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 datasetprint('Train:

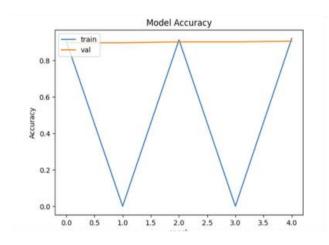
X = ', trainX.shape)

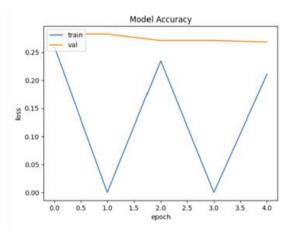
```
print('Test: X = ', testX.shape)
def model_arch():
        models = Sequential()
        # We are learning 64
        # filters with a kernal size of 5x5
        models.add(Conv2D(64, (5, 5),
                                       padding="same",
                                       activation="relu",
                                       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"))
```

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# 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.