Pandas-MNIST DataSets

December 16, 2020

0.1 Excercise: Pandas

0.1.1 Loading & Visualising MNIST Dataset using Pandas & Matplotlib

[1]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

[2]:
```
df = pd.read_csv('Dataset/mnist_train.csv')
```

[3]:
```
df.shape
```

[3]:
```
(42000, 785)
```

CSV stand for Comma Seperated values files. They are like excel files. This space indicates It has 42000 rows and 785 columns

[4]:
```
df.head(n=3)
```

[4]:
```
   label  pixel0  pixel1  pixel2  pixel3  pixel4  pixel5  pixel6  pixel7  \
0      1       0       0       0       0       0       0       0       0
1      0       0       0       0       0       0       0       0       0
2      1       0       0       0       0       0       0       0       0

   pixel8  …  pixel774  pixel775  pixel776  pixel777  pixel778  pixel779  \
0       0  …         0         0         0         0         0         0
1       0  …         0         0         0         0         0         0
2       0  …         0         0         0         0         0         0

   pixel780  pixel781  pixel782  pixel783
0         0         0         0         0
1         0         0         0         0
2         0         0         0         0

[3 rows x 785 columns]
```

We can see the column name and the zeroth column denote the label.Each row is going to denote a digit. First column denote y and rest are x.

[5]:
```
print(type(df))
```

```
<class 'pandas.core.frame.DataFrame'>
```

0.2 Convert Data Frame Into Numpy Array

[6]:
```
#To convert in numpy array
data = df.values
```

[7]:
```
print(type(data))
print(data.shape)
```

```
<class 'numpy.ndarray'>
(42000, 785)
```

#Seperate Y and X

For a particular y label all the element in rows denote the pixel value for the image

[8]:
```
#X include All the  data excluding the zeroth column
#Y include All the element of only zeroth column
X = data[ : ,1 : ]
Y = data[ : ,0]
```

[9]:
```
print(X.shape,Y.shape)
```

```
(42000, 784) (42000,)
```

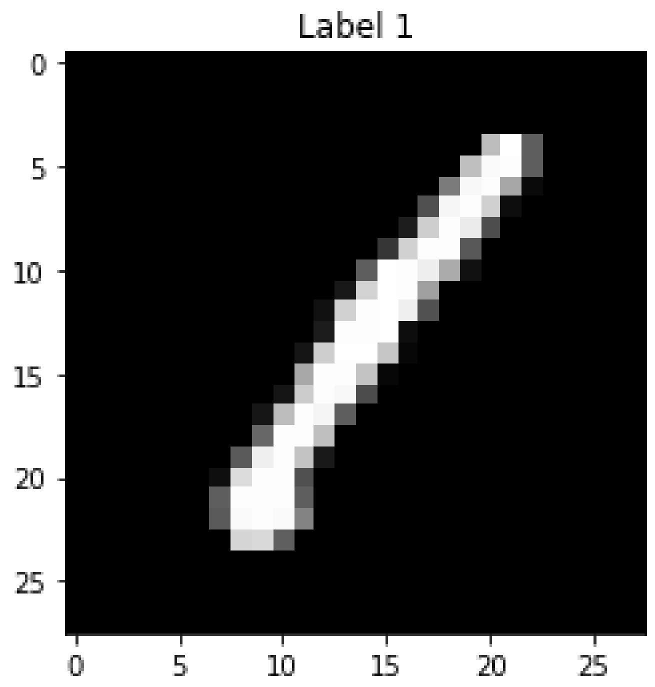
Here X is a 2-d matrix which contains pixel vale and Y is a label

0.3 Try to Visualise One Image

[10]:
```
X[0].shape
```

[10]:
```
(784,)
```

[11]:
```
def drawImg(X,Y,i):
    plt.imshow(X[i].reshape(28,28),cmap='gray')
    plt.title("Label "+str(Y[i]))
    plt.show()
for i in range(1):
    drawImg(X,Y,i)
```



0.4 Split DataSet

Whenever we are given a dataset, we generally keep a small part a dataset for testing & validation and rest of the dataset in training.

[12]:
```
split = int(0.80* X.shape[0])
print(split)
```

```
33600
```

[13]:
```
#First 33600 row willbe for training data.
#Here y is single column so only in row we distribute
X_train,Y_train = X[:split,:],Y[:split]
X_test,Y_test = X[split: , :],Y[split: ]
print(X_train.shape,Y_train.shape)
print(X_test.shape,Y_test.shape)
```

```
(33600, 784) (33600,)
(8400, 784) (8400,)
```

Sometimes it might be possible that our data isnt randomly shuffles. All the thousand rows are zero and then one and so on.

So if we do this only the last , second last label will go in testing.

