Assignment No:13

Title:Implementation of MNIST Handwritten Character Detection using Tensor Flow, Pytorch and Keras.

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In [2]:
```
import tensorflow as tf
from tensorflow.keras.datasets import mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Flatten
from tensorflow.keras.optimizers import Adam
```

In [4]:
```
# Load and preprocess the MNIST dataset
(X_train, y_train), (X_test, y_test) = mnist.load_data()
X_train = X_train / 255.0
X_test = X_test / 255.0
```

In [8]:
```
# Define the model architecture
model = Sequential([Flatten(input_shape=(28, 28)), Dense(128, activation='relu'), Dense(10, activation='softmax
```

In [10]:
```
# Compile the model
model.compile(optimizer=Adam(learning_rate=0.001),
loss='sparse_categorical_crossentropy', metrics=['accuracy'])
```

In [12]:
```
# Train the model
model.fit(X_train, y_train, batch_size=64, epochs=10, verbose=1)
```

```
Epoch 1/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 5s 3ms/step - accuracy: 0.8643 - loss: 0.5041
Epoch 2/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 3s 3ms/step - accuracy: 0.9585 - loss: 0.1459
Epoch 3/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 3s 4ms/step - accuracy: 0.9708 - loss: 0.0979
Epoch 4/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 3s 4ms/step - accuracy: 0.9807 - loss: 0.0694
Epoch 5/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 4s 4ms/step - accuracy: 0.9842 - loss: 0.0548
Epoch 6/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 4s 4ms/step - accuracy: 0.9871 - loss: 0.0434
Epoch 7/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 3s 4ms/step - accuracy: 0.9899 - loss: 0.0346
Epoch 8/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 4s 4ms/step - accuracy: 0.9925 - loss: 0.0282
Epoch 9/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 4s 4ms/step - accuracy: 0.9938 - loss: 0.0228
Epoch 10/10
938/938 ━━━━━━━━━━━━━━━━━━━━ 3s 4ms/step - accuracy: 0.9951 - loss: 0.0189
```

Out[12]:
```
<keras.src.callbacks.history.History at 0x1e19bcce6f0>
```

In [14]:
```
# Evaluate the model
loss, accuracy = model.evaluate(X_test, y_test)
print(f"Test Loss: {loss}")
print(f"Test Accuracy: {accuracy}")
```

```
313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 3ms/step - accuracy: 0.9748 - loss: 0.0854
Test Loss: 0.07652799040079117
Test Accuracy: 0.977400004863739
```

In [ ]: