**Deep Learning**

**Techniques in IDS (3)**

Wednesday, June 25, 2025

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# LSTM/BiLSTM/GRU

## Structure

|  |  |
| --- | --- |
| Figure : LSTM Structure. | Figure : BiLSTM Structure. |
| Figure : GRU Structure. | |

## Training Validation Result

### CIC\_IDS\_2017

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### CIC\_TON\_IOT

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## Test Result

### CIC\_IDS\_2017

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### CIC\_TON\_IOT

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### CIC\_IDS\_2017

# Auto Encoder Decoder Classifier/ CNN\_LSTM

## Structure

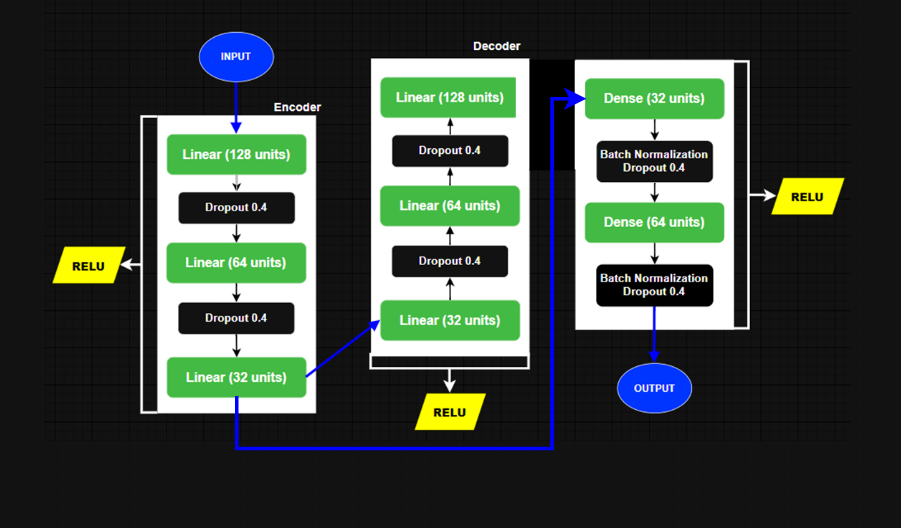


Figure : Auto Encoder Decoder Structure.

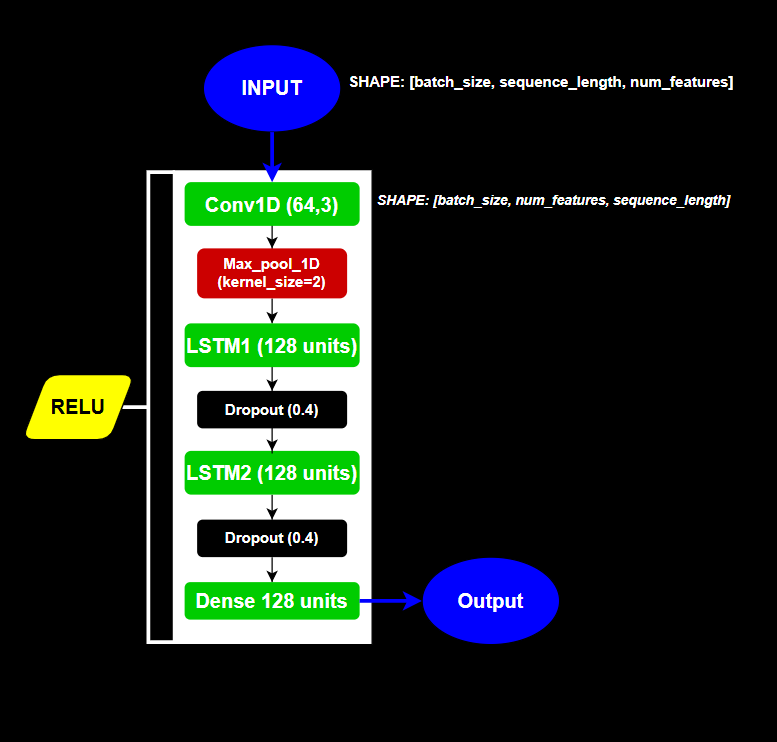


Figure : CNN\_LSTM\_UB Structure.

## Train Validation Result

### CIC\_IDS\_2017

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### CIC\_TON\_IOT

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## Test Result

### CIC\_IDS\_2017

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### CIC\_TON\_IOT

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# FINAL RESULTS

## CIC\_IDS\_2017

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## CIC\_TON\_IOT

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# NOTES

While searching for an AutoEncoderDecoder-based IDS model in recent research papers, I was unable to find one that directly fits our use case. Most models were either limited to encoders without a decoding component, or were developed for entirely different domains, making them unsuitable for adaptation to network intrusion detection. However, I did find an interesting CNN-LSTM architecture, which I evaluated under the name CNN\_LSTM\_UB.

The CNN\_LSTM\_2 is a model that we simulate from the research paper:

* IOT-BASED INTRUSION DETECTION SYSTEM USING NEW HYBRID DEEP LEARNING ALGORITHM

Similarly, the CNN\_LSTM\_UB is a model simulated from an existing one in the research paper:

* DDOS ATTACK DETECTION USING HYBRID (CCN AND LSTM) ML MODEL

Additionally, visualizations and performance graphs are available on **Weights & Biases** at the following links:

* [CIC-IDS-2017 Results](•%09https:/wandb.ai/mohammad-fleity-lebanese-university/DL-NIDS-2--cic-ids-2017?nw=nwusermohammadfleity)
* [CIC-TON-IoT Results](https://wandb.ai/mohammad-fleity-lebanese-university/DL-NIDS-2--cic-ton-iot/workspace?nw=nwusermohammadfleity)

All notebooks (excluding the one shared by Mr. Thermos) are available on [**GitHub**](https://github.com/Mohammad-Fleity2002/DL_IDS.git), which contains:

* Reports DL\_1, DL\_2 and the DL\_3.
* Notebook used.
* An excel that include the final results.

**Thank you for your Time.**