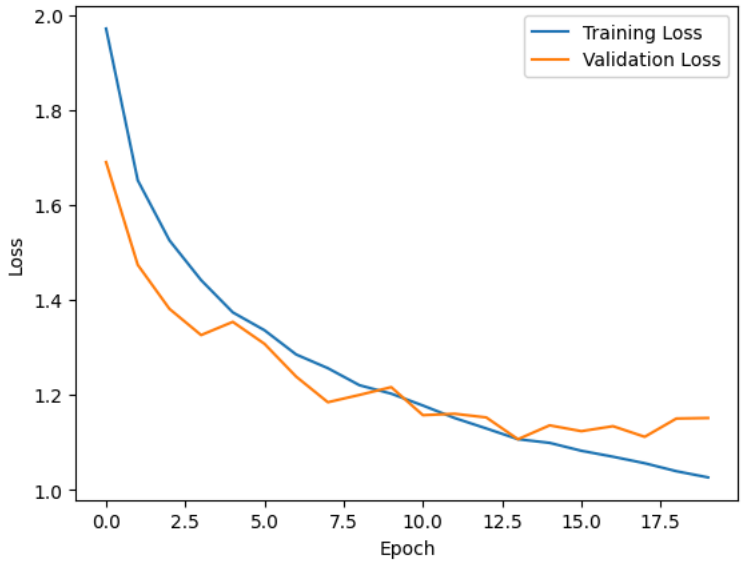
```
import numpy as np
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.keras.datasets import cifar10
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import accuracy_score, confusion_matrix, precision_score, recall_score
import seaborn as sns

# Load the CIFAR-10 dataset
(X, Y), (X_test, Y_test) = cifar10.load_data()

# Class labels for CIFAR-10
class_labels = ['airplane', 'automobile', 'bird', 'cat', 'deer', 'dog', 'frog', 'horse', 'ship', 'truck']

# Display a few images from the dataset
plt.figure(figsize=(15, 3))
for i in range(5):
    plt.subplot(1, 5, i + 1)
    plt.imshow(X[i])
    plt.title(class_labels[Y[i][0]])
    plt.axis('off')
plt.show()

# Normalize the data
scaler = MinMaxScaler()
X_scaled = X.reshape(-1, 32*32*3).astype(float)
X_scaled = scaler.fit_transform(X_scaled).reshape(-1, 32, 32, 3)
X_test_scaled = X_test.reshape(-1, 32*32*3).astype(float)
X_test_scaled = scaler.transform(X_test_scaled).reshape(-1, 32, 32, 3)

# Split the data into training, validation, and testing sets
X_temp, X_test_scaled, Y_temp, Y_test = train_test_split(X_scaled, Y, test_size=0.2, random_state=42)
X_train, X_val, Y_train, Y_val = train_test_split(X_temp, Y_temp, test_size=0.25, random_state=42)

# Define the CNN model
model = Sequential([
    Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)),
    MaxPooling2D((2, 2)),
    Conv2D(32, (3, 3), activation='relu'),
    MaxPooling2D((2, 2)),
    Conv2D(32, (3, 3), activation='relu'),
    MaxPooling2D((2, 2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dropout(0.5),
    Dense(256, activation='relu'),
    Dropout(0.5),
    Dense(128, activation='relu'),
    Dropout(0.5),
    Dense(10, activation='softmax')
])

# Compile the model
model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])

# Show model summary
model.summary()

# Train the model
history = model.fit(X_train, Y_train, epochs=20, validation_data=(X_val, Y_val))

# Plot training and validation loss
plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend()
plt.show()

# Evaluate the model on the test set
test_loss, test_accuracy = model.evaluate(X_test_scaled, Y_test, verbose=0)

# Predict on test set
```

```
y_pred = model.predict(X_test_scaled)
y_pred_labels = np.argmax(y_pred, axis=1)
conf_matrix = confusion_matrix(Y_test, y_pred_labels)

# Display confusion matrix
plt.figure(figsize=(10, 8))
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues', xticklabels=class_labels, yticklabels=class_labels)
plt.xlabel('Predicted Labels')
plt.ylabel('True Labels')
plt.title('Confusion Matrix')
plt.show()

# Calculate precision and recall
precision = precision_score(Y_test, y_pred_labels, average='weighted')
recall = recall_score(Y_test, y_pred_labels, average='weighted')

# Output accuracy, precision, and recall
print(f"Train accuracy: {history.history['accuracy'][-1]}")
print(f"Test accuracy: {test_accuracy}")
print(f"Precision: {precision}")
print(f"Recall: {recall}")


learning_rates = [0.0001, 0.035, 0.07, 0.3]
train_losses = []
val_losses = []

for lr in learning_rates:
    print(f"Training model with learning rate: {lr}")

    model.compile(optimizer=tf.keras.optimizers.Adam(learning_rate=lr), loss='sparse_categorical_crossentropy', metrics=['accuracy'])
