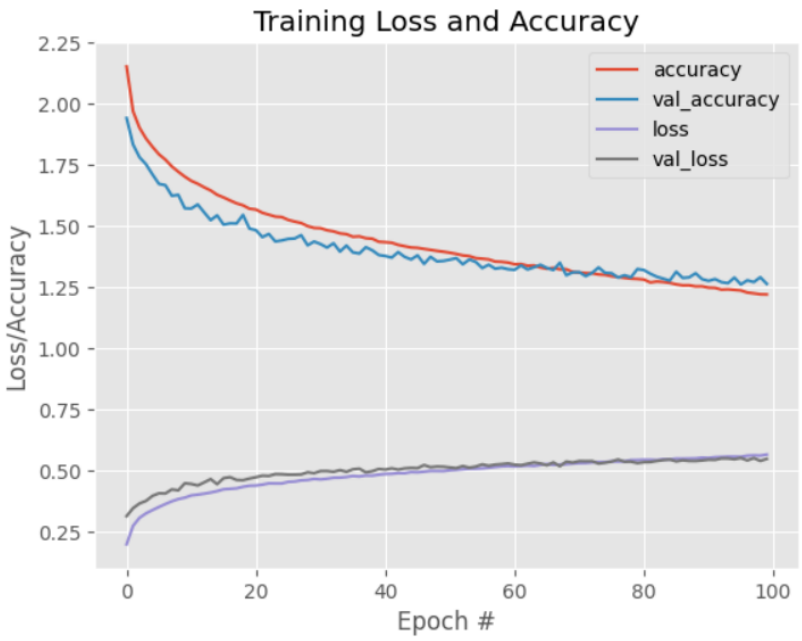
PROGRAM

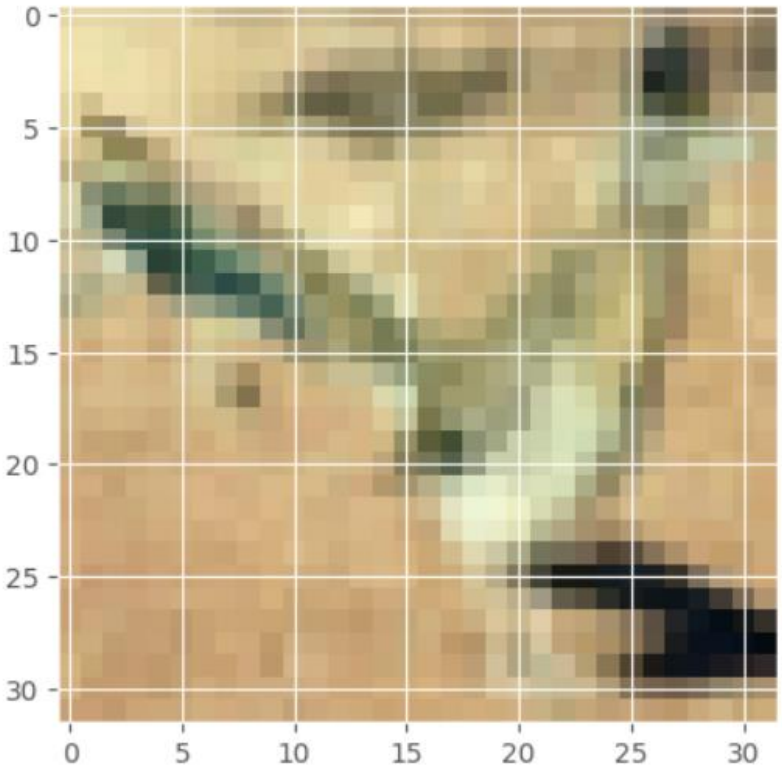
```
from sklearn.preprocessing import LabelBinarizer
from sklearn.metrics import classification_report
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.optimizers import SGD
from tensorflow.keras.datasets import cifar10
from tensorflow.keras import backend as K
import matplotlib.pyplot as plt
import numpy as np
print("[INFO] loading CIFAR-10 data...")
