**TABLE 1.** Weight values of the CM-CIC-IDS2017 and CM-UNSW-NB15 selected features for Importance, Similarity, and Misclassification

| Dataset | Feature | Feature Importance Score by XGBoost | | | | | | Similarity | Misclassification |
|---|---|---|---|---|---|---|---|---|---|
| | | Layer-1 | Layer-2 | Layer-3 | | | | | |
| | | | | Reconnaissance | Access | DoS | Malware | | |
| CM-CIC-IDS2017 | bwd_iat_mean | 0.008 | 0.008 | 0.000 | 0.001 | 0.003 | 0.003 | 0.708 | 0.184 |
| | bwd_pkts_s | 0.022 | 0.022 | 0.000 | 0.003 | 0.000 | 0.020 | 0.801 | 0.045 |
| | flow_duration | 0.006 | 0.006 | 0.001 | 0.005 | 0.042 | 0.015 | 0.774 | 0.036 |
| | flow_iat_mean | 0.004 | 0.004 | 0.000 | 0.000 | 0.007 | 0.001 | 0.796 | 0.024 |
| | fwd_act_data_pkts | 0.005 | 0.005 | 0.000 | 0.021 | 0.054 | 0.077 | 0.691 | 0.339 |
| | fwd_iat_mean | 0.009 | 0.009 | 0.004 | 0.001 | 0.000 | 0.002 | 0.797 | 0.017 |
| | fwd_iat_min | 0.021 | 0.021 | 0.004 | 0.010 | 0.006 | 0.002 | 0.743 | 0.032 |
| | fwd_iat_std | 0.012 | 0.012 | 0.020 | 0.002 | 0.001 | 0.005 | 0.777 | 0.022 |
| | fwd_iat_tot | 0.023 | 0.023 | 0.001 | 0.001 | 0.000 | 0.001 | 0.767 | 0.037 |
| | fwd_pkt_len_std | 0.004 | 0.004 | 0.000 | 0.008 | 0.000 | 0.068 | 0.703 | 0.157 |
| | pkt_len_max | 0.007 | 0.007 | 0.002 | 0.012 | 0.011 | 0.001 | 0.708 | 0.230 |
| | pkt_size_avg | 0.140 | 0.140 | 0.000 | 0.002 | 0.003 | 0.011 | 0.711 | 0.228 |
| | protocol | 0.013 | 0.013 | 0.002 | 0.135 | 0.001 | 0.025 | 0.835 | 0.273 |
| | subflow_bwd_pkts | 0.008 | 0.008 | 0.000 | 0.028 | 0.000 | 0.003 | 0.781 | 0.137 |
| | tot_bwd_pkts | 0.005 | 0.005 | 0.009 | 0.031 | 0.006 | 0.002 | 0.780 | 0.140 |
| | tot_fwd_pkts | 0.012 | 0.012 | 0.001 | 0.023 | 0.012 | 0.030 | 0.807 | 0.051 |
| CM-UNSW-NB15 | ackdat | 0.006 | 0.006 | 0.000 | 0.001 | 0.000 | 0.002 | 0.627 | 0.110 |
| | ct_state_ttl | 0.273 | 0.273 | 0.559 | 0.012 | 0.272 | 0.014 | 0.546 | 0.013 |
| | dbytes | 0.002 | 0.002 | 0.000 | 0.006 | 0.012 | 0.011 | 0.689 | 0.060 |
| | dintpkt | 0.000 | 0.000 | 0.007 | 0.009 | 0.009 | 0.017 | 0.659 | 0.092 |
| | dmeansz | 0.001 | 0.001 | 0.005 | 0.015 | 0.011 | 0.016 | 0.667 | 0.034 |
| | dpkts | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.001 | 0.718 | 0.073 |
| | dttl | 0.007 | 0.007 | 0.001 | 0.021 | 0.004 | 0.000 | 0.765 | 0.110 |
| | dwin | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.621 | 0.112 |
| | proto_udp | 0.001 | 0.001 | 0.000 | 0.056 | 0.000 | 0.625 | 0.833 | 0.268 |
| | res_bdy_len | 0.002 | 0.002 | 0.000 | 0.001 | 0.004 | 0.002 | 0.760 | 0.031 |
| | sbytes | 0.003 | 0.003 | 0.000 | 0.005 | 0.042 | 0.164 | 0.553 | 0.256 |
| | service_minus | 0.001 | 0.001 | 0.000 | 0.004 | 0.002 | 0.000 | 0.002 | 0.315 |
| | service_0 | 0.001 | 0.001 | 0.000 | 0.005 | 0.000 | 0.000 | 1.000 | 1.000 |
| | service_http | 0.002 | 0.002 | 0.000 | 0.035 | 0.004 | 0.000 | 0.002 | 0.913 |
| | service_ssh | 0.000 | 0.000 | 0.000 | 0.317 | 0.000 | 0.000 | 0.002 | 1.000 |
| | sintpkt | 0.001 | 0.001 | 0.001 | 0.001 | 0.009 | 0.004 | 0.730 | 0.913 |
| | sload | 0.018 | 0.018 | 0.001 | 0.001 | 0.004 | 0.001 | 0.786 | 0.904 |
| | sloss | 0.002 | 0.002 | 0.000 | 0.003 | 0.003 | 0.009 | 0.786 | 0.920 |
| | state_CON | 0.016 | 0.016 | 0.000 | 0.001 | 0.020 | 0.000 | 1.000 | 0.988 |
| | state_FIN | 0.000 | 0.000 | 0.005 | 0.000 | 0.045 | 0.000 | 0.000 | 0.889 |
| | state_REQ | 0.010 | 0.010 | 0.000 | 0.000 | 0.199 | 0.000 | 0.000 | 0.991 |
| | state_RST | 0.584 | 0.584 | 0.403 | 0.255 | 0.035 | 0.000 | 0.929 | 1.000 |
| | sttl | 0.005 | 0.005 | 0.006 | 0.049 | 0.006 | 0.028 | 0.000 | 0.992 |
| | swin | 0.001 | 0.001 | 0.000 | 0.004 | 0.006 | 0.025 | 0.739 | 0.888 |
| | synack | 0.034 | 0.034 | 0.000 | 0.007 | 0.000 | 0.002 | 0.673 | 0.898 |