In [3]:
```
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt
```

In [4]:
```
cifar=tf.keras.datasets.cifar10
(training_images,training_labels),(testing_images,testing_labels)=cifar.load_data()
```

In [5]:
```
names=['airplane','automobile','bird','cat','deer','dog','frog','horse','ship','truck']
```

In [6]:
```
training_images.shape
```

Out[6]:
```
(50000, 32, 32, 3)
```

In [7]:
```
training_labels.shape
```

Out[7]:
```
(50000, 1)
```

In [8]:
```
training_images=training_images/255.0
testing_images=testing_images/255.0
```

In [9]:
```
model=tf.keras.Sequential([
    tf.keras.layers.Flatten(input_shape=(32,32,3)),
    tf.keras.layers.Dense(128,activation='relu'),
    tf.keras.layers.Dense(128,activation='relu'),
    tf.keras.layers.Dense(10,activation='softmax')
])
```

In [10]:
```
model.compile(optimizer='adam',loss='sparse_categorical_crossentropy',metrics=['accuracy'])
```

In [11]:
```
model.fit(training_images,training_labels,epochs=100)
```

```
Epoch 1/100
1563/1563 [==============================] - 22s 13ms/step - loss: 1.8560 - accuracy: 0.3306
Epoch 2/100
1563/1563 [==============================] - 18s 11ms/step - loss: 1.6911 - accuracy: 0.3958
Epoch 3/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.6153 - accuracy: 0.4223
Epoch 4/100
1563/1563 [==============================] - 18s 12ms/step - loss: 1.5709 - accuracy: 0.4370
Epoch 5/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.5375 - accuracy: 0.4490
Epoch 6/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.5142 - accuracy: 0.4581
Epoch 7/100
1563/1563 [==============================] - 18s 12ms/step - loss: 1.4920 - accuracy: 0.4631
Epoch 8/100
1563/1563 [==============================] - 18s 12ms/step - loss: 1.4768 - accuracy: 0.4698
Epoch 9/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.4631 - accuracy: 0.4758
Epoch 10/100
1563/1563 [==============================] - 19s 12ms/step - loss: 1.4492 - accuracy: 0.4817
Epoch 11/100
1563/1563 [==============================] - 20s 13ms/step - loss: 1.4371 - accuracy: 0.4853
Epoch 12/100
1563/1563 [==============================] - 23s 15ms/step - loss: 1.4282 - accuracy: 0.4892
Epoch 13/100
1563/1563 [==============================] - 20s 13ms/step - loss: 1.4167 - accuracy: 0.4933
Epoch 14/100
1563/1563 [==============================] - 20s 13ms/step - loss: 1.4075 - accuracy: 0.4973
Epoch 15/100
1563/1563 [==============================] - 27s 17ms/step - loss: 1.3989 - accuracy: 0.5002
Epoch 16/100
1563/1563 [==============================] - 19s 12ms/step - loss: 1.3940 - accuracy: 0.5004
Epoch 17/100
1563/1563 [==============================] - 18s 11ms/step - loss: 1.3854 - accuracy: 0.5062
Epoch 18/100
1563/1563 [==============================] - 18s 11ms/step - loss: 1.3806 - accuracy: 0.5069
Epoch 19/100
1563/1563 [==============================] - 27s 17ms/step - loss: 1.3703 - accuracy: 0.5079
Epoch 20/100
1563/1563 [==============================] - 18s 11ms/step - loss: 1.3654 - accuracy: 0.5116
Epoch 21/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.3598 - accuracy: 0.5124
Epoch 22/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.3512 - accuracy: 0.5181
Epoch 23/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3528 - accuracy: 0.5164
Epoch 24/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3380 - accuracy: 0.5206
Epoch 25/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.3338 - accuracy: 0.5239
Epoch 26/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3343 - accuracy: 0.5227
```

```
Epoch 27/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3269 - accuracy: 0.5256
Epoch 28/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3228 - accuracy: 0.5273
Epoch 29/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3198 - accuracy: 0.5281
Epoch 30/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3111 - accuracy: 0.5314
Epoch 31/100
1563/1563 [==============================] - 15s 9ms/step - loss: 1.3088 - accuracy: 0.5305
Epoch 32/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3081 - accuracy: 0.5318
Epoch 33/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.3029 - accuracy: 0.5340
Epoch 34/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.3011 - accuracy: 0.5347
Epoch 35/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.2962 - accuracy: 0.5370
Epoch 36/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.2913 - accuracy: 0.5364
Epoch 37/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.2886 - accuracy: 0.5391
Epoch 38/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.2852 - accuracy: 0.5406
Epoch 39/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.2835 - accuracy: 0.5386
Epoch 40/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2799 - accuracy: 0.5412
Epoch 41/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.2750 - accuracy: 0.5437
Epoch 42/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2746 - accuracy: 0.5439
Epoch 43/100
1563/1563 [==============================] - 19s 12ms/step - loss: 1.2718 - accuracy: 0.5439
Epoch 44/100
1563/1563 [==============================] - 15s 10ms/step - loss: 1.2693 - accuracy: 0.5441
Epoch 45/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.2639 - accuracy: 0.5485
Epoch 46/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.2570 - accuracy: 0.5489
Epoch 47/100
