Get the numbers for training and test for each.

4,000 malware, 4,000 benign. Is training.

150 malware, 150 benign.

Malware to Malware & Malware to Vulnerabilities with Inst & Image.

Classification 50/50 split. Examples.

Control 4 system (AV).

Image: Malware to Malware

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Architecture | Transfer Type | Validation | Regularization | ID |
| Feedforward | Freezing | 5-fold validation | None | 1 |
| Feedforward | Freezing | 5-fold validation | Batchnorm | 2 |
| Feedforward | Freezing | 5-fold validation | Dropout | 3 |
| Feedforward | No Freezing | 5-fold validation | None | 4 |
| Feedforward | No Freezing | 5-fold validation | Batchnorm | 5 |
| Feedforward | No Freezing | 5-fold validation | Dropout | 6 |
| CNN | Freezing | 5-fold validation | None | 7 |
| CNN | Freezing | 5-fold validation | Batchnorm | 8 |
| CNN | Freezing | 5-fold validation | Dropout | 9 |
| CNN | No Freezing | 5-fold validation | None | 10 |
| CNN | No Freezing | 5-fold validation | Batchnorm | 11 |
| CNN | No Freezing | 5-fold validation | Dropout | 12 |
| Resnet | Freezing | 5-fold validation | None | 13 |
| Resnet | Freezing | 5-fold validation | Batchnorm | 14 |
| Resnet | Freezing | 5-fold validation | Dropout | 15 |
| Resnet | No Freezing | 5-fold validation | None | 16 |
| Resnet | No Freezing | 5-fold validation | Batchnorm | 17 |
| Resnet | No Freezing | 5-fold validation | Dropout | 18 |
| Feedforward | Freezing | 10-fold validation | None | 19 – 88 |
| Feedforward | Freezing | 10-fold validation | Batchnorm | 20 – 81 |
| Feedforward | Freezing | 10-fold validation | Dropout | 21 – 88 |
| Feedforward | No Freezing | 10-fold validation | None | 22 – 97 |
| Feedforward | No Freezing | 10-fold validation | Batchnorm | 23 - 51 |
| Feedforward | No Freezing | 10-fold validation | Dropout | 24 – 97 |
| CNN | Freezing | 10-fold validation | None | 25 – 58 |
| CNN | Freezing | 10-fold validation | Batchnorm | 26 – 53 |
| CNN | Freezing | 10-fold validation | Dropout | 27 – 58 |
| CNN | No Freezing | 10-fold validation | None | 28 – 52 |
| CNN | No Freezing | 10-fold validation | Batchnorm | 29 – 59 |
| CNN | No Freezing | 10-fold validation | Dropout | 30 – 50 |
| Resnet | Freezing | 10-fold validation | None | 31 – 66 |
| Resnet | Freezing | 10-fold validation | Batchnorm | 32 – 71 |
| Resnet | Freezing | 10-fold validation | Dropout | 33 – 55 |
| Resnet | No Freezing | 10-fold validation | None | 34 |
| Resnet | No Freezing | 10-fold validation | Batchnorm | 35 |
| Resnet | No Freezing | 10-fold validation | Dropout | 36 |

Image: Malware to Vulnerabilities

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Architecture | Transfer Type | Validation | Regularization | ID |
| Feedforward | Freezing | 5-fold validation | None | 1 |
| Feedforward | Freezing | 5-fold validation | Batchnorm | 2 |
| Feedforward | Freezing | 5-fold validation | Dropout | 3 |
| Feedforward | No Freezing | 5-fold validation | None | 4 |
| Feedforward | No Freezing | 5-fold validation | Batchnorm | 5 |
| Feedforward | No Freezing | 5-fold validation | Dropout | 6 |
| CNN | Freezing | 5-fold validation | None | 7 |
| CNN | Freezing | 5-fold validation | Batchnorm | 8 |
| CNN | Freezing | 5-fold validation | Dropout | 9 |
| CNN | No Freezing | 5-fold validation | None | 10 |
| CNN | No Freezing | 5-fold validation | Batchnorm | 11 |
| CNN | No Freezing | 5-fold validation | Dropout | 12 |
| Resnet | Freezing | 5-fold validation | None | 13 |
| Resnet | Freezing | 5-fold validation | Batchnorm | 14 |
| Resnet | Freezing | 5-fold validation | Dropout | 15 |
| Resnet | No Freezing | 5-fold validation | None | 16 |
| Resnet | No Freezing | 5-fold validation | Batchnorm | 17 |
| Resnet | No Freezing | 5-fold validation | Dropout | 18 |
| Feedforward | Freezing | 10-fold validation | None | 19 |
| Feedforward | Freezing | 10-fold validation | Batchnorm | 20 |
| Feedforward | Freezing | 10-fold validation | Dropout | 21 |
| Feedforward | No Freezing | 10-fold validation | None | 22 |
| Feedforward | No Freezing | 10-fold validation | Batchnorm | 23 |
| Feedforward | No Freezing | 10-fold validation | Dropout | 24 |
| CNN | Freezing | 10-fold validation | None | 25 |
| CNN | Freezing | 10-fold validation | Batchnorm | 26 |
| CNN | Freezing | 10-fold validation | Dropout | 27 |
| CNN | No Freezing | 10-fold validation | None | 28 |
| CNN | No Freezing | 10-fold validation | Batchnorm | 29 |
| CNN | No Freezing | 10-fold validation | Dropout | 30 |
| Resnet | Freezing | 10-fold validation | None | 31 |
| Resnet | Freezing | 10-fold validation | Batchnorm | 32 |
| Resnet | Freezing | 10-fold validation | Dropout | 33 |
| Resnet | No Freezing | 10-fold validation | None | 34 |
| Resnet | No Freezing | 10-fold validation | Batchnorm | 35 |
| Resnet | No Freezing | 10-fold validation | Dropout | 36 |