    history = model.fit(X_train, Y_train, epochs=20, validation_data=(X_val, Y_val), verbose=1)

    train_losses.append(history.history['loss'])
    val_losses.append(history.history['val_loss'])

plt.figure(figsize=(10, 6))
for i, lr in enumerate(learning_rates):
    plt.plot(train_losses[i], label=f'Training Loss (LR={lr})')
    plt.plot(val_losses[i], label=f'Validation Loss (LR={lr})')

plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.title('Training and Validation Loss for Different Learning Rates')
plt.legend()
plt.show()
```


```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_2 (Conv2D)           (None, 30, 30, 32)        896

 max_pooling2d_2 (MaxPoolin  (None, 15, 15, 32)        0
 g2D)

 conv2d_3 (Conv2D)           (None, 13, 13, 32)        9248

 max_pooling2d_3 (MaxPoolin  (None, 6, 6, 32)          0
 g2D)

 conv2d_4 (Conv2D)           (None, 4, 4, 32)          9248

 max_pooling2d_4 (MaxPoolin  (None, 2, 2, 32)          0
 g2D)

 flatten_1 (Flatten)         (None, 128)               0

 dense_4 (Dense)             (None, 128)               16512

 dropout_3 (Dropout)         (None, 128)               0

 dense_5 (Dense)             (None, 256)               33024

 dropout_4 (Dropout)         (None, 256)               0

 dense_6 (Dense)             (None, 128)               32896

 dropout_5 (Dropout)         (None, 128)               0

 dense_7 (Dense)             (None, 10)                1290

=================================================================
Total params: 103114 (402.79 KB)
Trainable params: 103114 (402.79 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
Epoch 1/20
938/938 [==============================] - 39s 40ms/step - loss: 1.9714 - accuracy: 0.2309 - val_loss: 1.6902 - val_accuracy: 0.3530
Epoch 2/20
938/938 [==============================] - 37s 39ms/step - loss: 1.6519 - accuracy: 0.3736 - val_loss: 1.4738 - val_accuracy: 0.4448
Epoch 3/20
938/938 [==============================] - 35s 38ms/step - loss: 1.5254 - accuracy: 0.4352 - val_loss: 1.3810 - val_accuracy: 0.4911
Epoch 4/20
938/938 [==============================] - 36s 39ms/step - loss: 1.4415 - accuracy: 0.4722 - val_loss: 1.3258 - val_accuracy: 0.5132
Epoch 5/20
938/938 [==============================] - 39s 41ms/step - loss: 1.3736 - accuracy: 0.5031 - val_loss: 1.3536 - val_accuracy: 0.5231
Epoch 6/20
938/938 [==============================] - 37s 39ms/step - loss: 1.3360 - accuracy: 0.5225 - val_loss: 1.3073 - val_accuracy: 0.5289
Epoch 7/20
938/938 [==============================] - 37s 39ms/step - loss: 1.2849 - accuracy: 0.5391 - val_loss: 1.2382 - val_accuracy: 0.5492
Epoch 8/20
938/938 [==============================] - 38s 41ms/step - loss: 1.2560 - accuracy: 0.5542 - val_loss: 1.1843 - val_accuracy: 0.5702
Epoch 9/20
938/938 [==============================] - 34s 37ms/step - loss: 1.2200 - accuracy: 0.5716 - val_loss: 1.1997 - val_accuracy: 0.5721
Epoch 10/20
938/938 [==============================] - 37s 40ms/step - loss: 1.2023 - accuracy: 0.5769 - val_loss: 1.2161 - val_accuracy: 0.5687
Epoch 11/20
938/938 [==============================] - 37s 39ms/step - loss: 1.1773 - accuracy: 0.5875 - val_loss: 1.1570 - val_accuracy: 0.5875
