

DL-Models report

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- CNN is more efficient to capture local patterns in data. It takes less time to train. It is used more frequently for image processing but can be used for datasets like ours.
- LSTM is supposed to be more adapted to capture temporal dependencies in data.
- AE-LSTM is supposed to be more robust than classic models like LSTM. More robust to overfitting and more generalizable.

We finally expect that AE-LSTM will outperform both CNN and LSTM in terms of generalization and robustness, especially when handling complex traffic patterns. The LSTM model is expected to achieve better results than CNN due to its ability to capture temporal dynamics within network flows. Therefore, we anticipate the following hierarchy in performance:

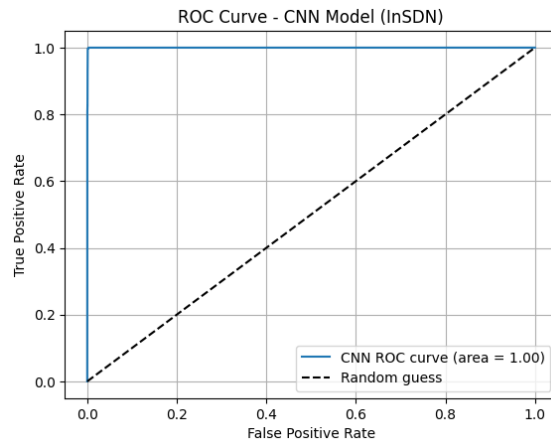
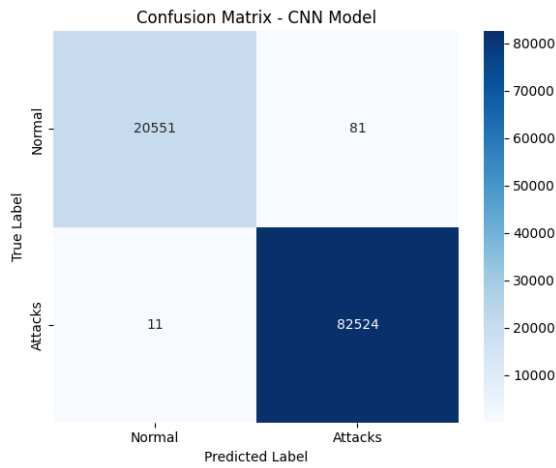
$$\text{AE-LSTM} \geq \text{LSTM} > \text{CNN} \quad (\text{particularly in terms of AUC and recall})$$

InSDN

CNN

Test Loss: 0.0045
Test Accuracy: 0.9991

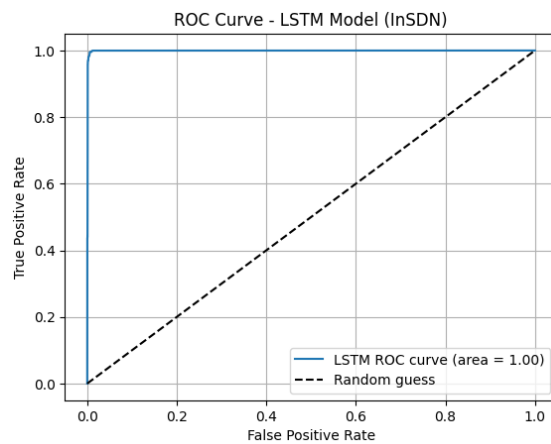
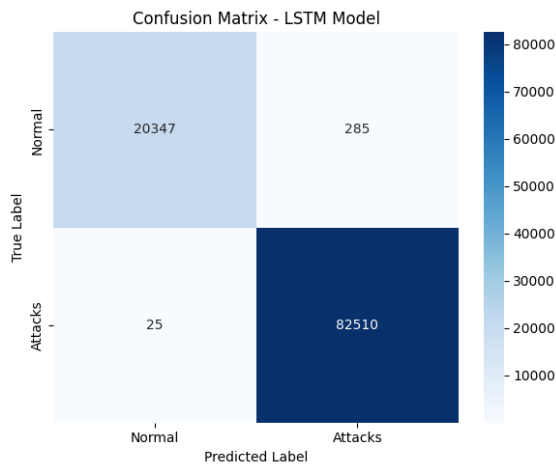
	Precision	Recall	F1-score
Normal	1.00	1.00	1.00
Attacks	1.00	1.00	1.00



