Roll Number: 210701112

Exp No: 3 BUILD A CONVOLUTIONAL NEURAL NETWORK

Aim:

To build a simple convolutional neural network with Keras/TensorFlow.

Procedure:

1. Download and load the dataset.
2. Perform analysis and preprocessing of the dataset.
3. Build a simple neural network model using Keras/TensorFlow.
4. Compile and fit the model.
5. Perform prediction with the test dataset.
6. Calculate performance metrics.

Program:

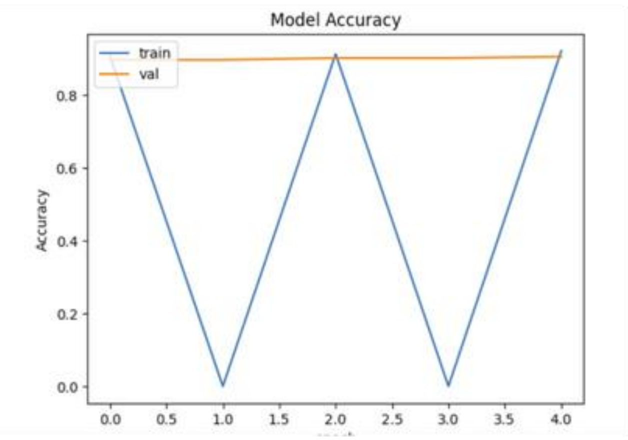
```
# To load the mnist data
from keras.datasets import fashion_mnist
from tensorflow.keras.models import Sequential


# importing various types of hidden layers
from tensorflow.keras.layers import Conv2D, MaxPooling2D,\
Dense, Flatten

# Adam optimizer for better LR and less loss
from tensorflow.keras.optimizers import Adam
import matplotlib.pyplot as plt
import numpy as np
# Split the data into training and testing
(trainX, trainy), (testX, testy) = fashion_mnist.load_data()

# Print the dimensions of the dataset
print('Train: X = ', trainX.shape)
```

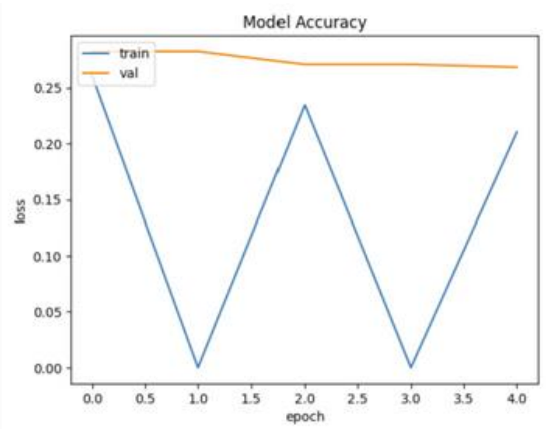
```
print('Test: X = ', testX.shape)
def model_arch():
    models = Sequential()

    # We are learning 64
    # filters with a kernal size of 5x5
    models.add(Conv2D(64, (5, 5),
                      padding="same",
                      activation="relu",
                      input_shape=(28, 28, 1)))

    # Max pooling will reduce the
    # size with a kernal size of 2x2
    models.add(MaxPooling2D(pool_size=(2, 2)))
    models.add(Conv2D(128, (5, 5), padding="same",
                      activation="relu"))

    models.add(MaxPooling2D(pool_size=(2, 2)))
     models.add(Conv2D(256, (5, 5), padding="same",
                      activation="relu"))

    models.add(MaxPooling2D(pool_size=(2, 2)))

    # Once the convolutional and pooling
    # operations are done the layer
    # is flattened and fully connected layers
    # are added
    models.add(Flatten())
    models.add(Dense(256, activation="relu"))
```

```
        # Finally as there are total 10
        # classes to be added a FCC layer of
        # 10 is created with a softmax activation
        # function
        models.add(Dense(10, activation="softmax"))
        return models


model = model_arch()
model.compile(optimizer=Adam(learning_rate=1e-3),
                    loss='sparse_categorical_crossentropy',
                    metrics=['sparse_categorical_accuracy'])
model.summary()
history = model.fit(
        trainX.astype(np.float32), trainy.astype(np.float32),
        epochs=5,
        steps_per_epoch=50,
        validation_split=0.33
)
# Accuracy vs Epoch plot
plt.plot(history.history['sparse_categorical_accuracy'])
plt.plot(history.history['val_sparse_categorical_accuracy'])
plt.title('Model Accuracy')
plt.ylabel('Accuracy')
plt.xlabel('epoch')
plt.legend(['train', 'val'], loc='upper left')
plt.show()

# Loss vs Epoch plot
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
```

```
plt.title('Model Accuracy')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.legend(['train', 'val'], loc='upper left')
plt.show()


# There are 10 output labels for the
# Fashion MNIST dataset
labels = ['t_shirt', 'trouser', 'pullover',
                    'dress', 'coat', 'sandal', 'shirt',
                    'sneaker', 'bag', 'ankle_boots']
# Make a prediction
predictions = model.predict(testX[:1])
label = labels[np.argmax(predictions)]
print(label)
plt.imshow(testX[:1][0])
plt.show()
```

Output:





Result:

CNN has been successfully built using the provided resources.