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# Annexes

## Annex A. The Result Tables of Deep Learning Experiments

**Table A.1.** Malware type classification with the help of DL and SVM methods (AllMalware set)

Count	Accuracy (percent)				Classification time (milliseconds)			
	LSTM	GRU	CNN	SVM	LSTM	GRU	CNN	SVM
10	88.1	88.3	87.3	89.4	0.0926	0.084	0.0401	0.044
20	88.8	88.1	89	89.4	0.1043	0.0994	0.051	0.0583
40	89.1	90.6	91.2	91.6	0.1327	0.1377	0.0618	0.0842
60	88.2	90.5	91.2	91.9	0.1786	0.1704	0.089	0.0848
80	91.8	91.6	92.3	92.7	0.2194	0.2221	0.1157	0.0937
100	91.6	91.9	92.8	92.4	0.2559	0.2566	0.129	0.1165
200	90.4	91.5	92.7	89.6	0.444	0.4363	0.3019	0.2392
400	87.6	90.3	93	87.3	0.984	0.8142	0.6222	0.6739
600	87.4	91.4	93.1	86.1	2.3443	2.3052	1.6681	1.5564

End of the Table A.1

Count	Accuracy (percent)				Classification time (milliseconds)			
	LSTM	GRU	CNN	SVM	LSTM	GRU	CNN	SVM
800	82.1	88.5	93	84.7	4.3159	3.7894	2.3929	2.2612
1000	75.5	89.6	93.1	83.2	6.8075	5.6159	3.3276	3.2245

**Table A.2.** All malware plus clean samples accuracy results. A total of six classes was classified

Count	AllMalwarePlusClean				AllMalwarePlusClean2			
	LSTM	GRU	CNN	SVM	LSTM	GRU	CNN	SVM
10	77.2	78.3	78.7	79.9	80.1	79.4	80.1	81.2
20	83	82.3	83.4	83.6	85.8	85.6	86.9	86.7
40	84.1	84.1	85.1	85.3	87.3	87.6	88.8	88
60	85	85.8	86.1	86.2	87.5	86.4	88.5	88.2
80	87.1	86.8	88.5	87.7	87.5	88	89.2	87.9
100	87.1	86.5	88.2	87.4	87.7	87.9	88.8	87.6
200	85.8	87.5	89.4	86.5	86.2	87.3	89.6	86.3
400	80.9	88.1	89.9	81.9	80.3	87.3	89.6	78.1
600	79.8	89.1	93.2	75.5	77.6	89.4	93.5	74.8
800	68.3	85.3	93.5	73.9	41.5	92.3	93.6	73.3
1000	77.1	89.1	93.6	72.9	64	84.1	93.9	72.3

**Table A.3.** Malicious and benign samples (Malware or Clean) classification accuracy

Count	MalwarePlusClean				MalwarePlusClean2			
	LSTM	GRU	CNN	SVM	LSTM	GRU	CNN	SVM
10	87	87.4	87.4	87.4	88.6	88.6	88.9	88.4
20	90	90.2	91.1	90.2	92	92.4	93	91.8
40	91.2	90.6	91.8	90.5	92.9	92.4	94.1	92
60	91.2	91.1	93.3	91.1	93.2	93	93.5	91.9
80	92.7	92	94.2	91.5	93	93.2	94.5	91.7
100	92.7	92.5	94.3	91.5	93	92.1	94.5	91.2

End of the Table A.3

Count	MalwarePlusClean				MalwarePlusClean2			
	LSTM	GRU	CNN	SVM	LSTM	GRU	CNN	SVM
200	90.7	90.8	94.3	88.6	92.4	91.8	94.9	88.9
400	87	90.9	94.8	88.4	89.2	92	94.8	88.7
600	86.4	88.7	98.5	87.2	85.8	90.1	98.6	87.1
800	84.2	84.7	98.8	86.9	85.1	82.8	98.9	87
1000	84.2	70.3	98.9	87.2	83.8	72.4	99.3	87

Table A.4. Classification accuracy in percent

Count	AWS-CTD-CNN-S	AWS-CTD-CNN-D	AWS-CTD-CNN-LSTM	AWS-CTD-CNN-GRU	FCN	LSTM-FCN	GRU-FCN
10	88.8	88.0	88.6	89.0	89.3	89.2	88.8
20	91.7	92.7	92.7	92.8	92.3	92.7	92.8
40	92.6	93.8	93.9	93.6	93.6	93.5	93.5
60	94.1	94.2	94.1	93.4	94.0	93.8	93.9
80	94.3	94.3	94.3	94.2	93.8	94.1	94.1
100	94.2	94.4	94.4	94.4	94.4	94.3	94.3
200	94.7	94.5	94.4	94.1	94.8	94.6	94.7
400	95.2	95.0	95.0	95.3	95.0	95.2	95.0
600	98.5	98.6	98.3	98.5	98.3	98.3	98.3
800	98.9	98.9	98.9	98.9	98.6	98.6	98.3
1000	99.3	99.3	99.1	99.2	98.9	98.9	98.8

Table A.5. Training time for one-fold (seconds)

Count	AWS-CTD-CNN-S	AWS-CTD-CNN-D	AWS-CTD-CNN-LSTM	AWS-CTD-CNN-GRU	FCN	LSTM-FCN	GRU-FCN
10	30.11	52.09	91.47	81.92	79.56	106.32	102.61
20	44.80	60.18	94.96	97.15	101.43	118.97	122.03
40	43.73	61.18	105.64	115.05	98.51	161.69	137.87

End of the Table A.5

Count	AWS-CTD-CNN-S	AWS-CTD-CNN-D	AWS-CTD-CNN-LSTM	AWS-CTD-CNN-GRU	FCN	LSTM-FCN	GRU-FCN
60	51.94	57.38	125.74	129.02	126.90	166.86	148.37
80	63.99	66.29	149.29	144.12	125.75	189.16	162.97
100	82.33	72.16	140.06	128.47	128.59	182.53	187.53
200	100.24	98.69	161.95	197.37	142.61	285.58	248.22
400	147.46	217.77	684.11	256.65	293.85	588.43	465.05
600	279.19	363.71	1190.30	578.03	280.22	1191.68	601.33
800	507.41	852.84	2246.27	887.89	565.09	2059.99	794.29
1000	453.21	745.45	2785.16	1043.92	549.20	3256.41	959.96

Table A.6. Classification time for one sample (seconds)

Count	AWS-CTD-CNN-S	AWS-CTD-CNN-D	AWS-CTD-CNN-LSTM	AWS-CTD-CNN-GRU	FCN	LSTM-FCN	GRU-FCN
10	0.00004	0.00004	0.00007	0.00007	0.00011	0.00014	0.00013
20	0.00005	0.00005	0.00009	0.00009	0.00011	0.00015	0.00014
40	0.00007	0.00007	0.00012	0.00013	0.00014	0.00018	0.00018
60	0.00010	0.00009	0.00017	0.00017	0.00016	0.00024	0.00021
80	0.00012	0.00012	0.00021	0.00021	0.00019	0.00027	0.00025
100	0.00016	0.00015	0.00023	0.00025	0.00021	0.00031	0.00029
200	0.00026	0.00030	0.00042	0.00039	0.00034	0.00053	0.00047
400	0.00055	0.00063	0.00123	0.00084	0.00066	0.00128	0.00085
600	0.00138	0.00164	0.00296	0.00172	0.00139	0.00283	0.00173
800	0.00182	0.00218	0.00479	0.00247	0.00194	0.00461	0.00229
1000	0.00223	0.00312	0.00770	0.00347	0.00248	0.00710	0.00283