

## A NOVEL METHOD FOR HANDWRITTEN DIGIT RECOGNITION SYSTEM

### ANALYZING THE DATA

```
print(X_train.shape)
print(X_test.shape)
(60000, 28, 28)
(10000, 28, 28)
X_train[0]
array([[ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  3,
        18, 18, 18, 126, 136, 175, 26, 166, 255, 247, 127,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0,  0, 30, 36, 94, 154, 170,
        253, 253, 253, 253, 253, 225, 172, 253, 242, 195, 64,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0, 49, 238, 253, 253, 253, 253,
        253, 253, 253, 253, 251, 93, 82, 82, 56, 39,  0,  0,  0,
         0,  0],
       [ 0,  0,  0,  0,  0,  0,  0, 18, 219, 253, 253, 253, 253,
        253, 198, 182, 247, 241,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0],
```

[ 0, 0, 0, 0, 0, 0, 0, 0, 80, 156, 107, 253, 253,  
205, 11, 0, 43, 154, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 14, 1, 154, 253,  
90, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 139, 253,  
190, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 11, 190,  
253, 70, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 35,  
241, 225, 160, 108, 1, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
81, 240, 253, 253, 119, 25, 0, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 45, 186, 253, 253, 150, 27, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0, 16, 93, 252, 253, 187, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 0, 0, 0, 249, 253, 249, 64, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0, 46, 130, 183, 253, 253, 207, 2, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 39,  
148, 229, 253, 253, 253, 250, 182, 0, 0, 0, 0, 0, 0,  
0, 0],  
[ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 114, 221,  
253, 253, 253, 253, 201, 78, 0, 0, 0, 0, 0, 0,  
0, 0],

```
[ 0,  0,  0,  0,  0,  0,  0,  0, 23, 66, 213, 253, 253,
253, 253, 198, 81,  2,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0],
[ 0,  0,  0,  0,  0,  0, 18, 171, 219, 253, 253, 253, 253,
195, 80,  9,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0],
[ 0,  0,  0,  0, 55, 172, 226, 253, 253, 253, 253, 244, 133,
11,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0],
[ 0,  0,  0,  0, 136, 253, 253, 253, 212, 135, 132, 16,  0,
 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0],
[ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0],
[ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0],
[ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
 0,  0]], dtype=uint8)
```

```
y_train[0]
```

```
5
```

```
plt.imshow(X_train[0])
```

```
plt.imshow(X_train[0])
```

```
<matplotlib.image.AxesImage at 0x7fa4f89ed1d0>
```