LSTM

Test Loss: 0.0152
Test Accuracy: 0.9970

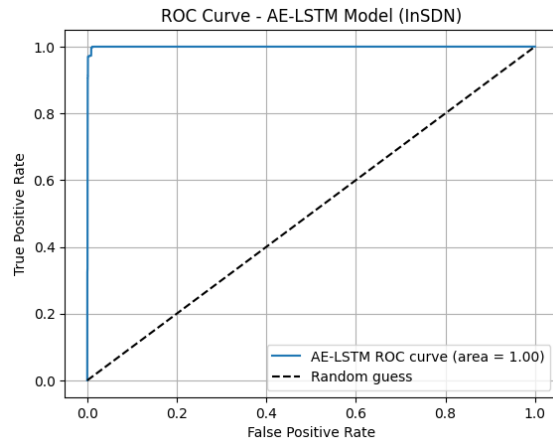
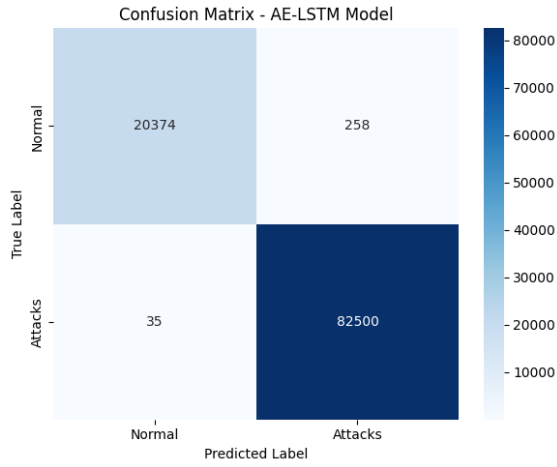
	Precision	Recall	F1-score
Normal	1.00	0.99	0.99
Attacks	1.00	1.00	1.00



