EXP NO: 10
DATE: 03-10-2025

Object Recognition

Aim: Object Recognition on available online image datasets

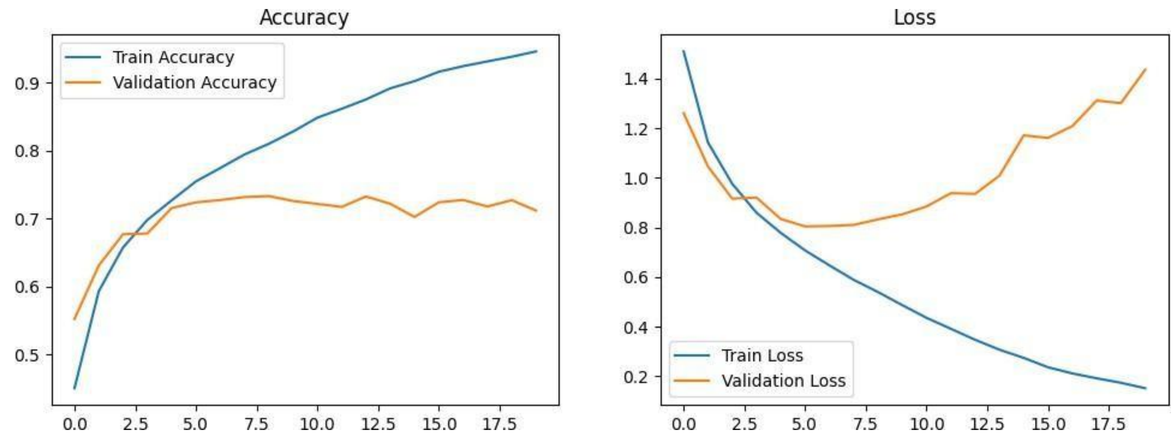
Algorithm:

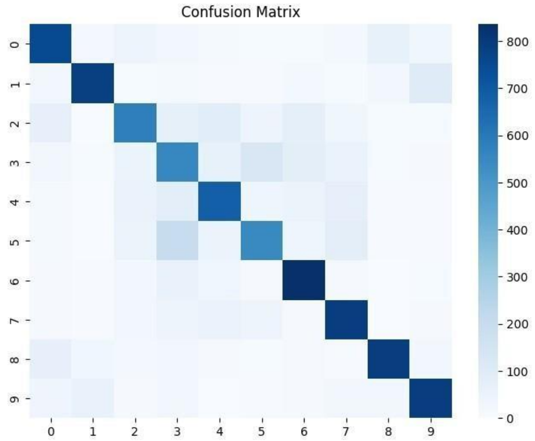
1. Load pretrained CNN model (e.g., ResNet, MobileNet).
2. Read and preprocess input image (resize, normalize).
3. Pass image through model for prediction.
4. Obtain top predicted labels and confidence scores.
5. Display recognized object with label.
6. Compare performance on dataset images.

Code:

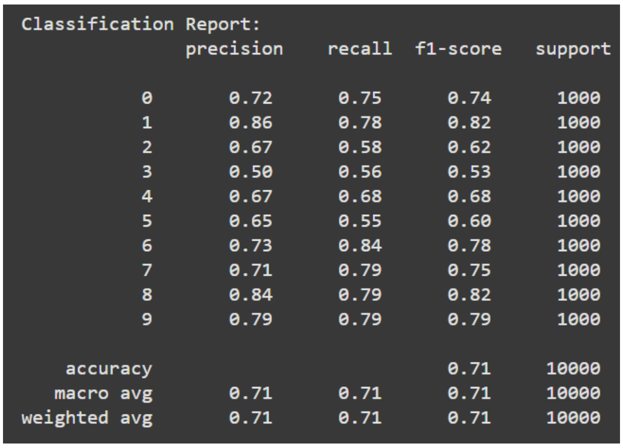
```
# Import libraries
import tensorflow as tf
from tensorflow.keras import datasets, layers, models
from sklearn.metrics import confusion_matrix, classification_report
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns

# Step 1: Load and preprocess dataset
(x_train, y_train), (x_test, y_test) = datasets.cifar10.load_data()
x_train, x_test = x_train / 255.0, x_test / 255.0  # Normalize
y_train, y_test = y_train.flatten(), y_test.flatten()

# Step 2: Define CNN model
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(128, (3,3), activation='relu'),

    layers.Flatten(),

    layers.Dense(128, activation='relu'),

    layers.Dense(10, activation='softmax')

])


# Step 3: Compile model

model.compile(optimizer='adam',

              loss='sparse_categorical_crossentropy',

              metrics=['accuracy'])


# Step 4: Train model

history = model.fit(x_train, y_train, epochs=20,

                    validation_data=(x_test, y_test),

                    batch_size=64)


# Step 5: Evaluate model

test_loss, test_acc = model.evaluate(x_test, y_test, verbose=2)

print(f"\nTest Accuracy: {test_acc*100:.2f}%")


# Step 6: Plot accuracy and loss curves

plt.figure(figsize=(12,4))

plt.subplot(1,2,1)

plt.plot(history.history['accuracy'], label='Train Accuracy')

plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
plt.legend(); plt.title("Accuracy")


plt.subplot(1,2,2)
plt.plot(history.history['loss'], label='Train Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.legend(); plt.title("Loss")
plt.show()


# Step 7: Confusion Matrix
y_pred = np.argmax(model.predict(x_test), axis=-1)
cm = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(8,6))
sns.heatmap(cm, annot=False, cmap='Blues')
plt.title("Confusion Matrix")
plt.show()


# Step 8: Classification report
print("\nClassification Report:\n", classification_report(y_test, y_pred))
```

Output:





Confusion Matrix



```
Classification Report:
              precision    recall  f1-score   support

           0       0.72      0.75      0.74      1000
           1       0.86      0.78      0.82      1000
           2       0.67      0.58      0.62      1000
           3       0.50      0.56      0.53      1000
           4       0.67      0.68      0.68      1000
           5       0.65      0.55      0.60      1000
           6       0.73      0.84      0.78      1000
           7       0.71      0.79      0.75      1000
           8       0.84      0.79      0.82      1000
           9       0.79      0.79      0.79      1000

    accuracy                           0.71     10000
   macro avg       0.71      0.71      0.71     10000
weighted avg       0.71      0.71      0.71     10000
```

Result: Thus, Object Recognition on available online image datasets was implemented successfully.