Epoch 12/20
938/938 [==============================] - 34s 36ms/step - loss: 1.1510 - accuracy: 0.5956 - val_loss: 1.1600 - val_accuracy: 0.5934
Epoch 13/20
938/938 [==============================] - 36s 39ms/step - loss: 1.1291 - accuracy: 0.6065 - val_loss: 1.1522 - val_accuracy: 0.5918
Epoch 14/20
938/938 [==============================] - 38s 41ms/step - loss: 1.1064 - accuracy: 0.6125 - val_loss: 1.1063 - val_accuracy: 0.6045
Epoch 15/20
938/938 [==============================] - 37s 40ms/step - loss: 1.0987 - accuracy: 0.6190 - val_loss: 1.1356 - val_accuracy: 0.6056
Epoch 16/20
938/938 [==============================] - 37s 39ms/step - loss: 1.0820 - accuracy: 0.6258 - val_loss: 1.1233 - val_accuracy: 0.6067
```

```
Epoch 17/20
938/938 [==============================] - 38s 41ms/step - loss: 1.0695 - accuracy: 0.6281 - val_loss: 1.1338 - val_accuracy: 0.6073
Epoch 18/20
938/938 [==============================] - 36s 38ms/step - loss: 1.0558 - accuracy: 0.6323 - val_loss: 1.1114 - val_accuracy: 0.6150
Epoch 19/20
938/938 [==============================] - 34s 37ms/step - loss: 1.0389 - accuracy: 0.6398 - val_loss: 1.1500 - val_accuracy: 0.5971
Epoch 20/20
938/938 [==============================] - 36s 39ms/step - loss: 1.0259 - accuracy: 0.6440 - val_loss: 1.1510 - val_accuracy: 0.5941
```




```
313/313 [==============================] - 3s 10ms/step
```


```
Train accuracy: 0.6439999938011169
Test accuracy: 0.607699990272522
Precision: 0.6261565127295173
Recall: 0.6077
Training model with learning rate: 0.0001
Epoch 1/20
938/938 [==============================] - 40s 40ms/step - loss: 0.9249 - accuracy: 0.6790 - val_loss: 1.0630 - val_accuracy: 0.6298
```

```
Epoch 2/20
938/938 [==============================] - 40s 43ms/step - loss: 0.8947 - accuracy: 0.6877 - val_loss: 1.0655 - val_accuracy: 0.6336
Epoch 3/20
938/938 [==============================] - 36s 39ms/step - loss: 0.8819 - accuracy: 0.6913 - val_loss: 1.0698 - val_accuracy: 0.6377
Epoch 4/20
938/938 [==============================] - 37s 39ms/step - loss: 0.8686 - accuracy: 0.7004 - val_loss: 1.0786 - val_accuracy: 0.6329
Epoch 5/20
938/938 [==============================] - 36s 38ms/step - loss: 0.8653 - accuracy: 0.6963 - val_loss: 1.0698 - val_accuracy: 0.6369
Epoch 6/20
938/938 [==============================] - 36s 38ms/step - loss: 0.8592 - accuracy: 0.6992 - val_loss: 1.0710 - val_accuracy: 0.6385
Epoch 7/20
938/938 [==============================] - 36s 38ms/step - loss: 0.8561 - accuracy: 0.6993 - val_loss: 1.0728 - val_accuracy: 0.6379
Epoch 8/20
938/938 [==============================] - 37s 39ms/step - loss: 0.8544 - accuracy: 0.7003 - val_loss: 1.0838 - val_accuracy: 0.6335
Epoch 9/20
938/938 [==============================] - 35s 37ms/step - loss: 0.8438 - accuracy: 0.7020 - val_loss: 1.0721 - val_accuracy: 0.6363
Epoch 10/20
938/938 [==============================] - 36s 38ms/step - loss: 0.8348 - accuracy: 0.7096 - val_loss: 1.0786 - val_accuracy: 0.6373
Epoch 11/20
938/938 [==============================] - 39s 41ms/step - loss: 0.8320 - accuracy: 0.7074 - val_loss: 1.0840 - val_accuracy: 0.6399
Epoch 12/20
938/938 [==============================] - 40s 42ms/step - loss: 0.8273 - accuracy: 0.7076 - val_loss: 1.0824 - val_accuracy: 0.6385
Epoch 13/20
938/938 [==============================] - 42s 45ms/step - loss: 0.8272 - accuracy: 0.7090 - val_loss: 1.0924 - val_accuracy: 0.6360
Epoch 14/20
938/938 [==============================] - 37s 39ms/step - loss: 0.8217 - accuracy: 0.7121 - val_loss: 1.0939 - val_accuracy: 0.6375
Epoch 15/20
938/938 [==============================] - 41s 43ms/step - loss: 0.8196 - accuracy: 0.7152 - val_loss: 1.0863 - val_accuracy: 0.6426
Epoch 16/20
938/938 [==============================] - 40s 43ms/step - loss: 0.8143 - accuracy: 0.7150 - val_loss: 1.0839 - val_accuracy: 0.6396
Epoch 17/20
938/938 [==============================] - 41s 44ms/step - loss: 0.8059 - accuracy: 0.7176 - val_loss: 1.0910 - val_accuracy: 0.6391
Epoch 18/20
938/938 [==============================] - 40s 42ms/step - loss: 0.8083 - accuracy: 0.7163 - val_loss: 1.0936 - val_accuracy: 0.6391
Epoch 19/20
938/938 [==============================] - 39s 41ms/step - loss: 0.8035 - accuracy: 0.7195 - val_loss: 1.0970 - val_accuracy: 0.6383
Epoch 20/20
938/938 [==============================] - 42s 44ms/step - loss: 0.8043 - accuracy: 0.7183 - val_loss: 1.1022 - val_accuracy: 0.6380
Training model with learning rate: 0.035
Epoch 1/20
938/938 [==============================] - 40s 41ms/step - loss: 2.6788 - accuracy: 0.1005 - val_loss: 2.3081 - val_accuracy: 0.1000
Epoch 2/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3072 - accuracy: 0.0999 - val_loss: 2.3076 - val_accuracy: 0.0971
Epoch 3/20
938/938 [==============================] - 40s 42ms/step - loss: 2.3073 - accuracy: 0.1015 - val_loss: 2.3064 - val_accuracy: 0.0981
Epoch 4/20
938/938 [==============================] - 37s 39ms/step - loss: 2.3070 - accuracy: 0.1022 - val_loss: 2.3055 - val_accuracy: 0.0974
Epoch 5/20
938/938 [==============================] - 37s 39ms/step - loss: 2.3071 - accuracy: 0.0988 - val_loss: 2.3080 - val_accuracy: 0.1000
Epoch 6/20
938/938 [==============================] - 36s 38ms/step - loss: 2.3152 - accuracy: 0.0992 - val_loss: 2.3046 - val_accuracy: 0.1001
Epoch 7/20
938/938 [==============================] - 34s 37ms/step - loss: 2.3076 - accuracy: 0.0971 - val_loss: 2.3048 - val_accuracy: 0.1000
Epoch 8/20
938/938 [==============================] - 35s 38ms/step - loss: 2.3075 - accuracy: 0.0967 - val_loss: 2.3077 - val_accuracy: 0.1011
Epoch 9/20
938/938 [==============================] - 36s 38ms/step - loss: 2.3074 - accuracy: 0.0983 - val_loss: 2.3051 - val_accuracy: 0.0981
Epoch 10/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3072 - accuracy: 0.0999 - val_loss: 2.3070 - val_accuracy: 0.0971
Epoch 11/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3078 - accuracy: 0.1009 - val_loss: 2.3077 - val_accuracy: 0.0971
Epoch 12/20
938/938 [==============================] - 34s 37ms/step - loss: 2.3074 - accuracy: 0.0971 - val_loss: 2.3038 - val_accuracy: 0.1024
Epoch 13/20
938/938 [==============================] - 35s 38ms/step - loss: 2.3070 - accuracy: 0.0990 - val_loss: 2.3104 - val_accuracy: 0.1000
Epoch 14/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3074 - accuracy: 0.0960 - val_loss: 2.3062 - val_accuracy: 0.1011
