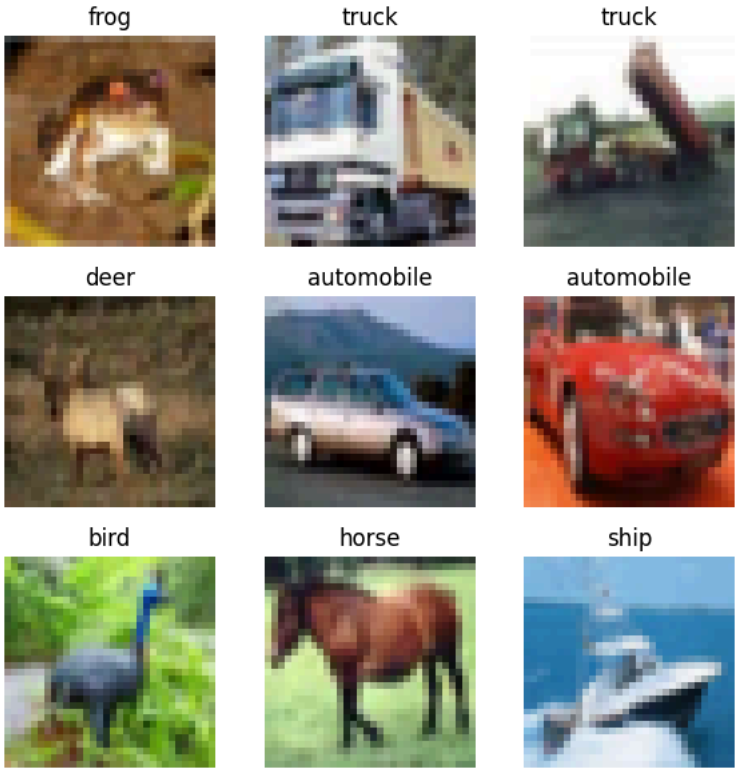
```
# Import libraries
import tensorflow as tf
from tensorflow.keras import layers, models
import matplotlib.pyplot as plt
import numpy as np

# Load CIFAR-10 dataset
(x_train, y_train), (x_test, y_test) = tf.keras.datasets.cifar10.load_data()
# Normalize the data (scale pixel values to 0-1)
x_train = x_train / 255.0
x_test = x_test / 255.0

# Class names for plotting
class_names = ['airplane', 'automobile', 'bird', 'cat', 'deer',
               'dog', 'frog', 'horse', 'ship', 'truck']

# Visualize first 9 images
plt.figure(figsize=(6, 6))
for i in range(9):
    plt.subplot(3, 3, i + 1)
    plt.imshow(x_train[i])
    plt.title(class_names[y_train[i][0]])
    plt.axis('off')
plt.tight_layout()
plt.show()

# Build the CNN model
model = models.Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)),
    layers.MaxPooling2D((2, 2)),

    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D((2, 2)),

    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.Flatten(),

    layers.Dense(64, activation='relu'),
    layers.Dense(10)  # 10 output classes
])

# Compile the model
model.compile(optimizer='adam',
              loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
              metrics=['accuracy'])

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

# Evaluate model
test_loss, test_acc = model.evaluate(x_test, y_test, verbose=2)
print("\nTest accuracy:", test_acc)

# Plot training vs validation accuracy
plt.plot(history.history['accuracy'], label='Train Accuracy')
plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.title('Model Accuracy')
plt.legend()
plt.grid(True)
plt.show()

# Predict and visualize a few test images
probability_model = tf.keras.Sequential([model, layers.Softmax()])
predictions = probability_model.predict(x_test)

plt.figure(figsize=(12, 6))
for i in range(6):
    plt.subplot(2, 3, i + 1)
    plt.imshow(x_test[i])
    predicted_label = class_names[np.argmax(predictions[i])]
    true_label = class_names[y_test[i][0]]
    plt.title(f"Predicted: {predicted_label}\nTrue: {true_label}")
    plt.axis('off')
plt.tight_layout()
plt.show()
```

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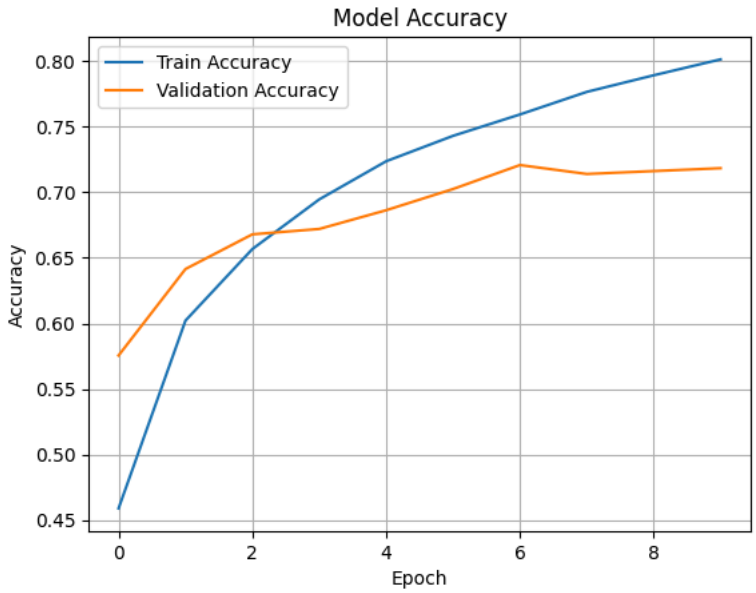
/usr/local/lib/python3.11/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an `input_shape`/`
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Epoch 1/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 76s 48ms/step - accuracy: 0.3630 - loss: 1.7262 - val_accuracy: 0.5755 - val_loss: 1.1869
Epoch 2/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 71s 45ms/step - accuracy: 0.5870 - loss: 1.1598 - val_accuracy: 0.6415 - val_loss: 1.0295
Epoch 3/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 79s 43ms/step - accuracy: 0.6514 - loss: 0.9855 - val_accuracy: 0.6680 - val_loss: 0.9610
Epoch 4/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 83s 44ms/step - accuracy: 0.6925 - loss: 0.8770 - val_accuracy: 0.6721 - val_loss: 0.9258
Epoch 5/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 83s 45ms/step - accuracy: 0.7258 - loss: 0.7901 - val_accuracy: 0.6864 - val_loss: 0.9043
Epoch 6/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 81s 44ms/step - accuracy: 0.7449 - loss: 0.7315 - val_accuracy: 0.7026 - val_loss: 0.8729
Epoch 7/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 81s 44ms/step - accuracy: 0.7646 - loss: 0.6696 - val_accuracy: 0.7209 - val_loss: 0.8378
Epoch 8/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 70s 45ms/step - accuracy: 0.7825 - loss: 0.6219 - val_accuracy: 0.7141 - val_loss: 0.8395
Epoch 9/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 83s 45ms/step - accuracy: 0.7964 - loss: 0.5794 - val_accuracy: 0.7163 - val_loss: 0.8565
Epoch 10/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 68s 44ms/step - accuracy: 0.8054 - loss: 0.5500 - val_accuracy: 0.7185 - val_loss: 0.8782
313/313 - 4s - 11ms/step - accuracy: 0.7185 - loss: 0.8782

Test accuracy: 0.718500018119812
```

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313/313 ━━━━━━━━━━━━━━━━━━━━ 4s 11ms/step
```