```python
#Matematyka konkretna
#Wariant 15 Karolina Baron

#"Artificial intelligence (AI) is intelligence—perceiving,
synthesizing,
#and inferring information—demonstrated by machines, as opposed to
intelligence displayed by non-human animals or by humans"

import numpy as np
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.utils import to_categorical
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Embedding, LSTM, Dense

text = "Artificial intelligence (AI) is intelligence—perceiving,
synthesizing, and inferring information—demonstrated by machines, as
opposed to intelligence displayed by non-human animals or by humans"

tokenizer = Tokenizer()
tokenizer.fit_on_texts([text])
total_words = len(tokenizer.word_index) + 1

input_sequences = []
for i in range(1, len(text.split())):
    n_gram_sequence = text.split()[:i+1]
    input_sequences.append(" ".join(n_gram_sequence))

max_sequence_len = max([len(seq.split()) for seq in input_sequences])
input_sequences =
pad_sequences(tokenizer.texts_to_sequences(input_sequences),
                              maxlen=max_sequence_len,
padding='pre')

X, y = input_sequences[:, :-1], input_sequences[:, -1]
y = to_categorical(y, num_classes=total_words)

model = Sequential()
model.add(Embedding(total_words, 50, input_length=max_sequence_len-1))
model.add(LSTM(100))
model.add(Dense(total_words, activation='softmax'))
model.compile(loss='categorical_crossentropy', optimizer='adam',
metrics=['accuracy'])

model.fit(X, y, epochs=100, verbose=1)

# Ocenianie dokładności na danych treningowych
loss, accuracy = model.evaluate(X, y, verbose=0)
print(f'Treningowa dokładność: {accuracy * 100:.2f}%')
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Epoch 1/100
1/1 [==============================] - 2s 2s/step - loss: 3.0463 -
accuracy: 0.0000e+00
Epoch 2/100
1/1 [==============================] - 0s 12ms/step - loss: 3.0408 -
accuracy: 0.1429
Epoch 3/100
1/1 [==============================] - 0s 12ms/step - loss: 3.0354 -
accuracy: 0.1429
Epoch 4/100
1/1 [==============================] - 0s 12ms/step - loss: 3.0299 -
accuracy: 0.1905
Epoch 5/100
1/1 [==============================] - 0s 11ms/step - loss: 3.0240 -
accuracy: 0.1905
Epoch 6/100
1/1 [==============================] - 0s 13ms/step - loss: 3.0176 -
accuracy: 0.1905
Epoch 7/100
1/1 [==============================] - 0s 13ms/step - loss: 3.0105 -
accuracy: 0.1905
Epoch 8/100
1/1 [==============================] - 0s 11ms/step - loss: 3.0024 -
accuracy: 0.1905
Epoch 9/100
1/1 [==============================] - 0s 12ms/step - loss: 2.9928 -
accuracy: 0.1905
Epoch 10/100
1/1 [==============================] - 0s 15ms/step - loss: 2.9812 -
accuracy: 0.2381
Epoch 11/100
1/1 [==============================] - 0s 12ms/step - loss: 2.9669 -
accuracy: 0.1905
Epoch 12/100
1/1 [==============================] - 0s 12ms/step - loss: 2.9489 -
accuracy: 0.1905
Epoch 13/100
1/1 [==============================] - 0s 14ms/step - loss: 2.9263 -
accuracy: 0.1429
Epoch 14/100
1/1 [==============================] - 0s 11ms/step - loss: 2.8988 -
accuracy: 0.1429
Epoch 15/100
1/1 [==============================] - 0s 11ms/step - loss: 2.8702 -
accuracy: 0.0952
Epoch 16/100
1/1 [==============================] - 0s 12ms/step - loss: 2.8547 -
accuracy: 0.0952
Epoch 17/100
1/1 [==============================] - 0s 12ms/step - loss: 2.8553 -
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accuracy: 0.0952
Epoch 18/100
1/1 [==============================] - 0s 10ms/step - loss: 2.8397 -
accuracy: 0.1429
Epoch 19/100
1/1 [==============================] - 0s 12ms/step - loss: 2.8123 -
accuracy: 0.1905
Epoch 20/100
1/1 [==============================] - 0s 11ms/step - loss: 2.7868 -
accuracy: 0.1905
Epoch 21/100
1/1 [==============================] - 0s 12ms/step - loss: 2.7673 -
accuracy: 0.1905
Epoch 22/100
1/1 [==============================] - 0s 13ms/step - loss: 2.7499 -
accuracy: 0.1905
Epoch 23/100
1/1 [==============================] - 0s 13ms/step - loss: 2.7293 -
