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E23CSEU2189

```
# ================= IMPORTS =================
import tensorflow as tf
import numpy as np

# ================= DATASET =================
text = """
artificial intelligence is transforming modern society.
it is used in healthcare finance education and transportation.
machine learning allows systems to improve automatically with experience.
data plays a critical role in training intelligent systems.
deep learning uses multi layer neural networks.
neural networks are inspired by biological neurons.
each neuron processes input and produces an output.
training a neural network requires optimization techniques.
gradient descent minimizes the loss function.
"""

# ================= PREPROCESSING =================
chars = sorted(list(set(text)))
vocab_size = len(chars)

char_to_idx = {c: i for i, c in enumerate(chars)}
idx_to_char = {i: c for i, c in enumerate(chars)}

encoded = np.array([char_to_idx[c] for c in text])

seq_len = 40
X, y = [], []

for i in range(len(encoded) - seq_len):
    X.append(encoded[i:i + seq_len])
    y.append(encoded[i + seq_len])

X = np.array(X)
y = np.array(y)

# ================= MODEL =================
model_lstm = tf.keras.Sequential([
    tf.keras.layers.Embedding(vocab_size, 64, input_length=seq_len),
    tf.keras.layers.LSTM(128),
    tf.keras.layers.Dense(vocab_size, activation='softmax')
])

model_lstm.compile(
    loss='sparse_categorical_crossentropy',
    optimizer='adam'
)

# ================= TRAIN =================
model_lstm.fit(X, y, epochs=30, batch_size=64)

# ================= TEMPERATURE SAMPLING =================
def sample_with_temperature(preds, temperature=0.8):
    preds = np.asarray(preds).astype("float64")
    preds = np.log(preds + 1e-8) / temperature
    exp_preds = np.exp(preds)
    preds = exp_preds / np.sum(exp_preds)
    return np.random.choice(len(preds), p=preds)

# ================= TEXT GENERATION =================
def generate_text(seed, length=300, temperature=0.8):
    result = seed
    for _ in range(length):
        encoded_seed = [char_to_idx[c] for c in seed]
        encoded_seed = np.array(encoded_seed).reshape(1, -1)

        prediction = model_lstm.predict(encoded_seed, verbose=0)[0]
        next_idx = sample_with_temperature(prediction, temperature)
        next_char = idx_to_char[next_idx]

        result += next_char
        seed = seed[1:] + next_char

    return result
```

```
# ================= OUTPUT =================
print("\nGenerated Text:\n")
print(generate_text("artificial intelligence is ", temperature=0.8))
```

```
Epoch 5/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.9343
Epoch 6/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 13ms/step - loss: 2.9263
Epoch 7/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 2.9497
Epoch 8/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.8877
Epoch 9/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.8906
Epoch 10/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.9039
Epoch 11/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.8779
Epoch 12/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 10ms/step - loss: 2.8700
Epoch 13/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 10ms/step - loss: 2.8561
Epoch 14/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.8190
Epoch 15/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 2.8185
Epoch 16/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.7958
Epoch 17/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 10ms/step - loss: 2.6764
Epoch 18/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.6688
Epoch 19/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.6181
Epoch 20/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.5877
Epoch 21/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 11ms/step - loss: 2.5497
Epoch 22/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.4666
Epoch 23/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.4848
Epoch 24/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.4294
Epoch 25/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.3701
Epoch 26/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.3472
Epoch 27/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.2940
Epoch 28/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 13ms/step - loss: 2.2899
Epoch 29/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.1956
Epoch 30/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 9ms/step - loss: 2.1374

Generated Text:

artificial intelligence is pauouxiurticied nyse thociieg hgtibieceatar linion. cicreran asc roalocwies ceeuran a
ain untorcale u.surne rninelte dpeptrininipon us ahn eloircithe sinteracppiyseetu emutrihns tes moise rany lecil
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