

Nieliniowe sieci RNN w oparciu o tensory

December 29, 2023

Sprawozdanie

Matematyka Konkretna

Prowadzący: prof. dr hab. Vasyl Martsenyuk

Laboratorium 9

5.12.2023

Nieliniowe sieci RNN w oparciu o tensory

Maksymilian Grygiel

Wariant 10

Suma dwóch liczb 12-bitowych

Link do repozytorium: <https://github.com/Maksiolo20/MK>

```
[1]: import tensorflow as tf
import numpy as np

# Generate training data for summing two 12-bit binary numbers
def generate_data_sum(num_samples=1000):
    X = np.random.randint(0, 2, size=(num_samples, 12, 2)) # Generate two
    ↪12-bit binary numbers
    Y = np.sum(X, axis=2) # Calculate the sum of two binary numbers
    return X, Y

# Create an RNN model
model_sum = tf.keras.Sequential([
    tf.keras.layers.SimpleRNN(8, input_shape=(12, 2), activation='relu',
    ↪return_sequences=True),
    tf.keras.layers.SimpleRNN(8, activation='relu'),
    tf.keras.layers.Dense(12, activation='sigmoid')
])

# Compile the model
model_sum.compile(optimizer='adam', loss='binary_crossentropy',
    ↪metrics=['accuracy'])

# Generate training data for summing two 12-bit binary numbers
X_train_sum, Y_train_sum = generate_data_sum()

# Train the model
model_sum.fit(X_train_sum, Y_train_sum, epochs=10, batch_size=32)
```

```

# Test the model on new data
X_test_sum, Y_test_sum = generate_data_sum(10)
predictions_sum = model_sum.predict(X_test_sum)

# Display the results
for i in range(10):
    input_data_sum = X_test_sum[i]
    true_output_sum = Y_test_sum[i]
    predicted_output_sum = predictions_sum[i].round()
    print(f"Wejście: {input_data_sum}")
    print(f"Prawdziwa suma: {true_output_sum}")
    print(f"Przewidziana suma: {predicted_output_sum}")
    print()

```

WARNING:tensorflow:From C:\Users\Maksiolo\anaconda3\Lib\site-packages\keras\src\losses.py:2976: The name tf.losses.sparse_softmax_cross_entropy is deprecated. Please use tf.compat.v1.losses.sparse_softmax_cross_entropy instead.

WARNING:tensorflow:From C:\Users\Maksiolo\anaconda3\Lib\site-packages\keras\src\layers\rnn\simple_rnn.py:130: The name tf.executing_eagerly_outside_functions is deprecated. Please use tf.compat.v1.executing_eagerly_outside_functions instead.

WARNING:tensorflow:From C:\Users\Maksiolo\anaconda3\Lib\site-packages\keras\src\optimizers__init__.py:309: The name tf.train.Optimizer is deprecated. Please use tf.compat.v1.train.Optimizer instead.

Epoch 1/10

WARNING:tensorflow:From C:\Users\Maksiolo\anaconda3\Lib\site-packages\keras\src\utils\tf_utils.py:492: The name tf.ragged.RaggedTensorValue is deprecated. Please use tf.compat.v1.ragged.RaggedTensorValue instead.

WARNING:tensorflow:From C:\Users\Maksiolo\anaconda3\Lib\site-packages\keras\src\engine\base_layer_utils.py:384: The name tf.executing_eagerly_outside_functions is deprecated. Please use tf.compat.v1.executing_eagerly_outside_functions instead.

32/32 [=====] - 2s 3ms/step - loss: 0.6311 - accuracy: 0.1050

Epoch 2/10

32/32 [=====] - 0s 3ms/step - loss: 0.4646 - accuracy: 0.1120

Epoch 3/10

32/32 [=====] - 0s 3ms/step - loss: 0.2142 - accuracy: 0.0930

Epoch 4/10

32/32 [=====] - 0s 3ms/step - loss: -0.2266 - accuracy: 0.0480

Epoch 5/10

32/32 [=====] - 0s 3ms/step - loss: -1.7703 - accuracy: 0.0430

Epoch 6/10

32/32 [=====] - 0s 3ms/step - loss: -10.4214 - accuracy: 0.0430

Epoch 7/10

32/32 [=====] - 0s 3ms/step - loss: -99.5123 - accuracy: 0.1420

Epoch 8/10

32/32 [=====] - 0s 3ms/step - loss: -1020.6134 - accuracy: 0.1830

Epoch 9/10

32/32 [=====] - 0s 3ms/step - loss: -11074.4541 - accuracy: 0.1830

Epoch 10/10

32/32 [=====] - 0s 3ms/step - loss: -129568.9531 - accuracy: 0.1830

1/1 [=====] - 0s 222ms/step

Wejście: [[0 0]

[0 1]

[1 1]

[1 0]

[1 0]

[1 0]

[0 1]

[0 0]

[1 0]

[1 1]

[1 1]

[0 1]]

Prawdziwa suma: [0 1 2 1 1 1 1 0 1 2 2 1]

Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[0 1]

[1 1]

[0 0]

[0 0]

[0 1]

[1 1]

[1 1]

[1 0]

[0 1]

[0 1]

[1 1]

[1 1]]

Prawdziwa suma: [1 2 0 0 1 2 2 1 1 1 2 2]
Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[1 1]

[0 1]
[1 1]
[1 1]
[1 1]
[0 1]
[0 0]
[0 0]
[0 1]
[1 0]
[1 1]
[1 0]]

Prawdziwa suma: [2 1 2 2 2 1 0 0 1 1 2 1]
Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[1 0]

[1 1]
[1 0]
[1 0]
[0 0]
[0 0]
[1 0]
[1 1]
[0 0]
[1 0]
[0 0]
[1 0]]

Prawdziwa suma: [1 2 1 1 0 0 1 2 0 1 0 1]
Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[1 1]

[1 0]
[1 1]
[1 0]
[1 1]
[0 0]
[0 1]
[1 1]
[0 0]
[0 1]
[1 1]
[0 1]]

Prawdziwa suma: [2 1 2 1 2 0 1 2 0 1 2 1]
Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[0 1]

[1 1]

[1 0]

[1 0]

[1 0]

[0 1]

[1 0]

[0 1]

[0 0]

[1 0]

[0 0]

[1 0]]

Prawdziwa suma: [1 2 1 1 1 1 1 1 0 1 0 1]

Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[0 1]

[1 1]

[0 0]

[1 1]

[1 1]

[0 0]

[0 0]

[0 0]

[0 0]

[0 1]

[0 1]

[1 0]]

Prawdziwa suma: [1 2 0 2 2 0 0 0 0 1 1 1]

Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[0 1]

[1 1]

[0 0]

[0 0]

[1 0]

[1 0]

[1 0]

[0 1]

[0 0]

[1 0]

[1 0]

[0 1]]

Prawdziwa suma: [1 2 0 0 1 1 1 1 0 1 1 1]

Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[1 0]

[0 1]

[0 1]

```
[1 1]
[0 0]
[0 0]
[0 1]
[0 0]
[1 1]
[0 1]
[1 0]
[0 0]]
```

Prawdziwa suma: [1 1 1 2 0 0 1 0 2 1 1 0]

Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

Wejście: [[0 1]

```
[1 1]
[0 1]
[1 1]
[1 0]
[1 0]
[0 1]
[0 0]
[0 1]
[1 1]
[0 0]
[1 0]]
```

Prawdziwa suma: [1 2 1 2 1 1 1 0 1 2 0 1]

Przewidziana suma: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]

[]: