```
#Matematyka Konkretna

#Laboratorium 11

#Paweł Wawrzuta https://github.com/PawelWawrzuta/MK-Lab10

#Wariant 9

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 = "General intelligence (the ability to solve an arbitrary
problem) is among the field's long-term goals. To solve these
problems, AI researchers have adapted and integrated a wide range of
problem-solving techniques, including search and mathematical
optimization, formal logic, artificial neural networks, and methods
based on statistics, probability, and economics"

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)

def generate_text(seed_text, next_words, model, max_sequence_len):
    for _ in range(next_words):
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        token_list = tokenizer.texts_to_sequences([seed_text])[0]
        token_list = pad_sequences([token_list],
maxlen=max_sequence_len-1, padding='pre')
        predicted = np.argmax(model.predict(token_list), axis=-1)
        output_word = ""
        for word, index in tokenizer.word_index.items():
            if index == predicted:
                output_word = word
                break
        seed_text += " " + output_word
    return seed_text

generated_text = generate_text("Computer", next_words=50, model=model,
max_sequence_len=max_sequence_len)
print(generated_text)
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/2 [==============>..............] - ETA: 2s - loss: 3.8055 -
accuracy: 0.0000e+00
2/2 [==============================] - 3s 32ms/step - loss: 3.8076 -
accuracy: 0.0000e+00
Epoch 2/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7999 -
accuracy: 0.0938
2/2 [==============================] - 0s 16ms/step - loss: 3.8004 -
accuracy: 0.1042
Epoch 3/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7946 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.7945 -
accuracy: 0.1250
Epoch 4/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7891 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.7879 -
accuracy: 0.1458
Epoch 5/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7821 -
accuracy: 0.1562
2/2 [==============================] - 0s 30ms/step - loss: 3.7806 -
accuracy: 0.1458
Epoch 6/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7715 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.7707 -
accuracy: 0.1458
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Epoch 7/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7519 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.7560 -
accuracy: 0.1458
Epoch 8/100

1/2 [==============>..............] - ETA: 0s - loss: 3.7348 -
accuracy: 0.0938
2/2 [==============================] - 0s 28ms/step - loss: 3.7247 -
accuracy: 0.1250
Epoch 9/100

1/2 [==============>..............] - ETA: 0s - loss: 3.6643 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.6784 -
accuracy: 0.1042
Epoch 10/100

1/2 [==============>..............] - ETA: 0s - loss: 3.6560 -
accuracy: 0.0938
2/2 [==============================] - 0s 10ms/step - loss: 3.6422 -
accuracy: 0.0833
Epoch 11/100

1/2 [==============>..............] - ETA: 0s - loss: 3.6430 -
accuracy: 0.1250
2/2 [==============================] - 0s 16ms/step - loss: 3.5931 -
accuracy: 0.1458
Epoch 12/100

1/2 [==============>..............] - ETA: 0s - loss: 3.4864 -
accuracy: 0.2188
2/2 [==============================] - 0s 17ms/step - loss: 3.5744 -
accuracy: 0.1458
Epoch 13/100

1/2 [==============>..............] - ETA: 0s - loss: 3.4555 -
accuracy: 0.1562
2/2 [==============================] - 0s 15ms/step - loss: 3.5104 -
accuracy: 0.1250
Epoch 14/100

1/2 [==============>..............] - ETA: 0s - loss: 3.5002 -
accuracy: 0.1250
2/2 [==============================] - 0s 16ms/step - loss: 3.4549 -
accuracy: 0.1250
Epoch 15/100
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1/2 [==============>..............] - ETA: 0s - loss: 3.3752 -
accuracy: 0.1875
2/2 [==============================] - 0s 16ms/step - loss: 3.3971 -
accuracy: 0.1250
Epoch 16/100

1/2 [==============>..............] - ETA: 0s - loss: 3.3180 -
accuracy: 0.1875
2/2 [==============================] - 0s 16ms/step - loss: 3.3642 -
accuracy: 0.1458
Epoch 17/100

1/2 [==============>..............] - ETA: 0s - loss: 3.2484 -
accuracy: 0.1250
2/2 [==============================] - 0s 16ms/step - loss: 3.2883 -
accuracy: 0.1458
Epoch 18/100

1/2 [==============>..............] - ETA: 0s - loss: 3.3023 -
accuracy: 0.1250
2/2 [==============================] - 0s 13ms/step - loss: 3.2322 -
accuracy: 0.1250
Epoch 19/100

1/2 [==============>..............] - ETA: 0s - loss: 3.1891 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.2295 -
accuracy: 0.1042
Epoch 20/100

1/2 [==============>..............] - ETA: 0s - loss: 3.2053 -
accuracy: 0.1250
2/2 [==============================] - 0s 18ms/step - loss: 3.1928 -
accuracy: 0.1042
Epoch 21/100

1/2 [==============>..............] - ETA: 0s - loss: 3.0806 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 3.1300 -
accuracy: 0.1250
Epoch 22/100

1/2 [==============>..............] - ETA: 0s - loss: 3.1025 -
accuracy: 0.1562
2/2 [==============================] - 0s 31ms/step - loss: 3.0787 -
accuracy: 0.1458
Epoch 23/100

1/2 [==============>..............] - ETA: 0s - loss: 3.1055 -
accuracy: 0.1250
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2/2 [==============================] - 0s 16ms/step - loss: 3.0476 -
accuracy: 0.1458
Epoch 24/100

1/2 [==============>..............] - ETA: 0s - loss: 3.0598 -
accuracy: 0.0625
2/2 [==============================] - 0s 15ms/step - loss: 3.0031 -
accuracy: 0.1042
Epoch 25/100

1/2 [==============>..............] - ETA: 0s - loss: 2.9073 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 2.9531 -
accuracy: 0.1042
Epoch 26/100

1/2 [==============>..............] - ETA: 0s - loss: 2.9717 -
accuracy: 0.1250
2/2 [==============================] - 0s 15ms/step - loss: 2.9187 -
accuracy: 0.1458
Epoch 27/100

1/2 [==============>..............] - ETA: 0s - loss: 2.9172 -
accuracy: 0.1250
2/2 [==============================] - 0s 16ms/step - loss: 2.8827 -
accuracy: 0.1250
Epoch 28/100

1/2 [==============>..............] - ETA: 0s - loss: 2.8412 -
accuracy: 0.1562
2/2 [==============================] - 0s 23ms/step - loss: 2.8233 -
accuracy: 0.1458
Epoch 29/100

1/2 [==============>..............] - ETA: 0s - loss: 2.7977 -
accuracy: 0.1562
2/2 [==============================] - 0s 31ms/step - loss: 2.8213 -
accuracy: 0.1250
Epoch 30/100

1/2 [==============>..............] - ETA: 0s - loss: 2.7540 -
accuracy: 0.1250
2/2 [==============================] - 0s 31ms/step - loss: 2.7666 -
accuracy: 0.1458
Epoch 31/100

1/2 [==============>..............] - ETA: 0s - loss: 2.7838 -
accuracy: 0.0938
2/2 [==============================] - 0s 28ms/step - loss: 2.7564 -
accuracy: 0.1250
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Epoch 32/100

1/2 [==============>..............] - ETA: 0s - loss: 2.7260 -
accuracy: 0.1562
2/2 [==============================] - 0s 16ms/step - loss: 2.7049 -
accuracy: 0.1250
Epoch 33/100

1/2 [==============>..............] - ETA: 0s - loss: 2.6592 -
accuracy: 0.2188
2/2 [==============================] - 0s 33ms/step - loss: 2.6570 -
accuracy: 0.1667
Epoch 34/100

1/2 [==============>..............] - ETA: 0s - loss: 2.5558 -
accuracy: 0.2188
2/2 [==============================] - 0s 30ms/step - loss: 2.6247 -
accuracy: 0.1667
Epoch 35/100

1/2 [==============>..............] - ETA: 0s - loss: 2.6067 -
accuracy: 0.1562
2/2 [==============================] - 0s 31ms/step - loss: 2.5958 -
accuracy: 0.1458
Epoch 36/100

1/2 [==============>..............] - ETA: 0s - loss: 2.5714 -
accuracy: 0.1562
2/2 [==============================] - 0s 30ms/step - loss: 2.5648 -
accuracy: 0.1667
Epoch 37/100

1/2 [==============>..............] - ETA: 0s - loss: 2.5533 -
accuracy: 0.1250
2/2 [==============================] - 0s 26ms/step - loss: 2.5374 -
accuracy: 0.1667
Epoch 38/100

1/2 [==============>..............] - ETA: 0s - loss: 2.5108 -
accuracy: 0.2188
2/2 [==============================] - 0s 31ms/step - loss: 2.4932 -
accuracy: 0.1875
Epoch 39/100

1/2 [==============>..............] - ETA: 0s - loss: 2.4742 -
accuracy: 0.2500
2/2 [==============================] - 0s 16ms/step - loss: 2.4832 -
accuracy: 0.2083
Epoch 40/100
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1/2 [==============>..............] - ETA: 0s - loss: 2.4594 -
accuracy: 0.2500
2/2 [==============================] - 0s 32ms/step - loss: 2.4450 -
accuracy: 0.2083
Epoch 41/100

1/2 [==============>..............] - ETA: 0s - loss: 2.4387 -
accuracy: 0.2500
2/2 [==============================] - 0s 15ms/step - loss: 2.4137 -
accuracy: 0.2708
Epoch 42/100

1/2 [==============>..............] - ETA: 0s - loss: 2.3388 -
accuracy: 0.2812
2/2 [==============================] - 0s 31ms/step - loss: 2.3766 -
accuracy: 0.2292
Epoch 43/100

1/2 [==============>..............] - ETA: 0s - loss: 2.3529 -
accuracy: 0.2812
2/2 [==============================] - 0s 32ms/step - loss: 2.3557 -
accuracy: 0.2292
Epoch 44/100

1/2 [==============>..............] - ETA: 0s - loss: 2.3749 -
accuracy: 0.2188
2/2 [==============================] - 0s 16ms/step - loss: 2.3229 -
accuracy: 0.2917
Epoch 45/100

1/2 [==============>..............] - ETA: 0s - loss: 2.2987 -
accuracy: 0.2500
2/2 [==============================] - 0s 31ms/step - loss: 2.2977 -
accuracy: 0.2500
Epoch 46/100

1/2 [==============>..............] - ETA: 0s - loss: 2.2468 -
accuracy: 0.2812
2/2 [==============================] - 0s 31ms/step - loss: 2.2712 -
accuracy: 0.2500
Epoch 47/100

1/2 [==============>..............] - ETA: 0s - loss: 2.2582 -
accuracy: 0.3125
2/2 [==============================] - 0s 15ms/step - loss: 2.2548 -
accuracy: 0.2708
Epoch 48/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1958 -
accuracy: 0.3125
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2/2 [==============================] - 0s 16ms/step - loss: 2.2423 -
accuracy: 0.2500
Epoch 49/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1883 -
accuracy: 0.2812
2/2 [==============================] - 0s 31ms/step - loss: 2.2370 -
accuracy: 0.2292
Epoch 50/100

1/2 [==============>..............] - ETA: 0s - loss: 2.2192 -
accuracy: 0.1875
2/2 [==============================] - 0s 17ms/step - loss: 2.2101 -
accuracy: 0.2292
Epoch 51/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1628 -
accuracy: 0.3438
2/2 [==============================] - 0s 16ms/step - loss: 2.1783 -
accuracy: 0.3333
Epoch 52/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1745 -
accuracy: 0.3750
2/2 [==============================] - 0s 31ms/step - loss: 2.1532 -
accuracy: 0.3333
Epoch 53/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1107 -
accuracy: 0.3750
2/2 [==============================] - 0s 17ms/step - loss: 2.1201 -
accuracy: 0.3542
Epoch 54/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1776 -
accuracy: 0.2500
2/2 [==============================] - 0s 16ms/step - loss: 2.1312 -
accuracy: 0.3125
Epoch 55/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1234 -
accuracy: 0.3438
2/2 [==============================] - 0s 33ms/step - loss: 2.1158 -
accuracy: 0.3542
Epoch 56/100

1/2 [==============>..............] - ETA: 0s - loss: 2.0232 -
accuracy: 0.4062
2/2 [==============================] - 0s 29ms/step - loss: 2.0970 -
accuracy: 0.3333
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Epoch 57/100

1/2 [==============>..............] - ETA: 0s - loss: 2.0169 -
accuracy: 0.4062
2/2 [==============================] - 0s 31ms/step - loss: 2.0609 -
accuracy: 0.3542
Epoch 58/100

1/2 [==============>..............] - ETA: 0s - loss: 2.0055 -
accuracy: 0.4375
2/2 [==============================] - 0s 36ms/step - loss: 2.0332 -
accuracy: 0.3750
Epoch 59/100

1/2 [==============>..............] - ETA: 0s - loss: 2.0617 -
accuracy: 0.3438
2/2 [==============================] - 0s 32ms/step - loss: 2.0099 -
accuracy: 0.3958
Epoch 60/100

1/2 [==============>..............] - ETA: 0s - loss: 1.9401 -
accuracy: 0.5000
2/2 [==============================] - 0s 21ms/step - loss: 1.9960 -
accuracy: 0.4167
Epoch 61/100

1/2 [==============>..............] - ETA: 0s - loss: 1.9724 -
accuracy: 0.4375
2/2 [==============================] - 0s 31ms/step - loss: 1.9764 -
accuracy: 0.4375
Epoch 62/100

1/2 [==============>..............] - ETA: 0s - loss: 1.9751 -
accuracy: 0.4062
2/2 [==============================] - 0s 32ms/step - loss: 1.9589 -
accuracy: 0.4583
Epoch 63/100

1/2 [==============>..............] - ETA: 0s - loss: 1.9594 -
accuracy: 0.4688
2/2 [==============================] - 0s 32ms/step - loss: 1.9406 -
accuracy: 0.5000
Epoch 64/100

1/2 [==============>..............] - ETA: 0s - loss: 2.0162 -
accuracy: 0.3750
2/2 [==============================] - 0s 32ms/step - loss: 1.9373 -
accuracy: 0.4167
Epoch 65/100
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1/2 [==============>..............] - ETA: 0s - loss: 2.0491 -
accuracy: 0.1250
2/2 [==============================] - 0s 31ms/step - loss: 2.0184 -
accuracy: 0.1667
Epoch 66/100

1/2 [==============>..............] - ETA: 0s - loss: 2.1316 -
accuracy: 0.1562
2/2 [==============================] - 0s 26ms/step - loss: 2.1033 -
accuracy: 0.1250
Epoch 67/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8772 -
accuracy: 0.3438
2/2 [==============================] - 0s 34ms/step - loss: 1.9849 -
accuracy: 0.2917
Epoch 68/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8915 -
accuracy: 0.3438
2/2 [==============================] - 0s 27ms/step - loss: 1.9380 -
accuracy: 0.3125
Epoch 69/100

1/2 [==============>..............] - ETA: 0s - loss: 2.0373 -
accuracy: 0.2188
2/2 [==============================] - 0s 20ms/step - loss: 1.9632 -
accuracy: 0.3125
Epoch 70/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8701 -
accuracy: 0.2500
2/2 [==============================] - 0s 25ms/step - loss: 1.9235 -
accuracy: 0.2500
Epoch 71/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8777 -
accuracy: 0.4375
2/2 [==============================] - 0s 27ms/step - loss: 1.8586 -
accuracy: 0.4583
Epoch 72/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8686 -
accuracy: 0.4688
2/2 [==============================] - 0s 22ms/step - loss: 1.8523 -
accuracy: 0.4792
Epoch 73/100

1/2 [==============>..............] - ETA: 0s - loss: 1.7785 -
accuracy: 0.5000
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2/2 [==============================] - 0s 23ms/step - loss: 1.8282 -
accuracy: 0.4375
Epoch 74/100

1/2 [==============>..............] - ETA: 0s - loss: 1.7779 -
accuracy: 0.4688
2/2 [==============================] - 0s 23ms/step - loss: 1.7978 -
accuracy: 0.5000
Epoch 75/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8991 -
accuracy: 0.3750
2/2 [==============================] - 0s 24ms/step - loss: 1.8002 -
accuracy: 0.4583
Epoch 76/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8677 -
accuracy: 0.3125
2/2 [==============================] - 0s 30ms/step - loss: 1.8497 -
accuracy: 0.3125
Epoch 77/100

1/2 [==============>..............] - ETA: 0s - loss: 1.7954 -
accuracy: 0.5312
2/2 [==============================] - 0s 31ms/step - loss: 1.7895 -
accuracy: 0.4167
Epoch 78/100

1/2 [==============>..............] - ETA: 0s - loss: 1.7745 -
accuracy: 0.3750
2/2 [==============================] - 0s 25ms/step - loss: 1.7771 -
accuracy: 0.3958
Epoch 79/100

1/2 [==============>..............] - ETA: 0s - loss: 1.8053 -
accuracy: 0.3750
2/2 [==============================] - 0s 30ms/step - loss: 1.8066 -
accuracy: 0.3542
Epoch 80/100

1/2 [==============>..............] - ETA: 0s - loss: 1.7268 -
accuracy: 0.5000
2/2 [==============================] - 0s 31ms/step - loss: 1.7229 -
accuracy: 0.4583
Epoch 81/100

1/2 [==============>..............] - ETA: 0s - loss: 1.7095 -
accuracy: 0.4375
2/2 [==============================] - 0s 15ms/step - loss: 1.7236 -
accuracy: 0.4583
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Epoch 82/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6967 -
accuracy: 0.4688
2/2 [==============================] - 0s 32ms/step - loss: 1.7156 -
accuracy: 0.5000
Epoch 83/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6136 -
accuracy: 0.6562
2/2 [==============================] - 0s 15ms/step - loss: 1.6731 -
accuracy: 0.5833
Epoch 84/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6893 -
accuracy: 0.5625
2/2 [==============================] - 0s 31ms/step - loss: 1.6668 -
accuracy: 0.6250
Epoch 85/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6531 -
accuracy: 0.7188
2/2 [==============================] - 0s 31ms/step - loss: 1.6435 -
accuracy: 0.7083
Epoch 86/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6450 -
accuracy: 0.6875
2/2 [==============================] - 0s 30ms/step - loss: 1.6277 -
accuracy: 0.7083
Epoch 87/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6262 -
accuracy: 0.6250
2/2 [==============================] - 0s 31ms/step - loss: 1.6093 -
accuracy: 0.6667
Epoch 88/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5357 -
accuracy: 0.7500
2/2 [==============================] - 0s 32ms/step - loss: 1.5922 -
accuracy: 0.6875
Epoch 89/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6367 -
accuracy: 0.5625
2/2 [==============================] - 0s 16ms/step - loss: 1.5813 -
accuracy: 0.6458
Epoch 90/100

1/2 [==============>..............] - ETA: 0s - loss: 1.6870 -
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accuracy: 0.5625
2/2 [==============================] - 0s 16ms/step - loss: 1.5647 -
accuracy: 0.6250
Epoch 91/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5589 -
accuracy: 0.6250
2/2 [==============================] - 0s 31ms/step - loss: 1.5551 -
accuracy: 0.6250
Epoch 92/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5294 -
accuracy: 0.6250
2/2 [==============================] - 0s 22ms/step - loss: 1.5443 -
accuracy: 0.5833
Epoch 93/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5325 -
accuracy: 0.5625
2/2 [==============================] - 0s 13ms/step - loss: 1.5289 -
accuracy: 0.5833
Epoch 94/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5570 -
accuracy: 0.6250
2/2 [==============================] - 0s 21ms/step - loss: 1.5112 -
accuracy: 0.6458
Epoch 95/100

1/2 [==============>..............] - ETA: 0s - loss: 1.4599 -
accuracy: 0.7500
2/2 [==============================] - 0s 31ms/step - loss: 1.5042 -
accuracy: 0.7083
Epoch 96/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5399 -
accuracy: 0.6875
2/2 [==============================] - 0s 30ms/step - loss: 1.4906 -
accuracy: 0.7292
Epoch 97/100

1/2 [==============>..............] - ETA: 0s - loss: 1.4956 -
accuracy: 0.8125
2/2 [==============================] - 0s 32ms/step - loss: 1.4805 -
accuracy: 0.7500
Epoch 98/100

1/2 [==============>..............] - ETA: 0s - loss: 1.5501 -
accuracy: 0.7500
2/2 [==============================] - 0s 18ms/step - loss: 1.4681 -
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accuracy: 0.7500
Epoch 99/100

1/2 [==============>..............] - ETA: 0s - loss: 1.4605 -
accuracy: 0.6875
2/2 [==============================] - 0s 16ms/step - loss: 1.4633 -
accuracy: 0.7083
Epoch 100/100

1/2 [==============>..............] - ETA: 0s - loss: 1.4015 -
accuracy: 0.7188
2/2 [==============================] - 0s 31ms/step - loss: 1.4540 -
accuracy: 0.6458

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 1s 610ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 32ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
```

```
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 35ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 32ms/step

1/1 [==============================] - ETA: 0s
```

```
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 40ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 47ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 22ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
```

```
1/1 [==============================] - 0s 31ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 16ms/step

1/1 [==============================] - ETA: 0s
1/1 [==============================] - 0s 31ms/step
Computer intelligence intelligence the the the the the the the the the
the field's term term term goals solve these problems ai researchers
have adapted and integrated a wide wide of of solving solving
including search and mathematical mathematical optimization formal
logic artificial neural networks and and methods based economics
economics
```