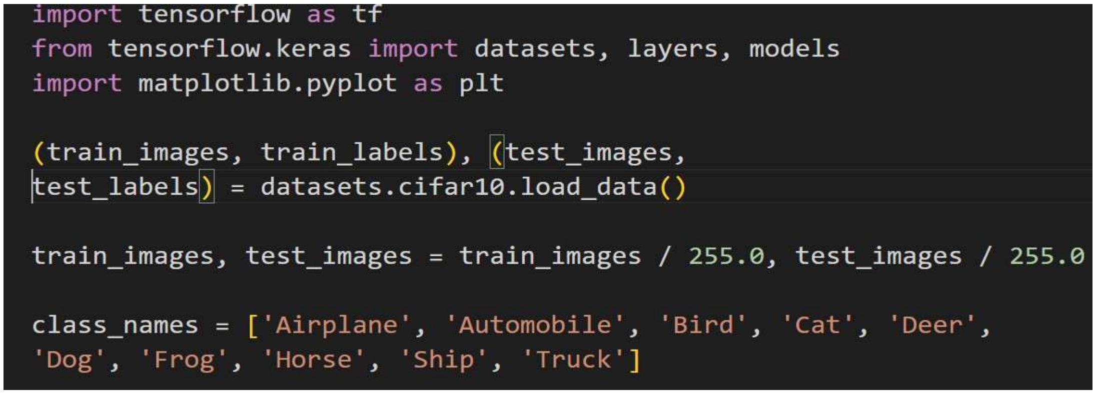
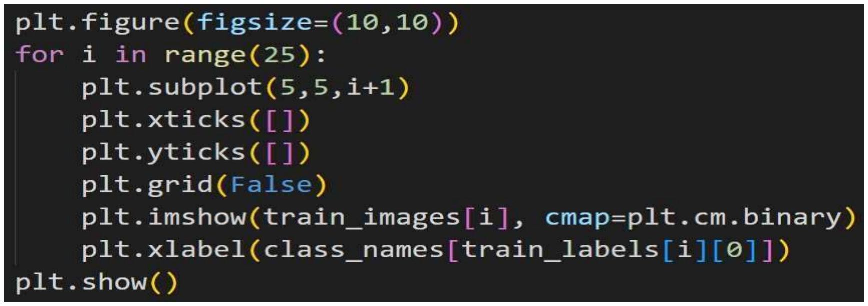
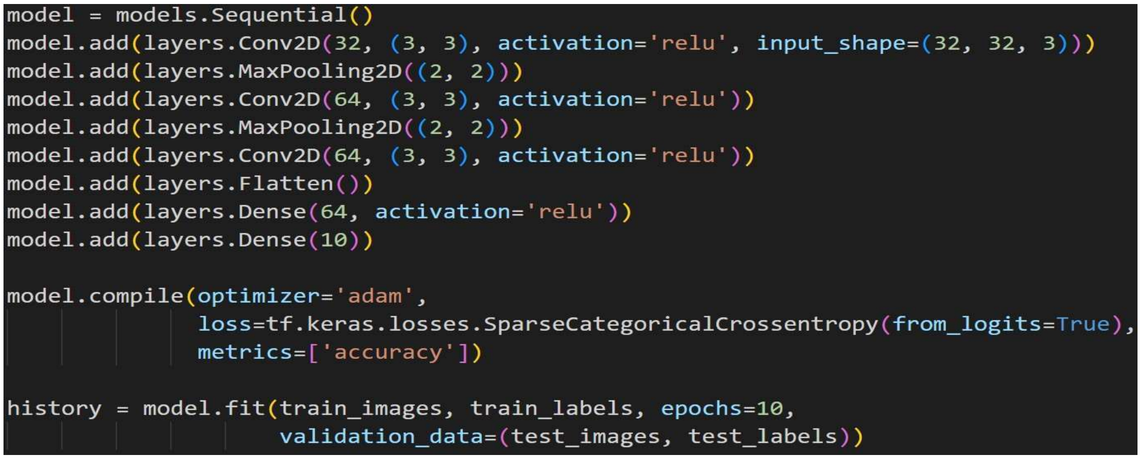
Ex.3.3