0.4.1 Randomization

[14]:
```
import numpy as np
a = np.array([1,2,3,4,5])
np.random.shuffle(a)

print(a)
```

```
[1 4 2 5 3]
```

[15]:
```
# Shuffle a 2-d Array
# See the rows are only shuffled but the values within rows aren't interchanged
a = np.array([[1,2,3],[5,6,7],[8,9,10]])
np.random.shuffle(a)
print(a)
```

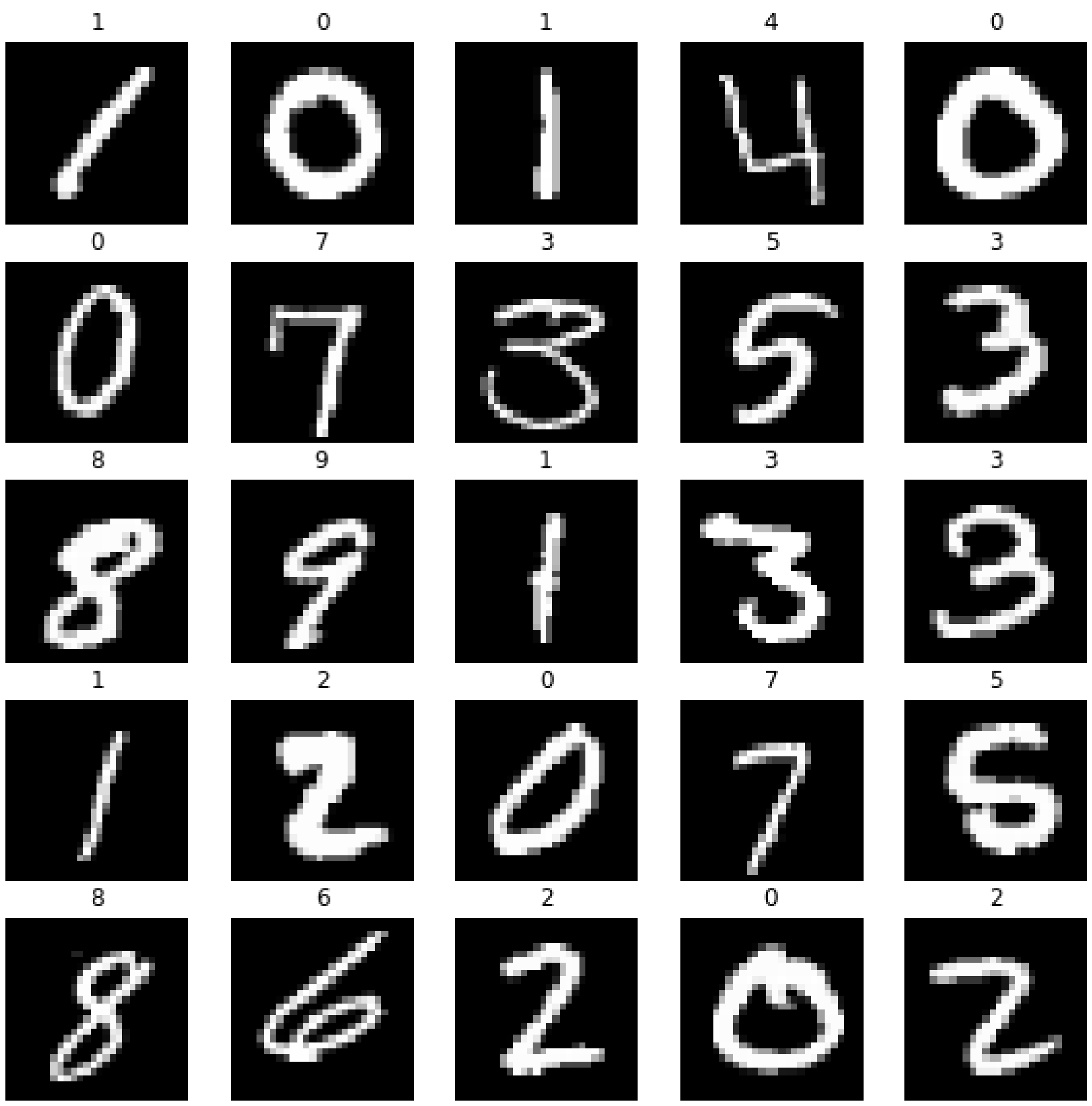
```
[[ 5  6  7]
 [ 8  9 10]
 [ 1  2  3]]
```

So in case datasets are not randomly shuffled we can shuffle it first then divide it in X and Y. **I repeat first shuffle it then divide it into X and Y because X and Y are mapped with labels**

0.5 Try to Plot a Visualisation

In matplotlib there is a concept of subplot. You can divide the big plotting area into small plotting area.

[16]:
```
#5*5 grid we are making i.e 5 rows and 5 columns
# and index of first image will 1 so we add 1
plt.figure(figsize=(10,10))
for i in range(25):
    plt.subplot(5,5,i+1)
    plt.imshow(X_train[i].reshape(28,28),cmap='gray')
    plt.title(Y_train[i])
    plt.axis("off")
```



0.6 If you dont want to do train and test split manually

So for that we can use sklearn library . It is library function to do this and it return 4 things.

[17]:
```python
from sklearn.model_selection import train_test_split

XT,Xt,YT,Yt = train_test_split(X,Y,test_size=0.2,random_state=5)
print(XT.shape,YT.shape)
print(Xt.shape,Yt.shape)
```

```
(33600, 784) (33600,)
(8400, 784) (8400,)
```

If we want a consistent dataset for train and test we can use this random_state=5 . So shuffling will be same type everytime. Kind of seed value used in random shuffling

[ ]:
```
```