

# Long Short-Term Memory (LSTM) Demonstration

## Soft Computing (SFC) project

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- type of Recurrent Neural Network
- designed to mitigate the **vanishing gradient** problem
  - **Memory cells**
  - **Gates** (input, output, forget)

## Application:

- **Natural Language Processing (NLP)**
  - text generation
  - machine translation
- **Time Series Prediction**

Task for the project = **sequence prediction**

## Task for the LSTM

- sequence prediction
- next symbol in a sequence of 1s and 0s:
  - e.g. 1,0,1,0,1,0,1,0 ... → 1,0,1,0,1,0,1,0, ...

## Software

- Python + PyQt (numpy, matplotlib)
- TensorFlow (Keras LSTM model)



LSTM Visualization Tool

[Model](#)
[Help](#)

Input Data

Enter Sequence (comma-separated, e.g., 0, 1, 0, 1):

Status: Ready (model untrained)

Original Sequence: N/A  
Updated Sequence: N/A  
Prediction will appear here after processing.

Predict

Training Control Buttons

Start
Reset
Pause
Continue
Show Training Progress

Training Information

Status: Model untrained  
0%  
Epoch: N/A  
Loss: N/A  
Accuracy: N/A

Network Information

Network Type: LSTM - Sequential  
Total Parameters: 64  
Optimizer: Adam  
Loss Function: binary\_crossentropy  
Layers:  
-- Layer 1: LSTM, Units: 3, Activation: tanh  
-- Layer 2: Dense, Units: 1, Activation: sigmoid  
Show Model Architecture

Hyperparameters

Number of Training Epochs:   
Number of LSTM Layers:   
Units Per Layer:   
Learning Rate:   
Optimizer:   
Context Size:   
Update Parameters

**LSTM Visualization Tool**

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**Hyperparameters**

**Number of Training Epochs:** 10  
**Number of LSTM Layers:** 1  
**Units Per Layer:** 3  
**Learning Rate:** 0.1  
**Optimizer:** adam  
**Context Size:** 4  
**Update Parameters**

input sequence

output section

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App status

LSTM Visualization Tool

Model
Help

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Control Buttons

Training information

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Training Control Buttons

Start Reset

Pause Continue

Show Training Progress

Training Information

Status: Model untrained

0%

Epoch: N/A

Loss: N/A

Accuracy: N/A

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Hyperparameters

Number of Training Epochs:

Number of LSTM Layers:

Units Per Layer:

Learning Rate:

Optimizer:

Context Size:

Update Parameters

Network info

Hyperparam. setting



LSTM Visualization Tool

Model Help

Input Data

Enter Sequence (comma-separated, e.g., 0,1,0,1): 0,1,0,1

Status: Prediction done

Original Sequence: 0,1,0,1  
Updated Sequence: 0,1,0,1,0  
Predicted value for the next step: 0 (Confidence: 100.00%)

Predict

Training Control Buttons

Start Reset  
Pause Continue  
Show Training Progress

Training Information

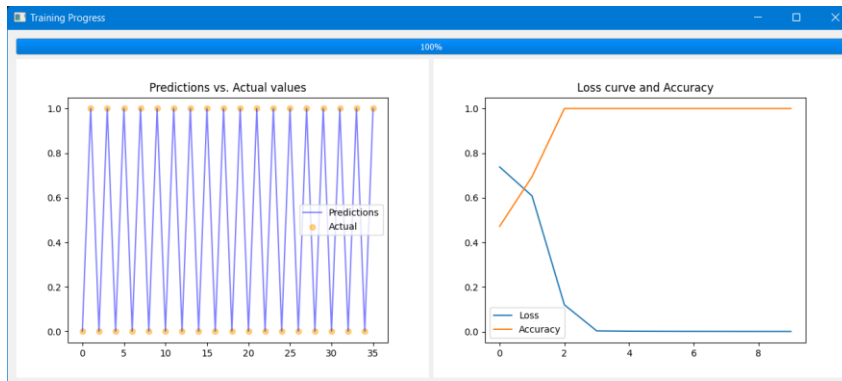
Status: Predicting...  
100%  
Epoch: 10/10  
Loss: 0.0008  
Accuracy: 1.0

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Learning Rate: 0.1  
Optimizer: adam  
Context Size: 4  
Update Parameters



**LSTM Visualization Tool**

**Model Help**

**Input Data**

Enter Sequence (comma-separated, e.g., 0, 1, 0, 1): 0,1,0,1

**Status: Prediction done**

Original Sequence: 0, 1, 0, 1  
 Updated Sequence: 0, 1, 0, 1, 0  
 Predicted value for the next step: 0 (Confidence: 100.00%)

**Predict**

**Training Control Buttons**

Start, Reset, Pause, Continue, Show Training Progress

**Training Information**

Status: Predicting...  
 100%  
 Epoch: 10/10  
 Loss: 0.0008  
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**Update Parameters**