accuracy: 0.1905
Epoch 24/100
1/1 [==============================] - 0s 11ms/step - loss: 2.7022 -
accuracy: 0.1905
Epoch 25/100
1/1 [==============================] - 0s 13ms/step - loss: 2.6685 -
accuracy: 0.1905
Epoch 26/100
1/1 [==============================] - 0s 11ms/step - loss: 2.6315 -
accuracy: 0.1905
Epoch 27/100
1/1 [==============================] - 0s 11ms/step - loss: 2.5949 -
accuracy: 0.1905
Epoch 28/100
1/1 [==============================] - 0s 13ms/step - loss: 2.5549 -
accuracy: 0.1905
Epoch 29/100
1/1 [==============================] - 0s 11ms/step - loss: 2.5046 -
accuracy: 0.1905
Epoch 30/100
1/1 [==============================] - 0s 11ms/step - loss: 2.4519 -
accuracy: 0.1905
Epoch 31/100
1/1 [==============================] - 0s 11ms/step - loss: 2.4052 -
accuracy: 0.1905
Epoch 32/100
1/1 [==============================] - 0s 10ms/step - loss: 2.3506 -
accuracy: 0.1905
Epoch 33/100
1/1 [==============================] - 0s 12ms/step - loss: 2.3043 -
accuracy: 0.1429
Epoch 34/100
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1/1 [==============================] - 0s 11ms/step - loss: 2.2471 -
accuracy: 0.1905
Epoch 35/100
1/1 [==============================] - 0s 13ms/step - loss: 2.2011 -
accuracy: 0.2857
Epoch 36/100
1/1 [==============================] - 0s 12ms/step - loss: 2.1437 -
accuracy: 0.2381
Epoch 37/100
1/1 [==============================] - 0s 13ms/step - loss: 2.0841 -
accuracy: 0.2857
Epoch 38/100
1/1 [==============================] - 0s 12ms/step - loss: 2.0452 -
accuracy: 0.2381
Epoch 39/100
1/1 [==============================] - 0s 12ms/step - loss: 2.0242 -
accuracy: 0.2857
Epoch 40/100
1/1 [==============================] - 0s 13ms/step - loss: 1.9378 -
accuracy: 0.3810
Epoch 41/100
1/1 [==============================] - 0s 13ms/step - loss: 1.9244 -
accuracy: 0.2857
Epoch 42/100
1/1 [==============================] - 0s 12ms/step - loss: 1.9286 -
accuracy: 0.2857
Epoch 43/100
1/1 [==============================] - 0s 12ms/step - loss: 1.8270 -
accuracy: 0.4286
Epoch 44/100
1/1 [==============================] - 0s 11ms/step - loss: 1.8919 -
accuracy: 0.3333
Epoch 45/100
1/1 [==============================] - 0s 11ms/step - loss: 1.7836 -
accuracy: 0.2381
Epoch 46/100
1/1 [==============================] - 0s 11ms/step - loss: 1.8020 -
accuracy: 0.2381
Epoch 47/100
1/1 [==============================] - 0s 12ms/step - loss: 1.7091 -
accuracy: 0.4762
Epoch 48/100
1/1 [==============================] - 0s 11ms/step - loss: 1.7482 -
accuracy: 0.4762
Epoch 49/100
1/1 [==============================] - 0s 12ms/step - loss: 1.6552 -
accuracy: 0.5714
Epoch 50/100
1/1 [==============================] - 0s 11ms/step - loss: 1.6785 -
accuracy: 0.3333
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Epoch 51/100
1/1 [==============================] - 0s 12ms/step - loss: 1.6162 -
accuracy: 0.5238
Epoch 52/100
1/1 [==============================] - 0s 14ms/step - loss: 1.6043 -
accuracy: 0.7143
Epoch 53/100
1/1 [==============================] - 0s 26ms/step - loss: 1.5763 -
accuracy: 0.6667
Epoch 54/100
1/1 [==============================] - 0s 18ms/step - loss: 1.5370 -
accuracy: 0.6667
Epoch 55/100
1/1 [==============================] - 0s 11ms/step - loss: 1.5337 -
accuracy: 0.6667
Epoch 56/100
1/1 [==============================] - 0s 12ms/step - loss: 1.4803 -
accuracy: 0.8095
Epoch 57/100
1/1 [==============================] - 0s 11ms/step - loss: 1.4865 -
accuracy: 0.5714
Epoch 58/100
1/1 [==============================] - 0s 10ms/step - loss: 1.4338 -
accuracy: 0.8095
Epoch 59/100
1/1 [==============================] - 0s 12ms/step - loss: 1.4360 -
accuracy: 0.7619
Epoch 60/100
1/1 [==============================] - 0s 11ms/step - loss: 1.3887 -
accuracy: 0.8095
Epoch 61/100
1/1 [==============================] - 0s 12ms/step - loss: 1.3894 -
accuracy: 0.6667
Epoch 62/100
1/1 [==============================] - 0s 12ms/step - loss: 1.3426 -
accuracy: 0.8571
Epoch 63/100
1/1 [==============================] - 0s 12ms/step - loss: 1.3423 -
accuracy: 0.7619
Epoch 64/100
1/1 [==============================] - 0s 12ms/step - loss: 1.2993 -
accuracy: 0.8571
Epoch 65/100
1/1 [==============================] - 0s 11ms/step - loss: 1.2960 -
accuracy: 0.8095
Epoch 66/100
1/1 [==============================] - 0s 11ms/step - loss: 1.2668 -
accuracy: 0.8095
Epoch 67/100
1/1 [==============================] - 0s 12ms/step - loss: 1.2443 -
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accuracy: 0.7619
Epoch 68/100
1/1 [==============================] - 0s 11ms/step - loss: 1.2385 -
accuracy: 0.8571
Epoch 69/100
1/1 [==============================] - 0s 12ms/step - loss: 1.2026 -
accuracy: 0.8571
Epoch 70/100
1/1 [==============================] - 0s 12ms/step - loss: 1.1910 -
accuracy: 0.8095
Epoch 71/100
1/1 [==============================] - 0s 11ms/step - loss: 1.1784 -
accuracy: 0.8571
Epoch 72/100
1/1 [==============================] - 0s 12ms/step - loss: 1.1486 -
accuracy: 0.8571
Epoch 73/100
1/1 [==============================] - 0s 11ms/step - loss: 1.1321 -
accuracy: 0.8571
Epoch 74/100
1/1 [==============================] - 0s 12ms/step - loss: 1.1262 -
accuracy: 0.8571
Epoch 75/100
1/1 [==============================] - 0s 12ms/step - loss: 1.1119 -
accuracy: 0.8095
Epoch 76/100
1/1 [==============================] - 0s 11ms/step - loss: 1.0826 -
accuracy: 0.9524
Epoch 77/100
1/1 [==============================] - 0s 11ms/step - loss: 1.0646 -
accuracy: 0.9524
Epoch 78/100
1/1 [==============================] - 0s 10ms/step - loss: 1.0589 -
accuracy: 0.9048
Epoch 79/100
1/1 [==============================] - 0s 12ms/step - loss: 1.0565 -
accuracy: 0.8571
Epoch 80/100
1/1 [==============================] - 0s 11ms/step - loss: 1.0698 -
accuracy: 0.9048
Epoch 81/100
1/1 [==============================] - 0s 13ms/step - loss: 1.0448 -
accuracy: 0.8095
Epoch 82/100
1/1 [==============================] - 0s 12ms/step - loss: 1.0231 -
accuracy: 0.9048
Epoch 83/100
1/1 [==============================] - 0s 12ms/step - loss: 0.9829 -
accuracy: 0.9524
Epoch 84/100
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1/1 [==============================] - 0s 13ms/step - loss: 0.9811 -
accuracy: 0.9524
Epoch 85/100
1/1 [==============================] - 0s 12ms/step - loss: 0.9962 -
accuracy: 0.9048
Epoch 86/100
1/1 [==============================] - 0s 12ms/step - loss: 0.9572 -
accuracy: 0.9524
Epoch 87/100
1/1 [==============================] - 0s 12ms/step - loss: 0.9340 -
accuracy: 0.9524
Epoch 88/100
1/1 [==============================] - 0s 10ms/step - loss: 0.9371 -
accuracy: 0.9048
Epoch 89/100
1/1 [==============================] - 0s 11ms/step - loss: 0.9221 -
accuracy: 0.9524
Epoch 90/100
1/1 [==============================] - 0s 12ms/step - loss: 0.9002 -
accuracy: 0.9524
Epoch 91/100
1/1 [==============================] - 0s 11ms/step - loss: 0.8905 -
accuracy: 0.9524
Epoch 92/100
1/1 [==============================] - 0s 11ms/step - loss: 0.8857 -
accuracy: 0.9524
Epoch 93/100
1/1 [==============================] - 0s 10ms/step - loss: 0.8733 -
accuracy: 0.9048
Epoch 94/100
1/1 [==============================] - 0s 12ms/step - loss: 0.8540 -
accuracy: 0.9524
Epoch 95/100
1/1 [==============================] - 0s 11ms/step - loss: 0.8461 -
accuracy: 0.9524
Epoch 96/100
1/1 [==============================] - 0s 11ms/step - loss: 0.8436 -
accuracy: 0.9524
Epoch 97/100
1/1 [==============================] - 0s 12ms/step - loss: 0.8292 -
accuracy: 1.0000
Epoch 98/100
1/1 [==============================] - 0s 11ms/step - loss: 0.8138 -
accuracy: 1.0000
Epoch 99/100
1/1 [==============================] - 0s 12ms/step - loss: 0.7983 -
accuracy: 1.0000
Epoch 100/100
1/1 [==============================] - 0s 11ms/step - loss: 0.7876 -
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accuracy: 1.0000
Treningowa dokładność: 100.00%
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