Neural Network & Deep Learning Assignment 3
Name : Yamini Radha Veeranki
Student Id : 700741751

```
import numpy as np
from keras.datasets import cifar10
from keras.models import Sequential
from keras.layers import Dense, Dropout, Flatten
from keras.layers.convolutional import Conv2D, MaxPooling2D
from keras.constraints import maxnorm
from keras.utils import np_utils
from keras.optimizers import SGD

# Fix random seed for reproducibility
np.random.seed(7)

# Load data
(X_train, y_train), (X_test, y_test) = cifar10.load_data()

# Normalize inputs from 0-255 to 0.0-1.0
X_train = X_train.astype('float32') / 255.0
X_test = X_test.astype('float32') / 255.0

# One hot encode outputs
y_train = np_utils.to_categorical(y_train)
y_test = np_utils.to_categorical(y_test)
num_classes = y_test.shape[1]

# Create the model
model = Sequential()
model.add(Conv2D(32, (3, 3), input_shape=(32, 32, 3), padding='same', activation='relu'))
model.add(Dropout(0.2))
model.add(Conv2D(32, (3, 3), activation='relu', padding='same'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Conv2D(64, (3, 3), activation='relu', padding='same'))
model.add(Dropout(0.2))
model.add(Conv2D(64, (3, 3), activation='relu', padding='same'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Conv2D(128, (3, 3), activation='relu', padding='same'))
model.add(Dropout(0.2))
model.add(Conv2D(128, (3, 3), activation='relu', padding='same'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten())
model.add(Dropout(0.2))
model.add(Dense(1024, activation='relu'))
model.add(Dropout(0.2))
model.add(Dense(512, activation='relu'))
model.add(Dropout(0.2))
model.add(Dense(num_classes, activation='softmax'))
```

Neural Network & Deep Learning Assignment 3

Name : Yamini Radha Veeranki

Student Id : 700741751

```
# Compile model
epochs = 5
learning_rate = 0.01
decay_rate = learning_rate / epochs
sgd = SGD(lr=learning_rate, momentum=0.9, decay=decay_rate, nesterov=False)
model.compile(loss='categorical_crossentropy', optimizer=sgd, metrics=['accuracy'])
print(model.summary())

# Fit the model
history = model.fit(X_train, y_train, validation_data=(X_test, y_test), epochs=epochs, batch_size=32)

# Evaluate the model
scores = model.evaluate(X_test, y_test, verbose=0)
print("Accuracy: %.2f%%" % (scores[1] * 100))
```

```
# Predict the first 4 images of the test data
predictions = model.predict(X_test[:4])

# Convert the predictions to class labels
predicted_labels = np.argmax(predictions, axis=1)

# Convert the actual labels to class labels
actual_labels = np.argmax(y_test[:4], axis=1)

# Print the predicted and actual labels for the  first 4 images
print("Predicted labels:", predicted_labels)
print("Actual labels:", actual_labels)
```

```
1/1 [==============================] - 0s 18ms/step
Predicted labels: [3 1 8 8]
Actual labels: [3 8 8 0]
```

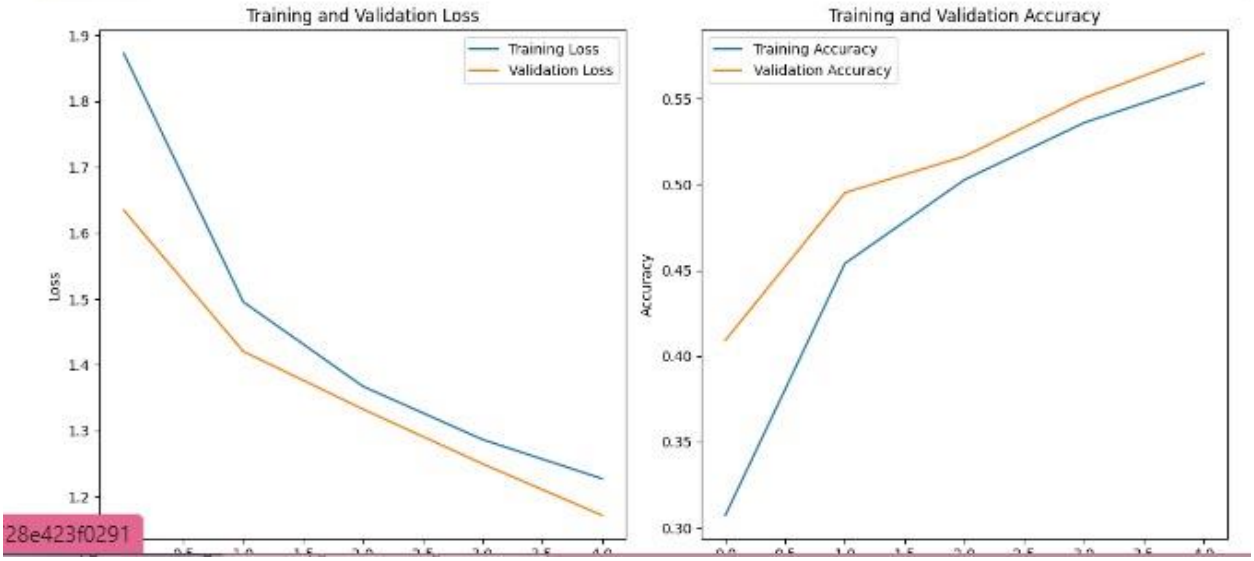
Neural Network & Deep Learning Assignment 3
Name : Yamini Radha Veeranki
Student Id : 700741751

```
import matplotlib.pyplot as plt

# Plot the training and validation loss
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.title('Training and Validation Loss')
plt.legend()

# Plot the training and validation accuracy
plt.subplot(1, 2, 2)
plt.plot(history.history['accuracy'], label='Training Accuracy')
plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.title('Training and Validation Accuracy')
plt.legend()

plt.tight_layout()
plt.show()
```



GitHub link: https://github.com/Yaminiradha/NN_700741751_ICP3

Video Link: https://drive.google.com/file/d/18J8amae1gjYY_aeikrKBEI6p-OCPc907/view?usp=drive_link