Instruction Counts:

Malware to Malware

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Architecture | Transfer Type | Validation | Regularization | Embedding | ID |
| Feedforward | Freezing | 5-fold validation | None | tfidf | 1 |
| Feedforward | Freezing | 5-fold validation | Batchnorm | tfidf | 2 |
| Feedforward | Freezing | 5-fold validation | Dropout | tfidf | 3 |
| Feedforward | No Freezing | 5-fold validation | None | tfidf | 4 |
| Feedforward | No Freezing | 5-fold validation | Batchnorm | tfidf | 5 |
| Feedforward | No Freezing | 5-fold validation | Dropout | tfidf | 6 |
| CNN | Freezing | 5-fold validation | None | tfidf | 7 |
| CNN | Freezing | 5-fold validation | Batchnorm | tfidf | 8 |
| CNN | Freezing | 5-fold validation | Dropout | tfidf | 9 |
| CNN | No Freezing | 5-fold validation | None | tfidf | 10 |
| CNN | No Freezing | 5-fold validation | Batchnorm | tfidf | 11 |
| CNN | No Freezing | 5-fold validation | Dropout | tfidf | 12 |
| LSTM | Freezing | 5-fold validation | None | tfidf | 13 |
| LSTM | Freezing | 5-fold validation | Batchnorm | tfidf | 14 |
| LSTM | Freezing | 5-fold validation | Dropout | tfidf | 15 |
| LSTM | No Freezing | 5-fold validation | None | tfidf | 16 |
| LSTM | No Freezing | 5-fold validation | Batchnorm | tfidf | 17 |
| LSTM | No Freezing | 5-fold validation | Dropout | tfidf | 18 |
| Feedforward | Freezing | 10-fold validation | None | tfidf | 19 |
| Feedforward | Freezing | 10-fold validation | Batchnorm | tfidf | 20 |
| Feedforward | Freezing | 10-fold validation | Dropout | tfidf | 21 |
| Feedforward | No Freezing | 10-fold validation | None | tfidf | 22 |
| Feedforward | No Freezing | 10-fold validation | Batchnorm | tfidf | 23 |
| Feedforward | No Freezing | 10-fold validation | Dropout | tfidf | 24 |
| CNN | Freezing | 10-fold validation | None | tfidf | 25 |
| CNN | Freezing | 10-fold validation | Batchnorm | tfidf | 26 |
| CNN | Freezing | 10-fold validation | Dropout | tfidf | 27 |
| CNN | No Freezing | 10-fold validation | None | tfidf | 28 |
| CNN | No Freezing | 10-fold validation | Batchnorm | tfidf | 29 |
| CNN | No Freezing | 10-fold validation | Dropout | tfidf | 30 |
| LSTM | Freezing | 10-fold validation | None | tfidf | 31 |
| LSTM | Freezing | 10-fold validation | Batchnorm | tfidf | 32 |
| LSTM | Freezing | 10-fold validation | Dropout | tfidf | 33 |
| LSTM | No Freezing | 10-fold validation | None | tfidf | 34 |