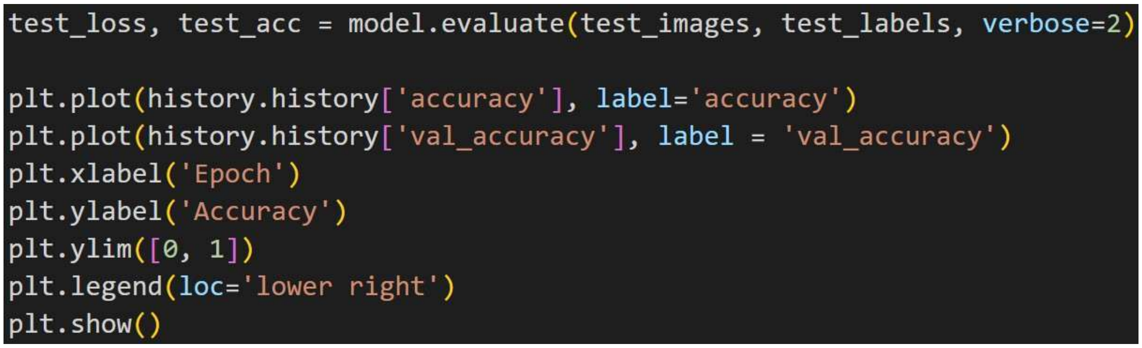
```
import tensorflow as tf
from tensorflow.keras import datasets, layers, models
import matplotlib.pyplot as plt

(train_images, train_labels), (test_images,
test_labels) = datasets.cifar10.load_data()

train_images, test_images = train_images / 255.0, test_images / 255.0

class_names = ['Airplane', 'Automobile', 'Bird', 'Cat', 'Deer',
'Dog', 'Frog', 'Horse', 'Ship', 'Truck']
```



```
plt.figure(figsize=(10,10))
for i in range(25):
    plt.subplot(5,5,i+1)
    plt.xticks([])
    plt.yticks([])
    plt.grid(False)
    plt.imshow(train_images[i], cmap=plt.cm.binary)
    plt.xlabel(class_names[train_labels[i][0]])
plt.show()
```

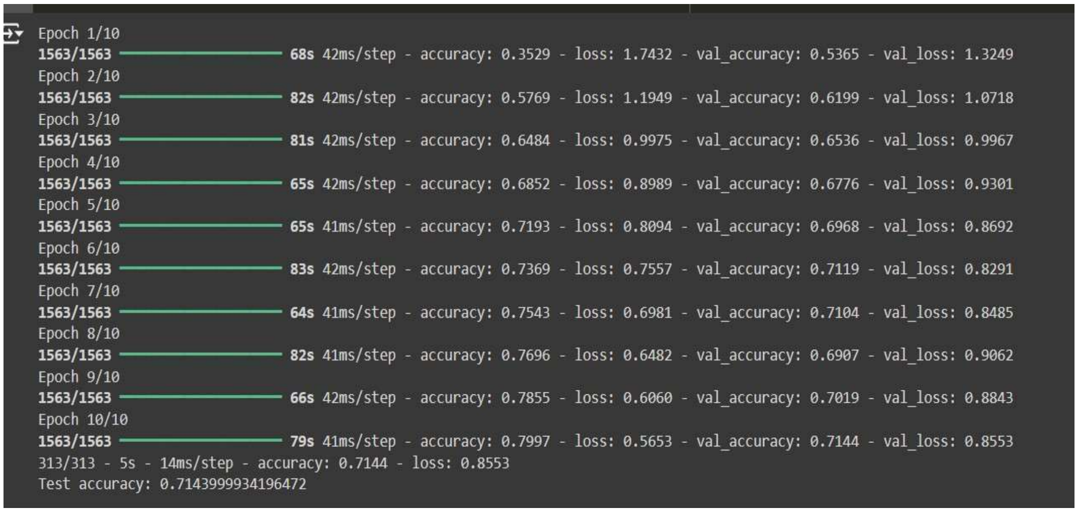


```
model = models.Sequential()
model.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.Flatten())
model.add(layers.Dense(64, activation='relu'))
model.add(layers.Dense(10))

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

history = model.fit(train_images, train_labels, epochs=10,
                    validation_data=(test_images, test_labels))
```