1563/1563 [==============================] - 15s 10ms/step - loss: 1.2587 - accuracy: 0.5479
Epoch 48/100
1563/1563 [==============================] - 18s 11ms/step - loss: 1.2563 - accuracy: 0.5492
Epoch 49/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2544 - accuracy: 0.5508
Epoch 50/100
1563/1563 [==============================] - 18s 12ms/step - loss: 1.2479 - accuracy: 0.5511
Epoch 51/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2525 - accuracy: 0.5472
Epoch 52/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.2490 - accuracy: 0.5512
Epoch 53/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.2433 - accuracy: 0.5512
Epoch 54/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.2392 - accuracy: 0.5539
Epoch 55/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2405 - accuracy: 0.5530
Epoch 56/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2398 - accuracy: 0.5536
Epoch 57/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.2345 - accuracy: 0.5575
Epoch 58/100
1563/1563 [==============================] - 14s 9ms/step - loss: 1.2355 - accuracy: 0.5561
Epoch 59/100
1563/1563 [==============================] - 13s 8ms/step - loss: 1.2290 - accuracy: 0.5561
Epoch 60/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2271 - accuracy: 0.5603
Epoch 61/100
1563/1563 [==============================] - 16s 11ms/step - loss: 1.2287 - accuracy: 0.5579
Epoch 62/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.2234 - accuracy: 0.5605
Epoch 63/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2219 - accuracy: 0.5583
Epoch 64/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2226 - accuracy: 0.5615
Epoch 65/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2234 - accuracy: 0.5604
Epoch 66/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2154 - accuracy: 0.5633
Epoch 67/100
1563/1563 [==============================] - 16s 11ms/step - loss: 1.2180 - accuracy: 0.5613
Epoch 68/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2168 - accuracy: 0.5621
Epoch 69/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2116 - accuracy: 0.5631
Epoch 70/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2148 - accuracy: 0.5608
Epoch 71/100
```

```
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2087 - accuracy: 0.5639
Epoch 72/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2067 - accuracy: 0.5658
Epoch 73/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.2090 - accuracy: 0.5653
Epoch 74/100
1563/1563 [==============================] - 16s 11ms/step - loss: 1.2029 - accuracy: 0.5674
Epoch 75/100
1563/1563 [==============================] - 16s 11ms/step - loss: 1.2032 - accuracy: 0.5678
Epoch 76/100
1563/1563 [==============================] - 17s 11ms/step - loss: 1.2035 - accuracy: 0.5666
Epoch 77/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1962 - accuracy: 0.5706
Epoch 78/100
1563/1563 [==============================] - 15s 9ms/step - loss: 1.1997 - accuracy: 0.5680
Epoch 79/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1961 - accuracy: 0.5679
Epoch 80/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1962 - accuracy: 0.5697
Epoch 81/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1962 - accuracy: 0.5702
Epoch 82/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1901 - accuracy: 0.5712
Epoch 83/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1899 - accuracy: 0.5691
Epoch 84/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1883 - accuracy: 0.5720
Epoch 85/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1882 - accuracy: 0.5712
Epoch 86/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1877 - accuracy: 0.5710
Epoch 87/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1846 - accuracy: 0.5734
Epoch 88/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1840 - accuracy: 0.5726
Epoch 89/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1859 - accuracy: 0.5732
Epoch 90/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1864 - accuracy: 0.5724
Epoch 91/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1776 - accuracy: 0.5743
Epoch 92/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1766 - accuracy: 0.5750
Epoch 93/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1747 - accuracy: 0.5762
Epoch 94/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1755 - accuracy: 0.5770
Epoch 95/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1733 - accuracy: 0.5780
Epoch 96/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1802 - accuracy: 0.5747
Epoch 97/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1751 - accuracy: 0.5778
Epoch 98/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1715 - accuracy: 0.5767
Epoch 99/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1654 - accuracy: 0.5816
Epoch 100/100
1563/1563 [==============================] - 16s 10ms/step - loss: 1.1720 - accuracy: 0.5761
```

Out[11]:
```
<keras.src.callbacks.History at 0x2eb36cfc9d0>
```

In [12]:
```
test_loss,test_acc=model.evaluate(testing_images,testing_labels)
```

```
313/313 [==============================] - 1s 3ms/step - loss: 1.5973 - accuracy: 0.4724
```

In [13]:
```
print("Test accuracy:",test_acc)
```

```
Test accuracy: 0.4724000096321106
```

In [14]:
```
predictions=model.predict(testing_images)
```

```
313/313 [==============================] - 1s 2ms/step
```