Datasets -:

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Handwritten Digit Recognition with LeNet5 Model in PyTorch, in this project the best supported datasets can be MNIST and EMNIST

MNIST(default) -

The MNIST dataset (Modified National Institute of Standards and Technology) is a large collection of handwritten digits that is commonly used for training various image processing systems. Here are the key characteristics of the MNIST dataset:

1. Content: The dataset contains images of handwritten digits from 0 to 9.

2. Size: It consists of 70,000 images in total, with 60,000 images for training and 10,000 images for testing.

3. Image Details:
   - Each image is a grayscale image of size 28x28 pixels.
   - Each pixel has a value ranging from 0 to 255, where 0 represents black and 255 represents white, with varying shades of gray in between.

4. Labeling: Each image is labeled with the corresponding digit it represents (0 through 9).

5. Usage: The dataset is used for training and evaluating various machine learning models, particularly in the field of image recognition. It's especially popular for testing the performance of convolutional neural networks (CNNs).

The MNIST dataset is widely regarded as the "hello world" of machine learning and computer vision because of its simplicity and the ease with which models can achieve high accuracy on it. This makes it an excellent starting point for those new to machine learning and neural networks.

Links to download:-

Using official website:
http://yann.lecun.com/exdb/mnist/

Using TensorFlow: TensorFlow provides a simple way to download and load the MNIST dataset.

```
import tensorflow as tf

(x_train, y_train), (x_test,
y_test) =
tf.keras.datasets.mnist.load_data()
```

Using PyTorch: Similarly, PyTorch offers an easy-to-use interface for downloading and loading MNIST.

```
from torchvision import datasets,
transforms

train_dataset =
datasets.MNIST(root='mnist_data/',
train=True,
transform=transforms.ToTensor(),
download=True)
test_dataset =
datasets.MNIST(root='mnist_data/',
train=False,
transform=transforms.ToTensor(),
download=True)
```

Using Kaggle :
https://www.kaggle.com/datasets/oddrationale/mnist-in-csv

Using github : https://git-disl.github.io/GTDLBench/datasets/mnist_datasets/

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EMNIST(Extended MNIST)

EMNIST (Extended MNIST) is a dataset developed as an extension of the popular MNIST dataset. While MNIST contains images of handwritten digits (0-9), EMNIST expands this to include handwritten letters, both uppercase and lowercase, along with digits. The dataset is designed for use in training and evaluating machine learning models for tasks such as image classification and pattern recognition.

The EMNIST dataset is divided into several different splits to support a variety of tasks:

1. ByClass: Contains balanced examples of each class (62 classes: 10 digits + 52 letters).
2. ByMerge: Merges some similar-looking classes (47 classes).
3. Balanced: A balanced set of letters and digits (47 classes).
4. Digits: Similar to the original MNIST dataset, only digits (10 classes).
5. Letters: Only the letters (26 classes).
6. MNIST: A direct copy of the original MNIST dataset (10 classes).

EMNIST is useful for more complex handwritten text recognition tasks, going beyond just digits to include alphabetic characters, providing a more comprehensive dataset for training models.

Links to download:

Using Cohen Institute for Intelligent information (official):
https://rds.westernsydney.edu.au/Institutes/MARCS/BENS/EMNIST/emnist-gzip.zip

Using NIST (National Institute of standards and technology) :
https://www.nist.gov/itl/products-and-services/emnist-dataset

Using tensorflow_datasets:
We can use the tensorflow_datasets library, which provides a simple interface to download and load the dataset:

```
import tensorflow as tf
import tensorflow_datasets as tfds

# Load the EMNIST dataset
(train_data, test_data), info =
tfds.load(
    'emnist',
    split=['train', 'test'],
    with_info=True,
    as_supervised=True,
)

# Print dataset information
print(info)
```

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Kuzushiji-MNIST (KMNIST)
(Not suitable)

KMNIST is a dataset for the classification of cursive Japanese characters.

- Description: It contains 70,000 images of 10 classes (28x28 grayscale images).

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Fashion-MNIST
(Not suitable)

Fashion-MNIST is a dataset of Zalando’s article images, intended as a drop-in replacement for the original MNIST dataset for benchmarking machine learning algorithms.

- Description: It contains 70,000 grayscale images of 10 fashion categories (28x28 pixels).(not suitable)

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Other datasets can be omniglot ,CIFAR-10 which are also not used for handwritten digit recognition although omniglot can still be used but not an ideal option.