  |  |  |
| CVE-2001-0344 | 4 | 1, 4 | 4, 5 | 6, 7 |
| … |  |  |  |  |
| CVE-2002-0259 | 6 | 1 | 4, 5 | 6 |
| … |  |  |  |  |
| CVE-2003-0353 | 4 | 1, 2, 3, 4 | 3, 5 | 3, 5, 6 |
| … |  |  |  |  |
| CVE-2004-0977 | 3, 5, 8 | 1 | 4, 5 | 6 |
| … |  |  |  |  |
| CVE-2005-0244 | 3, 5 | 1, 4 | 4, 5 | 5 |
| … |  |  |  |  |
| CVE-2006-0410 | 3, 4, 5, 8 | 1, 2, 3, 4 | 3 | 3, 5 |
| … |  |  |  |  |
| CVE-2007-2269 | 2 | 1 | 4, 5 | 6 |
| … |  |  |  |  |
| CVE-2008-6591 | 4 | 1 | 5 | 6 |
| … |  |  |  |  |
| CVE-2009-4070 | 3, 4, 8 | 1, 2, 3, 4 | 3 | 3, 5 |
| … |  |  |  |  |
| CVE-2010-2497 | 7, 8 | 1, 2, 3, 4 | 3, 5 | 3, 4, 5, 6 |
| … |  |  |  |  |
| CVE-2011-1502 | 6 | 1 | 5 | 6 |
| … |  |  |  |  |
| CVE-2012-1592 | 3, 6, 8 | 1, 4 | 4, 5 | 5, 6 |
| … |  |  |  |  |
| CVE-2013-4159 | 8 | 1 | 5 | 6 |
| … |  |  |  |  |
| CVE-2014-0210 | 3, 8 | 1, 2, 3, 4 | 3 | 3, 5 |
| … |  |  |  |  |
| CVE-2015-4342 | 3, 4, 8 | 1, 2, 3, 4 | 3, 5 | 3, 5, 6 |
| … |  |  |  |  |
| CVE-2016-5018 | 3, 6, 8 | 1 | 5 | 6 |
| … |  |  |  |  |
| CVE-2017-11829 | 1 | 1 | 5 | 6 |
| … |  |  |  |  |
| CVE-2018-12464 | 4 | 1, 2, 3, 4 | 1, 3 | 1, 3, 5 |
| … |  |  |  |  |
| CVE-2019-0575 | 1, 2 | 1, 2, 3 | 3 | 3 |
| … |  |  |  |  |
| CVE-2020-8656 | 4 | 1, 2, 3 | 1, 3, 5 | 1, 3, 6 |
| … |  |  |  |  |
| CVE-2021-40120 | 3 | 1, 2, 3, 4 | 1, 3 | 1, 3, 5 |
| … |  |  |  |  |
| CVE-2022-27473 | 4 | 1, 2, 3, 4 | 1, 3 | 1, 3, 5 |
| … |  |  |  |  |
| CVE-2023-35708 | 4 | 1 | 1, 5 | 1, 6 |
| … |  |  |  |  |

RF: Random Forest

LR: Logistic Regression

DT: Decision Tree

SVM: Support Vector Machine

KNN: K-Nearest Neighbors

GBM: Gradient Boosting Machine

AdaBoost: Adaptive Boosting

XGBoost: eXtreme Gradient Boosting

GNB: Gaussian Naive Bayes

Accuracy:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| Training | 0.77 | 0.70 | 0.77 | 0.75 | 0.75 | 0.77 | 0.47 | 0.77 | 0.48 |
| Testing | 0.78 | 0.69 | 0.78 | 0.75 | 0.74 | 0.77 | 0.47 | 0.78 | 0.48 |
| Validation | 0.78 | 0.70 | 0.78 | 0.76 | 0.74 | 0.77 | 0.48 | 0.78 | 0.48 |

Testing Metrics:

Precision:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| 1 | 0.62 | 0 | 0.62 | 0.62 | 0.75 | 0.55 | 0 | 0.62 | 0.55 |
| 2 | 0.9 | 0 | 0.89 | 0.68 | 0.88 | 0.9 | 0 | 0.9 | 0 |
| 3 | 0.6 | 0 | 0.6 | 0.41 | 0.56 | 0.6 | 0 | 0.6 | 0.18 |
| 4 | 0.73 | 0.6 | 0.73 | 0.61 | 0.75 | 0.72 | 0.17 | 0.73 | 0.8 |
| 5 | 0.76 | 0.69 | 0.76 | 0.8 | 0.68 | 0.76 | 0.35 | 0.76 | 0.1 |
| 6 | 0.84 | 0.74 | 0.84 | 0.81 | 0.84 | 0.84 | 0.74 | 0.84 | 0.74 |
| 7 | 0.63 | 0.54 | 0.63 | 0.62 | 0.51 | 0.63 | 0.53 | 0.63 | 0.53 |

