Assignment No:12

Title:Implementation of CNN using Tensor Flow/Pytorch.

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```python
In [2]: import tensorflow as tf
        from tensorflow.keras.datasets import mnist
        from tensorflow.keras.models import Sequential
        from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense
        from tensorflow.keras.utils import to_categorical
```

```python
In [4]: (X_train, y_train), (X_test, y_test) = mnist.load_data()
        X_train = X_train.reshape(-1, 28, 28, 1) / 255.0
        X_test = X_test.reshape(-1, 28, 28, 1) / 255.0
        y_train = to_categorical(y_train)
        y_test = to_categorical(y_test)
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 ──────────────────── 3s 0us/step
```

```python
In [8]: model = Sequential([
        Conv2D(32, (3, 3), activation='relu', input_shape=(28, 28, 1)),
        MaxPooling2D((2, 2)),
        Conv2D(64, (3, 3), activation='relu'),
        MaxPooling2D((2, 2)),
        Conv2D(64, (3, 3), activation='relu'), Flatten(),
        Dense(64, activation='relu'), Dense(10, activation='softmax')
        ])
```

```python
In [10]: model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
         model.fit(X_train, y_train, batch_size=64, epochs=10, verbose=1)
         loss, accuracy = model.evaluate(X_test, y_test)
         print(f"Test Loss: {loss}")
         print(f"Test Accuracy: {accuracy}")
```

```
Epoch 1/10
938/938 ──────────────────── 19s 16ms/step - accuracy: 0.8715 - loss: 0.4178
Epoch 2/10
938/938 ──────────────────── 18s 19ms/step - accuracy: 0.9829 - loss: 0.0551
Epoch 3/10
938/938 ──────────────────── 18s 19ms/step - accuracy: 0.9874 - loss: 0.0372
Epoch 4/10
938/938 ──────────────────── 15s 16ms/step - accuracy: 0.9922 - loss: 0.0247
Epoch 5/10
938/938 ──────────────────── 18s 19ms/step - accuracy: 0.9927 - loss: 0.0209
Epoch 6/10
938/938 ──────────────────── 18s 19ms/step - accuracy: 0.9949 - loss: 0.0167
Epoch 7/10
938/938 ──────────────────── 16s 17ms/step - accuracy: 0.9957 - loss: 0.0129
Epoch 8/10
938/938 ──────────────────── 18s 19ms/step - accuracy: 0.9963 - loss: 0.0118
Epoch 9/10
938/938 ──────────────────── 18s 19ms/step - accuracy: 0.9968 - loss: 0.0100
Epoch 10/10
938/938 ──────────────────── 16s 17ms/step - accuracy: 0.9974 - loss: 0.0076
313/313 ──────────────────── 2s 5ms/step - accuracy: 0.9895 - loss: 0.0430
Test Loss: 0.031514186412096024
Test Accuracy: 0.9919000267982483
```

```
In [ ]:
```

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