((trainX, trainY), (testX, testY)) = cifar10.load_data()
trainX = trainX.astype("float") / 255.0
testX = testX.astype("float") / 255.0
trainX = trainX.reshape((trainX.shape[0], 3072))
testX = testX.reshape((testX.shape[0], 3072))
lb = LabelBinarizer()
trainY = lb.fit_transform(trainY)
testY = lb.transform(testY)
labelNames = ["airplane", "automobile", "bird", "cat", "deer",
 "dog", "frog", "horse", "ship", "truck"]

from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
import tensorflow as tf
from tensorflow.keras import layers, models
model = Sequential()
model.add(Dense(1024, input_shape=(3072,), activation="relu"))
model.add(layers.Dropout(0.5))
model.add(Dense(512, activation="relu"))
model.add(layers.Dropout(0.5))
model.add(Dense(256, activation="relu"))
model.add(layers.Dropout(0.5))
model.add(Dense(10, activation="softmax"))
print("[INFO] training network...")
sgd = SGD(0.01)
model.compile(loss="categorical_crossentropy", optimizer=sgd,
 metrics=["accuracy"])
H = model.fit(trainX, trainY, validation_data=(testX, testY),
 epochs=100, batch_size=32)
test_loss, test_acc = model.evaluate(testX, testY)
print("Test Loss: %.2f" % test_loss)
print("Test Accuracy: %.2f" % (test_acc * 100))
model.summary()
print("[INFO] evaluating network...")
predictions = model.predict(testX, batch_size=32)
print(classification_report(testY.argmax(axis=1),
predictions.argmax(axis=1), target_names=labelNames))
```

```
plt.style.use("ggplot")
plt.figure()
plt.plot(np.arange(0, 100), H.history["loss"], label="train_loss")
plt.plot(np.arange(0, 100), H.history["val_loss"], label="val_loss")
plt.plot(np.arange(0, 100), H.history["accuracy"], label="train_acc")
plt.plot(np.arange(0, 100), H.history["val_accuracy"], label="val_acc")
plt.title("Training Loss and Accuracy")
plt.xlabel("Epoch #")
plt.ylabel("Loss/Accuracy")
plt.legend(['accuracy','val_accuracy','loss','val_loss'])
plt.show()

import matplotlib.pyplot as plt
import random
n = random.randint(0, 9999)
image = testX[n].reshape(32, 32, 3)
plt.imshow(image)
plt.show()
predictions = model.predict(testX)
predicted_label = np.argmax(predictions[n])
print("Predicted Label:", predicted_label)
import matplotlib.pyplot as plt
plt.plot(H.history['accuracy'], label='Training Accuracy')
plt.plot(H.history['val_accuracy'], label='Validation Accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.legend()
plt.show()
```

OUTPUT

```
313/313 [==============================] - 1s 3ms/step - loss: 1.2631 - accuracy: 0.5471
Test Loss: 1.26
Test Accuracy: 54.71
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense (Dense)               (None, 1024)              3146752

 dropout (Dropout)           (None, 1024)              0

 dense_1 (Dense)             (None, 512)               524800

 dropout_1 (Dropout)         (None, 512)               0

 dense_2 (Dense)             (None, 256)               131328

 dropout_2 (Dropout)         (None, 256)               0

 dense_3 (Dense)             (None, 10)                2570

=================================================================
Total params: 3805450 (14.52 MB)
Trainable params: 3805450 (14.52 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
[INFO] evaluating network...
313/313 [==============================] - 1s 2ms/step
              precision    recall  f1-score   support

    airplane       0.68      0.52      0.59      1000
  automobile       0.68      0.69      0.68      1000
        bird       0.47      0.31      0.38      1000
         cat       0.36      0.39      0.38      1000
        deer       0.43      0.54      0.48      1000
```





```
313/313 [==============================] - 1s 2ms/step
Predicted Label: 4
```