AE-LSTM

Test Loss: 0.0130
Test Accuracy: 0.9972

	Precision	Recall	F1-score
Normal	1.00	0.99	0.99
Attacks	1.00	1.00	1.00



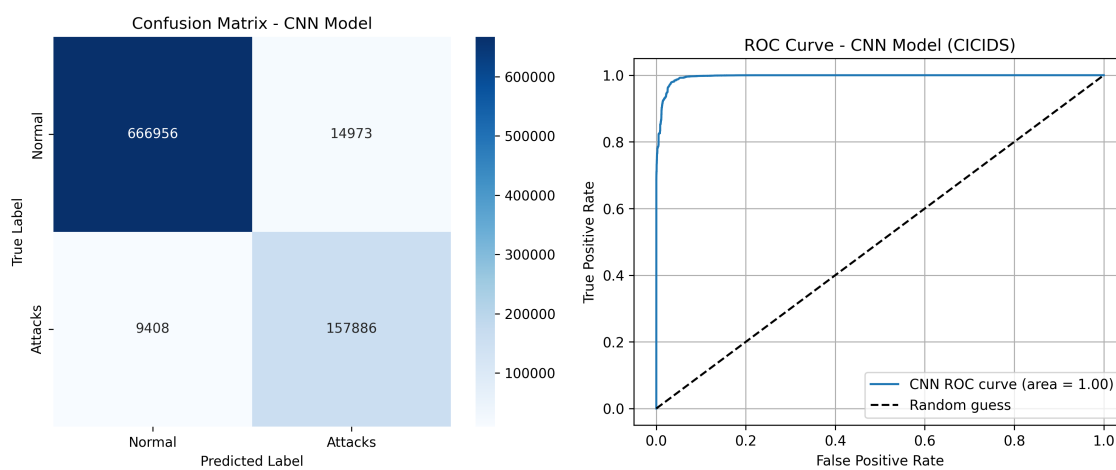
CICIDS2017

CNN

5 epochs

Test Loss: 0.0639
Test Accuracy: 0.9713

	Precision	Recall	F1-score
Normal	0.98	0.98	0.98
Attacks	0.94	0.93	0.93

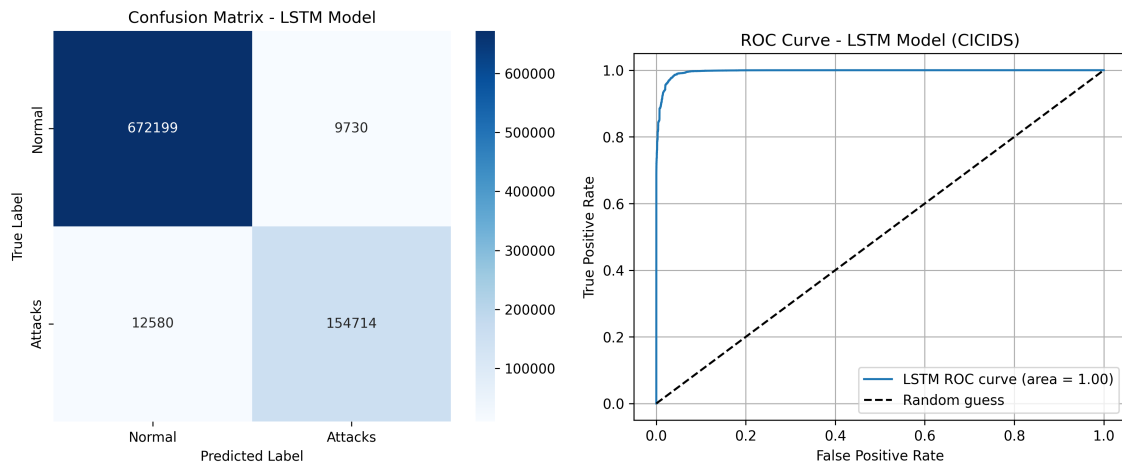


LSTM

5 epochs

Test Loss: 0.0608
Test Accuracy: 0.9737

	Precision	Recall	F1-score
Normal	0.98	0.98	0.98
Attacks	0.94	0.93	0.93

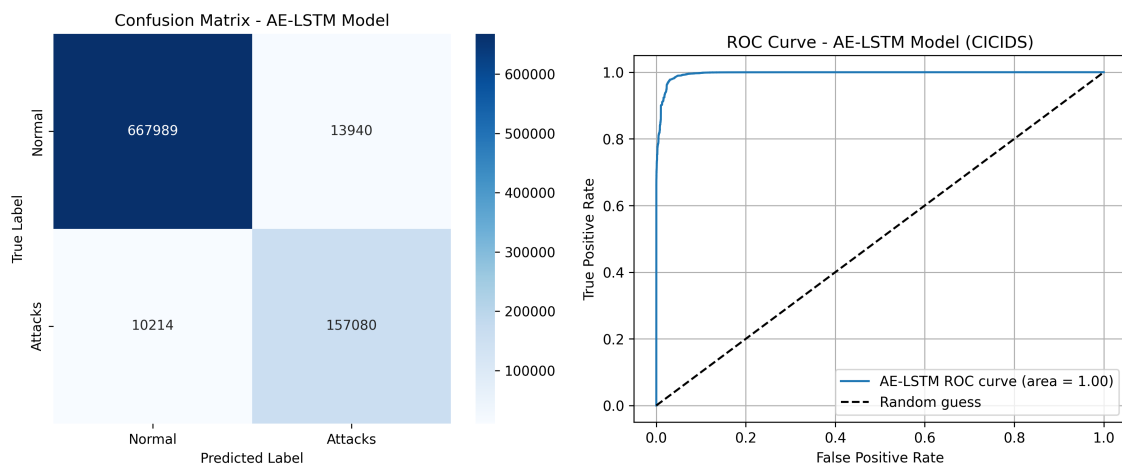


AE-LSTM

5 epochs

Test Loss: 0.0662
Test Accuracy: 0.9716