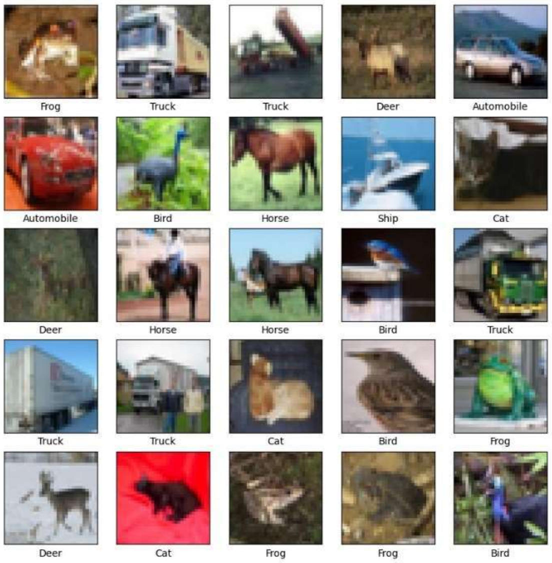


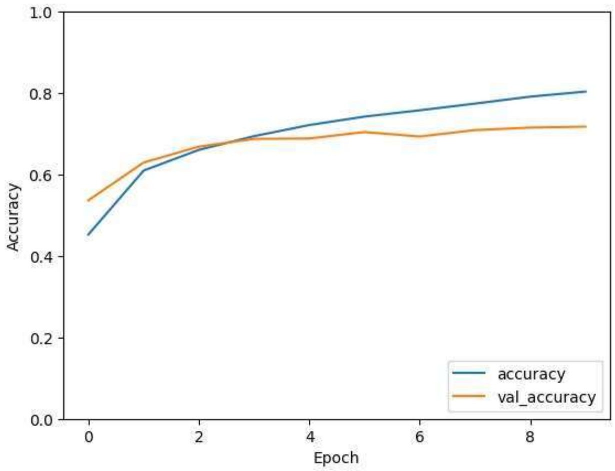
```
test_loss, test_acc = model.evaluate(test_images, test_labels, verbose=2)

plt.plot(history.history['accuracy'], label='accuracy')
plt.plot(history.history['val_accuracy'], label = 'val_accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.ylim([0, 1])
plt.legend(loc='lower right')
plt.show()
```

Output:



```
Epoch 1/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 68s 42ms/step - accuracy: 0.3529 - loss: 1.7432 - val_accuracy: 0.5365 - val_loss: 1.3249
Epoch 2/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 82s 42ms/step - accuracy: 0.5769 - loss: 1.1949 - val_accuracy: 0.6199 - val_loss: 1.0718
Epoch 3/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 81s 42ms/step - accuracy: 0.6484 - loss: 0.9975 - val_accuracy: 0.6536 - val_loss: 0.9967
Epoch 4/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 65s 42ms/step - accuracy: 0.6852 - loss: 0.8989 - val_accuracy: 0.6776 - val_loss: 0.9301
Epoch 5/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 65s 41ms/step - accuracy: 0.7193 - loss: 0.8094 - val_accuracy: 0.6968 - val_loss: 0.8692
Epoch 6/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 83s 42ms/step - accuracy: 0.7369 - loss: 0.7557 - val_accuracy: 0.7119 - val_loss: 0.8291
Epoch 7/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 64s 41ms/step - accuracy: 0.7543 - loss: 0.6981 - val_accuracy: 0.7104 - val_loss: 0.8485
Epoch 8/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 82s 41ms/step - accuracy: 0.7696 - loss: 0.6482 - val_accuracy: 0.6907 - val_loss: 0.9062
Epoch 9/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 66s 42ms/step - accuracy: 0.7855 - loss: 0.6060 - val_accuracy: 0.7019 - val_loss: 0.8843
Epoch 10/10
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 79s 41ms/step - accuracy: 0.7997 - loss: 0.5653 - val_accuracy: 0.7144 - val_loss: 0.8553
313/313 - 5s - 14ms/step - accuracy: 0.7144 - loss: 0.8553
Test accuracy: 0.7143999934196472
```




Accuracy
Epoch
accuracy
val_accuracy