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import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Conv2D, MaxPooling2D, Flatten
from tensorflow.keras.datasets import mnist
from tensorflow.keras.utils import to_categorical
import matplotlib.pyplot as plt

(x_train, y_train), (x_test, y_test) = mnist.load_data()
x_train = x_train.reshape(-1, 28, 28, 1) / 255.0
x_test = x_test.reshape(-1, 28, 28, 1) / 255.0
y_train = to_categorical(y_train, 10)
y_test = to_categorical(y_test, 10)

model = Sequential([
    Conv2D(32, (3, 3), activation='relu', input_shape=(28, 28, 1)),
    MaxPooling2D((2, 2)),
    Conv2D(64, (3, 3), activation='relu'),
    MaxPooling2D((2, 2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dense(10, activation='softmax')
])

model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])

history = model.fit(x_train, y_train, epochs=10, validation_data=(x_test, y_test))

plt.figure(figsize=(12, 4))

plt.subplot(1, 2, 1)
plt.plot(history.history['loss'], label='Train Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.xlabel('Epochs')
plt.ylabel('Loss')
plt.legend()

plt.subplot(1, 2, 2)
plt.plot(history.history['accuracy'], label='Train Accuracy')
plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
plt.xlabel('Epochs')
plt.ylabel('Accuracy')
plt.legend()

plt.show()
```

Epoch 1/10
1875/1875 — 59s 31ms/step - accuracy: 0.9130 - loss: 0.2853 - val_accuracy: 0.9853 - val_loss: 0.0492
Epoch 2/10
1875/1875 — 81s 31ms/step - accuracy: 0.9866 - loss: 0.0441 - val_accuracy: 0.9902 - val_loss: 0.0313
Epoch 3/10
1875/1875 — 83s 31ms/step - accuracy: 0.9920 - loss: 0.0276 - val_accuracy: 0.9906 - val_loss: 0.0274
Epoch 4/10
1875/1875 — 57s 30ms/step - accuracy: 0.9940 - loss: 0.0189 - val_accuracy: 0.9898 - val_loss: 0.0284
Epoch 5/10
1875/1875 — 87s 33ms/step - accuracy: 0.9959 - loss: 0.0132 - val_accuracy: 0.9919 - val_loss: 0.0278
Epoch 6/10
1875/1875 — 57s 30ms/step - accuracy: 0.9967 - loss: 0.0112 - val_accuracy: 0.9903 - val_loss: 0.0321
Epoch 7/10
1875/1875 — 83s 31ms/step - accuracy: 0.9970 - loss: 0.0088 - val_accuracy: 0.9919 - val_loss: 0.0308
Epoch 8/10
1875/1875 — 83s 31ms/step - accuracy: 0.9980 - loss: 0.0066 - val_accuracy: 0.9919 - val_loss: 0.0310
Epoch 9/10
1875/1875 — 81s 30ms/step - accuracy: 0.9982 - loss: 0.0055 - val_accuracy: 0.9906 - val_loss: 0.0350
Epoch 10/10
1875/1875 — 81s 30ms/step - accuracy: 0.9980 - loss: 0.0060 - val_accuracy: 0.9924 - val_loss: 0.0315

