Experiment 4

Aim: To implement a CNN model to classify CIFAR-10 dataset.

Tools Used: Python

Theory: A Convolutional Neural Network (CNN) for classifying the CIFAR-10 dataset consists of multiple convolutional and pooling layers, followed by fully connected layers. It processes 32x32 color images, using convolutional layers to extract features and pooling layers to reduce dimensionality. The final fully connected layers output probabilities for the 10 classes in the dataset, enabling effective pattern recognition in the images.

Code:

```
import tensorflow as tf
from tensorflow.keras import layers, models
from tensorflow.keras.datasets import cifar10
from tensorflow.keras.utils import to_categorical

(x_train, y_train), (x_test, y_test) = cifar10.load_data()
x_train, x_test = x_train.astype('float32') / 255.0, x_tes
t.astype('float32') / 255.0
y_train, y_test = to_categorical(y_train, 10), to_categoric
al(y_test, 10)

model = models.Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shap
e=(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='categorical_crossentr
opy', metrics=['accuracy'])
```

```
model.fit(x_train, y_train, epochs=10, batch_size=64, valid
ation_data=(x_test, y_test))
```

Output:

```
Epoch 1/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 33s 40ms/step - accuracy: 0.3
294 - loss: 1.8140 - val_accuracy: 0.5288 - val_loss: 1.312
0
Epoch 2/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 31s 39ms/step - accuracy: 0.5
462 - loss: 1.2655 - val_accuracy: 0.5884 - val_loss: 1.136
9
Epoch 3/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 41s 39ms/step - accuracy: 0.6
123 - loss: 1.0941 - val_accuracy: 0.6188 - val_loss: 1.060
2
Epoch 4/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 41s 39ms/step - accuracy: 0.6
570 - loss: 0.9835 - val_accuracy: 0.6606 - val_loss: 0.961
7
Epoch 5/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 31s 39ms/step - accuracy: 0.6
891 - loss: 0.8937 - val_accuracy: 0.6659 - val_loss: 0.967
8
Epoch 6/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 30s 39ms/step - accuracy: 0.7
094 - loss: 0.8389 - val_accuracy: 0.6922 - val_loss: 0.881
6
Epoch 7/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 30s 39ms/step - accuracy: 0.7
343 - loss: 0.7689 - val_accuracy: 0.6787 - val_loss: 0.907
2
Epoch 8/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 30s 39ms/step - accuracy: 0.7
417 - loss: 0.7454 - val_accuracy: 0.7024 - val_loss: 0.851
8
Epoch 9/10
```

```
782/782 ━━━━━━━━━━━━━━━━━━━━ 30s 39ms/step - accuracy: 0.7
579 - loss: 0.6923 - val_accuracy: 0.7091 - val_loss: 0.850
8
Epoch 10/10
782/782 ━━━━━━━━━━━━━━━━━━━━ 30s 38ms/step - accuracy: 0.7
693 - loss: 0.6639 - val_accuracy: 0.7167 - val_loss: 0.824
6
```

Result: CNN model to classify CIFAR-10 dataset has been successfully implemented.

Criteria	Total Marks	Marks Obtained	Comments
Concept (A)			
Implementation (B)			
Performance (C)			
Total			