Recall:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| 1 | 0.95 | 0 | 0.95 | 0.95 | 0.95 | 1 | 0 | 0.95 | 1 |
| 2 | 0.76 | 0 | 0.74 | 0.56 | 0.56 | 0.76 | 0 | 0.76 | 0 |
| 3 | 0.15 | 0 | 0.15 | 0.11 | 0.11 | 0.15 | 0 | 0.15 | 0.97 |
| 4 | 0.67 | 0.54 | 0.67 | 0.71 | 0.71 | 0.67 | 0.34 | 0.67 | 0.21 |
| 5 | 0.87 | 0.7 | 0.87 | 0.77 | 0.77 | 0.87 | 0.15 | 0.87 | 0 |
| 6 | 0.9 | 0.91 | 0.9 | 0.91 | 0.91 | 0.89 | 0.91 | 0.9 | 0.91 |
| 7 | 0.57 | 0.82 | 0.57 | 0.57 | 0.57 | 0.57 | 0.83 | 0.57 | 0.82 |

F1 Score:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| 1 | 0.75 | 0 | 0.75 | 0.75 | 0.65 | 0.71 | 0 | 0.75 | 0.71 |
| 2 | 0.83 | 0 | 0.81 | 0.61 | 0.72 | 0.83 | 0 | 0.83 | 0 |
| 3 | 0.24 | 0 | 0.24 | 0.18 | 0.13 | 0.24 | 0 | 0.24 | 0.31 |
| 4 | 0.7 | 0.57 | 0.7 | 0.66 | 0.66 | 0.7 | 0.22 | 0.7 | 0.33 |
| 5 | 0.81 | 0.7 | 0.81 | 0.79 | 0.77 | 0.81 | 0.21 | 0.81 | 0 |
| 6 | 0.87 | 0.82 | 0.87 | 0.86 | 0.85 | 0.86 | 0.82 | 0.87 | 0.82 |
| 7 | 0.59 | 0.65 | 0.59 | 0.6 | 0.57 | 0.59 | 0.65 | 0.59 | 0.65 |

Validation Metrics:

Precision:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| 1 | 0.55 | 0 | 0.57 | 0.55 | 0.45 | 0.57 | 0 | 0.55 | 0.57 |
| 2 | 0.86 | 0 | 0.86 | 0.76 | 0.84 | 0.86 | 0 | 0.86 | 0 |
| 3 | 0.53 | 0 | 0.53 | 0.45 | 0.51 | 0.53 | 0 | 0.53 | 0.17 |
| 4 | 0.72 | 0.62 | 0.72 | 0.62 | 0.74 | 0.71 | 0.17 | 0.72 | 0.79 |
| 5 | 0.75 | 0.7 | 0.75 | 0.81 | 0.68 | 0.75 | 0.36 | 0.75 | 0 |
| 6 | 0.85 | 0.75 | 0.85 | 0.8 | 0.85 | 0.85 | 0.75 | 0.85 | 0.75 |
| 7 | 0.65 | 0.55 | 0.65 | 0.65 | 0.53 | 0.65 | 0.54 | 0.65 | 0.55 |

Recall:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| 1 | 0.92 | 0 | 1 | 0.92 | 0.42 | 1 | 0 | 0.92 | 1 |
| 2 | 0.67 | 0 | 0.67 | 0.53 | 0.58 | 0.67 | 0 | 0.67 | 0 |
| 3 | 0.13 | 0 | 0.13 | 0.12 | 0.06 | 0.13 | 0 | 0.13 | 0.96 |
| 4 | 0.68 | 0.56 | 0.68 | 0.71 | 0.57 | 0.68 | 0.33 | 0.68 | 0.21 |
| 5 | 0.85 | 0.69 | 0.85 | 0.77 | 0.87 | 0.85 | 0.17 | 0.85 | 0 |
| 6 | 0.9 | 0.92 | 0.9 | 0.91 | 0.87 | 0.9 | 0.92 | 0.9 | 0.92 |
| 7 | 0.61 | 0.82 | 0.61 | 0.62 | 0.64 | 0.61 | 0.82 | 0.61 | 0.82 |

F1 Score:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class | RF | LR | DT | SVM | KNN | GBM | AdaBoost | XGBoost | GNB |
| 1 | 0.69 | 0 | 0.73 | 0.69 | 0.43 | 0.73 | 0 | 0.69 | 0.73 |
| 2 | 0.75 | 0 | 0.75 | 0.62 | 0.69 | 0.75 | 0 | 0.75 | 0 |
| 3 | 0.21 | 0 | 0.21 | 0.19 | 0.11 | 0.21 | 0 | 0.21 | 0.29 |
| 4 | 0.7 | 0.59 | 0.7 | 0.67 | 0.65 | 0.69 | 0.22 | 0.7 | 0.33 |
| 5 | 0.8 | 0.69 | 0.8 | 0.79 | 0.76 | 0.8 | 0.23 | 0.8 | 0 |
| 6 | 0.87 | 0.83 | 0.87 | 0.86 | 0.86 | 0.87 | 0.83 | 0.87 | 0.82 |
| 7 | 0.63 | 0.66 | 0.63 | 0.63 | 0.58 | 0.63 | 0.65 | 0.63 | 0.66 |