| LSTM | No Freezing | 10-fold validation | Batchnorm | tfidf | 35 |
| LSTM | No Freezing | 10-fold validation | Dropout | tfidf | 36 |
| Feedforward | Freezing | 5-fold validation | None | d2v | 37 |
| Feedforward | Freezing | 5-fold validation | Batchnorm | d2v | 38 |
| Feedforward | Freezing | 5-fold validation | Dropout | d2v | 39 |
| Feedforward | No Freezing | 5-fold validation | None | d2v | 40 |
| Feedforward | No Freezing | 5-fold validation | Batchnorm | d2v | 41 |
| Feedforward | No Freezing | 5-fold validation | Dropout | d2v | 42 |
| CNN | Freezing | 5-fold validation | None | d2v | 43 |
| CNN | Freezing | 5-fold validation | Batchnorm | d2v | 44 |
| CNN | Freezing | 5-fold validation | Dropout | d2v | 45 |
| CNN | No Freezing | 5-fold validation | None | d2v | 46 |
| CNN | No Freezing | 5-fold validation | Batchnorm | d2v | 47 |
| CNN | No Freezing | 5-fold validation | Dropout | d2v | 48 |
| LSTM | Freezing | 5-fold validation | None | d2v | 49 |
| LSTM | Freezing | 5-fold validation | Batchnorm | d2v | 50 |
| LSTM | Freezing | 5-fold validation | Dropout | d2v | 51 |
| LSTM | No Freezing | 5-fold validation | None | d2v | 52 |
| LSTM | No Freezing | 5-fold validation | Batchnorm | d2v | 53 |
| LSTM | No Freezing | 5-fold validation | Dropout | d2v | 54 |
| Feedforward | Freezing | 10-fold validation | None | d2v | 55 |
| Feedforward | Freezing | 10-fold validation | Batchnorm | d2v | 56 |
| Feedforward | Freezing | 10-fold validation | Dropout | d2v | 57 |
| Feedforward | No Freezing | 10-fold validation | None | d2v | 58 |
| Feedforward | No Freezing | 10-fold validation | Batchnorm | d2v | 59 |
| Feedforward | No Freezing | 10-fold validation | Dropout | d2v | 60 |
| CNN | Freezing | 10-fold validation | None | d2v | 61 |
| CNN | Freezing | 10-fold validation | Batchnorm | d2v | 62 |
| CNN | Freezing | 10-fold validation | Dropout | d2v | 63 |
| CNN | No Freezing | 10-fold validation | None | d2v | 64 |
| CNN | No Freezing | 10-fold validation | Batchnorm | d2v | 65 |
| CNN | No Freezing | 10-fold validation | Dropout | d2v | 66 |
| LSTM | Freezing | 10-fold validation | None | d2v | 67 |
| LSTM | Freezing | 10-fold validation | Batchnorm | d2v | 68 |
| LSTM | Freezing | 10-fold validation | Dropout | d2v | 69 |
| LSTM | No Freezing | 10-fold validation | None | d2v | 70 |
| LSTM | No Freezing | 10-fold validation | Batchnorm | d2v | 71 |
| LSTM | No Freezing | 10-fold validation | Dropout | d2v | 72 |