	Precision	Recall	F1-score
Normal	0.98	0.99	0.98
Attacks	0.95	0.91	0.93



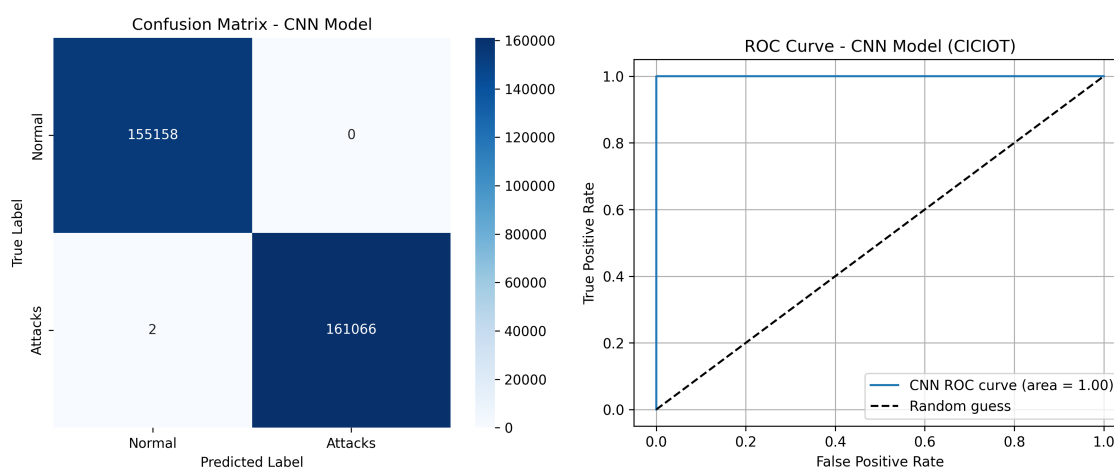
CICIOT2023

CNN

5 epochs

Test Loss: 0.0001
Test Accuracy: 1.0000

	Precision	Recall	F1-score
Normal	1.00	1.00	1.00
Attacks	1.00	1.00	1.00

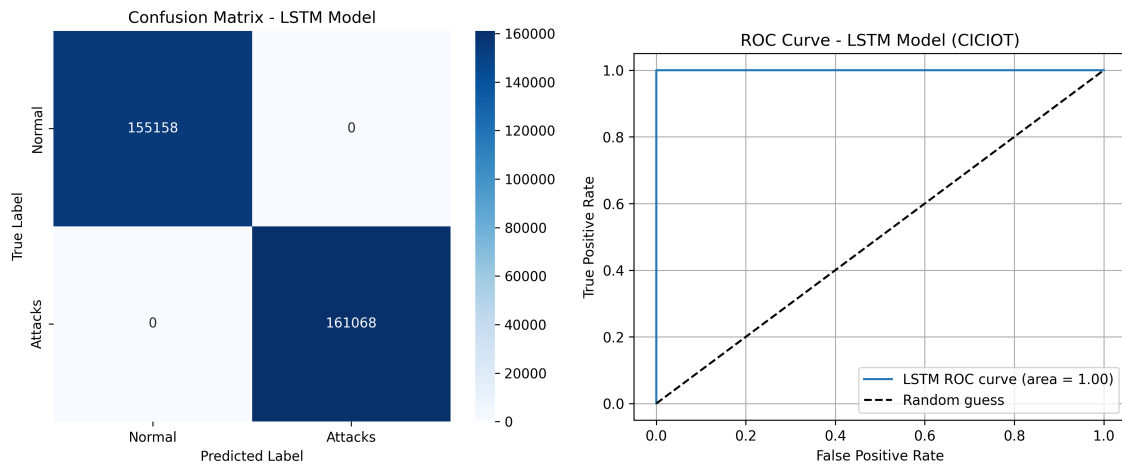


LSTM

5 epochs

Test Loss: 0.0001
Test Accuracy: 1.0000

	Precision	Recall	F1-score
Normal	1.00	1.00	1.00
Attacks	1.00	1.00	1.00



AE-LSTM

5 epochs

Test Loss: 0.0001
Test Accuracy: 1.0000

	Precision	Recall	F1-score
Normal	1.00	1.00	1.00
Attacks	1.00	1.00	1.00

