1. WORKING OF CNN ARCHITECTURE TO CLASSIFY IMAGES

EX.N0 : 1	**WORKING OF CNN ARCHITECTURE TO CLASSIFY IMAGES**
DATE : 21/01/2025	

AIM:

To implement and demonstrate a Convolutional Neural Network (CNN) for image classification using the CIFAR-10 dataset in TensorFlow and Keras.

ALGORITHM:

Step 1: Import necessary libraries.

Step 2: Load and pre-process the CIFAR-10 dataset.

Step 3: Build the CNN model using Keras Sequential API.

Step 4: Compile the model with appropriate loss function and optimizer.

Step 5: Train the model on the training dataset.

Step 6: Evaluate the model on the test dataset.

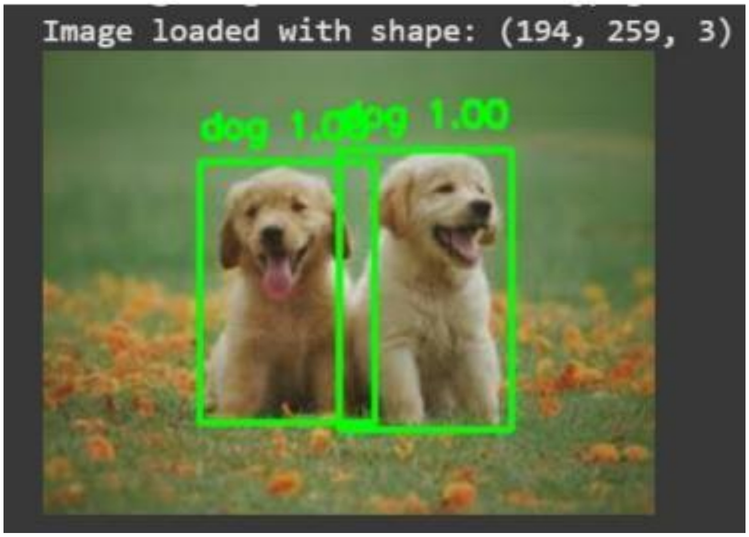
Step 7: Visualize a few predictions to validate performance.

PROGRAM:

```
import tensorflow as tf
from tensorflow.keras import layers, models
import matplotlib.pyplot as plt
from tensorflow.keras.datasets import cifar10
import numpy as np
(x_train, y_train), (x_test, y_test) = cifar10.load_data()
x_train = x_train.astype('float32') / 255.0
```

```
x_test = x_test.astype('float32') / 255.0
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, activation='softmax')
])
model.compile(optimizer='adam',
loss='sparse_categorical_crossentropy',
metrics=['accuracy'])
history = model.fit(x_train, y_train, epochs=10, batch_size=64,
validation_data=(x_test, y_test))
test_loss, test_acc = model.evaluate(x_test, y_test, verbose=2)
print(f'\nTest accuracy: {test_acc:.4f}')
class_names = ['airplane','automobile','bird','cat','deer',
'dog','frog','horse','ship','truck']
predictions = model.predict(x_test)
plt.figure(figsize=(10,5))
for i in range(5):
plt.subplot(1, 5, i+1)
plt.xticks([])
plt.yticks([])
plt.grid(False)
plt.imshow(x_test[i])
pred_label = class_names[np.argmax(predictions[i])]
true_label = class_names[y_test[i][0]]
plt.xlabel(f"Pred: {pred_label}\nTrue: {true_label}")
plt.tight_layout()
plt.show()
```

OUTPUT:



```
Image loaded with shape: (194, 259, 3)
```

RESULT:

Thus, to implement and demonstrate a Convolutional Neural Network (CNN) for image classification using the CIFAR-10 dataset in TensorFlow and Keras.