Malware to Vulnerabilities

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Architecture | Transfer Type | Validation | Regularization | Embedding | ID |
| Feedforward | Freezing | 5-fold validation | None | tfidf | 1 |
| Feedforward | Freezing | 5-fold validation | Batchnorm | tfidf | 2 |
| Feedforward | Freezing | 5-fold validation | Dropout | tfidf | 3 |
| Feedforward | No Freezing | 5-fold validation | None | tfidf | 4 |
| Feedforward | No Freezing | 5-fold validation | Batchnorm | tfidf | 5 |
| Feedforward | No Freezing | 5-fold validation | Dropout | tfidf | 6 |
| CNN | Freezing | 5-fold validation | None | tfidf | 7 |
| CNN | Freezing | 5-fold validation | Batchnorm | tfidf | 8 |
| CNN | Freezing | 5-fold validation | Dropout | tfidf | 9 |
| CNN | No Freezing | 5-fold validation | None | tfidf | 10 |
| CNN | No Freezing | 5-fold validation | Batchnorm | tfidf | 11 |
| CNN | No Freezing | 5-fold validation | Dropout | tfidf | 12 |
| LSTM | Freezing | 5-fold validation | None | tfidf | 13 |
| LSTM | Freezing | 5-fold validation | Batchnorm | tfidf | 14 |
| LSTM | Freezing | 5-fold validation | Dropout | tfidf | 15 |
| LSTM | No Freezing | 5-fold validation | None | tfidf | 16 |
| LSTM | No Freezing | 5-fold validation | Batchnorm | tfidf | 17 |
| LSTM | No Freezing | 5-fold validation | Dropout | tfidf | 18 |
| Feedforward | Freezing | 10-fold validation | None | tfidf | 19 |
| Feedforward | Freezing | 10-fold validation | Batchnorm | tfidf | 20 |
| Feedforward | Freezing | 10-fold validation | Dropout | tfidf | 21 |
| Feedforward | No Freezing | 10-fold validation | None | tfidf | 22 |
| Feedforward | No Freezing | 10-fold validation | Batchnorm | tfidf | 23 |
| Feedforward | No Freezing | 10-fold validation | Dropout | tfidf | 24 |
| CNN | Freezing | 10-fold validation | None | tfidf | 25 |
| CNN | Freezing | 10-fold validation | Batchnorm | tfidf | 26 |
| CNN | Freezing | 10-fold validation | Dropout | tfidf | 27 |
| CNN | No Freezing | 10-fold validation | None | tfidf | 28 |
| CNN | No Freezing | 10-fold validation | Batchnorm | tfidf | 29 |
| CNN | No Freezing | 10-fold validation | Dropout | tfidf | 30 |
| LSTM | Freezing | 10-fold validation | None | tfidf | 31 |
| LSTM | Freezing | 10-fold validation | Batchnorm | tfidf | 32 |
| LSTM | Freezing | 10-fold validation | Dropout | tfidf | 33 |
| LSTM | No Freezing | 10-fold validation | None | tfidf | 34 |
| LSTM | No Freezing | 10-fold validation | Batchnorm | tfidf | 35 |
| LSTM | No Freezing | 10-fold validation | Dropout | tfidf | 36 |
| Feedforward | Freezing | 5-fold validation | None | d2v | 37 |
| Feedforward | Freezing | 5-fold validation | Batchnorm | d2v | 38 |
| Feedforward | Freezing | 5-fold validation | Dropout | d2v | 39 |
| Feedforward | No Freezing | 5-fold validation | None | d2v | 40 |
| Feedforward | No Freezing | 5-fold validation | Batchnorm | d2v | 41 |
| Feedforward | No Freezing | 5-fold validation | Dropout | d2v | 42 |
| CNN | Freezing | 5-fold validation | None | d2v | 43 |
| CNN | Freezing | 5-fold validation | Batchnorm | d2v | 44 |
| CNN | Freezing | 5-fold validation | Dropout | d2v | 45 |
| CNN | No Freezing | 5-fold validation | None | d2v | 46 |
| CNN | No Freezing | 5-fold validation | Batchnorm | d2v | 47 |
| CNN | No Freezing | 5-fold validation | Dropout | d2v | 48 |
| LSTM | Freezing | 5-fold validation | None | d2v | 49 |
| LSTM | Freezing | 5-fold validation | Batchnorm | d2v | 50 |
| LSTM | Freezing | 5-fold validation | Dropout | d2v | 51 |
| LSTM | No Freezing | 5-fold validation | None | d2v | 52 |
| LSTM | No Freezing | 5-fold validation | Batchnorm | d2v | 53 |
| LSTM | No Freezing | 5-fold validation | Dropout | d2v | 54 |
| Feedforward | Freezing | 10-fold validation | None | d2v | 55 |
| Feedforward | Freezing | 10-fold validation | Batchnorm | d2v | 56 |
| Feedforward | Freezing | 10-fold validation | Dropout | d2v | 57 |
| Feedforward | No Freezing | 10-fold validation | None | d2v | 58 |
| Feedforward | No Freezing | 10-fold validation | Batchnorm | d2v | 59 |
| Feedforward | No Freezing | 10-fold validation | Dropout | d2v | 60 |
| CNN | Freezing | 10-fold validation | None | d2v | 61 |
| CNN | Freezing | 10-fold validation | Batchnorm | d2v | 62 |
| CNN | Freezing | 10-fold validation | Dropout | d2v | 63 |
| CNN | No Freezing | 10-fold validation | None | d2v | 64 |
| CNN | No Freezing | 10-fold validation | Batchnorm | d2v | 65 |
| CNN | No Freezing | 10-fold validation | Dropout | d2v | 66 |
| LSTM | Freezing | 10-fold validation | None | d2v | 67 |
| LSTM | Freezing | 10-fold validation | Batchnorm | d2v | 68 |
| LSTM | Freezing | 10-fold validation | Dropout | d2v | 69 |
| LSTM | No Freezing | 10-fold validation | None | d2v | 70 |
| LSTM | No Freezing | 10-fold validation | Batchnorm | d2v | 71 |
| LSTM | No Freezing | 10-fold validation | Dropout | d2v | 72 |