

Dataset size:

There are three datasets for this stage of the project: MNIST, ORL and CIFAR, which are all image datasets.

MNIST (gray image)

Training set size: 60,000, testing set size: 10,000, number of classes: 10. Each instance is a 28x28 gray image, and will have one single class label denoted by an integer from {0, 1, ..., 9}.

ORL (gray image)

Training set size: 360, testing set size: 40, number of classes: 40. Each instance is a 112x92 gray image, and will have one single class label denoted by an integer from {1, 2, ..., 39, 40}.

CIFAR (color image)

Training set size: 50,000, testing set size: 10,000, number of classes: 10. Each instance is a 32x32 color image, and will have one single label denoted by an integer from {0, 1, 2, ..., 9}.

Dataset organization:

These dataset are organized as with a dictionary data structure in Python as follows:

```
{
  'train': [
    {'image': a matrix/tensor representing a image, 'label': an integer representing the label}
    {'image': a matrix/tensor representing a image, 'label': an integer representing the label}
    ...
    {'image': a matrix/tensor representing a image, 'label': an integer representing the label}
  ]
  'test': [
    {'image': a matrix/tensor representing a image, 'label': an integer representing the label}
    {'image': a matrix/tensor representing a image, 'label': an integer representing the label}
    ...
    {'image': a matrix/tensor representing a image, 'label': an integer representing the label}
  ]
}
```

Dataset visualization:

You can load and show the dataset with the following code (it requires the matplotlib toolkit installed in pycharm).

```
import pickle
import matplotlib.pyplot as plt

if 1:
    f = open('MNIST', 'rb') # or change MNIST to other dataset names
    data = pickle.load(f)
```

```
f.close()
```

```
print('training set size:', len(data['train']), 'testing set size:',  
len(data['test']))
```

```
for pair in data['train']:  
    #for pair in data['test']:  
        plt.imshow(pair['image'], cmap="Greys")  
        plt.show()  
        print(pair['label'])
```

Task To Be Done:

Please train a CNN for these three datasets, respectively, and evaluate its performance on the testing set. Please report your experimental results on all these three datasets.