**Importing Libraries :**

* The code starts by importing necessary libraries for data manipulation (Pandas, NumPy), machine learning (TensorFlow, Keras), and visualization (Matplotlib, Plotly).

**Loading and Preprocessing Data:**

* The dataset is loaded from a CSV file into a Pandas Data Frame.
* Features taken from 2017 dataset are Destination Port , Bwd Packet Length Max, Bwd Packet Length Mean , Bwd Packet Length Std, Packet Length Mean, URG Flag Count, Average Packet Size, Avg Bwd Segment Size,Flow Duration,Total Fwd Packets,Subflow Bwd Packets ,Label
* Features taken from 2019 dataset are Destination Port , Bwd Packet Length Max, Bwd Packet Length Mean , Bwd Packet Length Std, Packet Length Mean, URG Flag Count, Average Packet Size, Avg Bwd Segment Size,Flow Duration,Total Fwd Packets,Subflow Bwd Packets , Source IP, Destination IP ,Protocol ,Label .
* Rest of the Features in both dataset are redundant.
* The labels ('BENIGN', 'DDoS') are converted to numerical values (0, 1).
* Missing values are dropped and an unnecessary column like (' Flow Packets/s') is removed.
* Features for training are selected and separated into input features and output labels.

**Splitting Data:**

* The dataset is split into training and testing sets using train\_test\_split from Scikit-learn.

**Building the LSTM Model:**

* A sequential Keras model is built with Bidirectional LSTM layers.
* The model consists of multiple LSTM layers, each followed by a Dropout layer to prevent overfitting.
* The final layer is a Dense layer with a sigmoid activation function for binary classification.

**Training the Model**:

* The model is compiled with Adam optimizer and binary cross-entropy loss function.
* The model is trained on the training data for 10 epochs with a batch size of 128.

**Evaluating the Model**:

* The model is evaluated on the training and testing sets to calculate loss and accuracy.
* Predictions are made on the testing set, and errors (MAE, MSE) are calculated.
* On Earlier papers the accuracy was 99.33 ( An Efficient Hybrid DNN for DDOS Detection for IIOT Networks ).
* Accuracy on 2017 dataset is 99.7
* Accuracy on 2019 dataset is 99.8

**Retraining and Plotting Results**:

* The model is retrained for 3 epochs with a batch size of 64.
* Training history is plotted to visualize accuracy and loss over epochs.

Input Data (x\_train)

Bidirectional LSTM layer |

(units=10 ,return\_sequence=True)

Dropout Layer

(rate=0.2)

LSTM Layer

(units=10, return\_sequences=True) |

Dropout Layer

(rate=0.2)

LSTM Layer

(units=10, return\_sequences=True) |

Dropout Layer

(rate=0.2)

LSTM Layer

(units=10)

Dropout Layer

(rate=0.2)

Dense Layer

(units=1, activation='sigmoid') |

Output Data (predictions)