Epoch 15/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3066 - accuracy: 0.0995 - val_loss: 2.3047 - val_accuracy: 0.1011
Epoch 16/20
938/938 [==============================] - 34s 36ms/step - loss: 2.3071 - accuracy: 0.0988 - val_loss: 2.3088 - val_accuracy: 0.1024
Epoch 17/20
938/938 [==============================] - 39s 41ms/step - loss: 2.3071 - accuracy: 0.1017 - val_loss: 2.3050 - val_accuracy: 0.1001
Epoch 18/20
938/938 [==============================] - 34s 36ms/step - loss: 2.3073 - accuracy: 0.0975 - val_loss: 2.3094 - val_accuracy: 0.1011
Epoch 19/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3073 - accuracy: 0.0977 - val_loss: 2.3065 - val_accuracy: 0.0971
Epoch 20/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3071 - accuracy: 0.1004 - val_loss: 2.3058 - val_accuracy: 0.1000
Training model with learning rate: 0.07
Epoch 1/20
938/938 [==============================] - 38s 38ms/step - loss: 2.3119 - accuracy: 0.0996 - val_loss: 2.3037 - val_accuracy: 0.1011
Epoch 2/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3115 - accuracy: 0.1018 - val_loss: 2.3076 - val_accuracy: 0.1001
Epoch 3/20
```

```
Epoch 3/20
938/938 [==============================] - 35s 37ms/step - loss: 2.3122 - accuracy: 0.0989 - val_loss: 2.3089 - val_accuracy: 0.1054
Epoch 4/20
938/938 [==============================] - 34s 36ms/step - loss: 2.3120 - accuracy: 0.1007 - val_loss: 2.3050 - val_accuracy: 0.0974
Epoch 5/20
938/938 [==============================] - 36s 38ms/step - loss: 2.3113 - accuracy: 0.0987 - val_loss: 2.3109 - val_accuracy: 0.0971
Epoch 6/20
938/938 [==============================] - 38s 41ms/step - loss: 2.3110 - accuracy: 0.0997 - val_loss: 2.3238 - val_accuracy: 0.0971
Epoch 7/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3123 - accuracy: 0.0979 - val_loss: 2.3136 - val_accuracy: 0.0971
Epoch 8/20
938/938 [==============================] - 37s 39ms/step - loss: 2.3104 - accuracy: 0.0999 - val_loss: 2.3109 - val_accuracy: 0.1001
Epoch 9/20
938/938 [==============================] - 34s 36ms/step - loss: 2.3118 - accuracy: 0.1003 - val_loss: 2.3101 - val_accuracy: 0.1054
Epoch 10/20
938/938 [==============================] - 34s 37ms/step - loss: 2.3125 - accuracy: 0.0979 - val_loss: 2.3150 - val_accuracy: 0.1000
Epoch 11/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3122 - accuracy: 0.0975 - val_loss: 2.3070 - val_accuracy: 0.0981
Epoch 12/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3112 - accuracy: 0.1007 - val_loss: 2.3172 - val_accuracy: 0.1000
Epoch 13/20
938/938 [==============================] - 34s 36ms/step - loss: 2.3120 - accuracy: 0.1004 - val_loss: 2.3059 - val_accuracy: 0.1001
Epoch 14/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3120 - accuracy: 0.1013 - val_loss: 2.3100 - val_accuracy: 0.0971
Epoch 15/20
938/938 [==============================] - 36s 38ms/step - loss: 2.3117 - accuracy: 0.0994 - val_loss: 2.3153 - val_accuracy: 0.0971
Epoch 16/20
938/938 [==============================] - 37s 39ms/step - loss: 2.3110 - accuracy: 0.1036 - val_loss: 2.3142 - val_accuracy: 0.1054
Epoch 17/20
938/938 [==============================] - 34s 37ms/step - loss: 2.3111 - accuracy: 0.0988 - val_loss: 2.3080 - val_accuracy: 0.1000
Epoch 18/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3124 - accuracy: 0.0983 - val_loss: 2.3111 - val_accuracy: 0.1000
Epoch 19/20
938/938 [==============================] - 34s 36ms/step - loss: 2.3113 - accuracy: 0.1006 - val_loss: 2.3178 - val_accuracy: 0.0971
Epoch 20/20
938/938 [==============================] - 39s 42ms/step - loss: 2.3108 - accuracy: 0.1021 - val_loss: 2.3109 - val_accuracy: 0.1000
Training model with learning rate: 0.3
Epoch 1/20
938/938 [==============================] - 38s 39ms/step - loss: 2.3401 - accuracy: 0.1014 - val_loss: 2.3557 - val_accuracy: 0.1024
Epoch 2/20
938/938 [==============================] - 39s 42ms/step - loss: 2.3390 - accuracy: 0.1001 - val_loss: 2.3276 - val_accuracy: 0.1001
Epoch 3/20
938/938 [==============================] - 39s 41ms/step - loss: 2.3379 - accuracy: 0.1012 - val_loss: 2.3437 - val_accuracy: 0.0971
Epoch 4/20
938/938 [==============================] - 40s 43ms/step - loss: 2.3399 - accuracy: 0.1012 - val_loss: 2.3440 - val_accuracy: 0.1054
Epoch 5/20
938/938 [==============================] - 36s 39ms/step - loss: 2.3399 - accuracy: 0.1002 - val_loss: 2.3175 - val_accuracy: 0.1000
Epoch 6/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3421 - accuracy: 0.1007 - val_loss: 2.3583 - val_accuracy: 0.1011
Epoch 7/20
938/938 [==============================] - 37s 40ms/step - loss: 2.3385 - accuracy: 0.1002 - val_loss: 2.3285 - val_accuracy: 0.1000
Epoch 8/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3393 - accuracy: 0.1031 - val_loss: 2.3288 - val_accuracy: 0.1000
Epoch 9/20
938/938 [==============================] - 38s 41ms/step - loss: 2.3409 - accuracy: 0.1010 - val_loss: 2.3556 - val_accuracy: 0.1024
Epoch 10/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3378 - accuracy: 0.1004 - val_loss: 2.3229 - val_accuracy: 0.1000
Epoch 11/20
938/938 [==============================] - 35s 37ms/step - loss: 2.3406 - accuracy: 0.1018 - val_loss: 2.3333 - val_accuracy: 0.0971
Epoch 12/20
938/938 [==============================] - 37s 40ms/step - loss: 2.3390 - accuracy: 0.1007 - val_loss: 2.3605 - val_accuracy: 0.0971
Epoch 13/20
938/938 [==============================] - 40s 42ms/step - loss: 2.3362 - accuracy: 0.1000 - val_loss: 2.3332 - val_accuracy: 0.1011
Epoch 14/20
938/938 [==============================] - 37s 40ms/step - loss: 2.3399 - accuracy: 0.0999 - val_loss: 2.3211 - val_accuracy: 0.0971
Epoch 15/20
938/938 [==============================] - 37s 40ms/step - loss: 2.3400 - accuracy: 0.0990 - val_loss: 2.3262 - val_accuracy: 0.0984
Epoch 16/20
938/938 [==============================] - 34s 37ms/step - loss: 2.3414 - accuracy: 0.1000 - val_loss: 2.3521 - val_accuracy: 0.0984
Epoch 17/20
938/938 [==============================] - 35s 37ms/step - loss: 2.3360 - accuracy: 0.0989 - val_loss: 2.3390 - val_accuracy: 0.0981
Epoch 18/20
938/938 [==============================] - 38s 40ms/step - loss: 2.3410 - accuracy: 0.1034 - val_loss: 2.3613 - val_accuracy: 0.1054
Epoch 19/20
938/938 [==============================] - 37s 39ms/step - loss: 2.3384 - accuracy: 0.0980 - val_loss: 2.3513 - val_accuracy: 0.1000
Epoch 20/20
938/938 [==============================] - 34s 37ms/step - loss: 2.3399 - accuracy: 0.0997 - val_loss: 2.3343 - val_accuracy: 0.0974
```