```python
from keras.datasets import mnist
import matplotlib.pyplot as plt
import numpy as np
from random import randint

def img_plt(images, labels):
  plt.figure()
  for i in range(1,11):
    plt.subplot(2,5,i)
    plt.imshow(images[i-1,:,:],cmap='gray')
    plt.title('Label: ' + str(labels[i-1]))
  plt.show()
```

```python
(x_train, y_train), (x_test, y_test) = mnist.load_data()

print('The number of images in training set is',x_train.shape[0])
print('The number of images in testing set is',x_test.shape[0])
```

```
    The number of images in training set is 60000
    The number of images in testing set is 10000
```

```python
x_train_01=x_train[np.logical_or(y_train==blank1,y_train==blank2),:,:]
y_train_01=y_train[np.logical_or(y_train==blank3,y_train==blank4)]

img_plt(x_train_01[0:10, blank5:blank6, blank7:blank8],y_train_01[0:10])
print(np.sum(x_train_01[0 ,blank5:blank6, blank7:blank8]))
#calculate the attributes
features = np.sum(x_train_01[:,blank5:blank6, blank7:blank8], axis=2)/blank9
print(features.shape)
```



```
    3085
    (12700, 5)
```
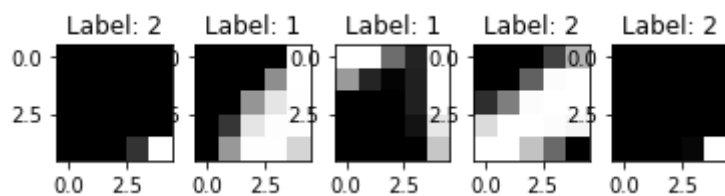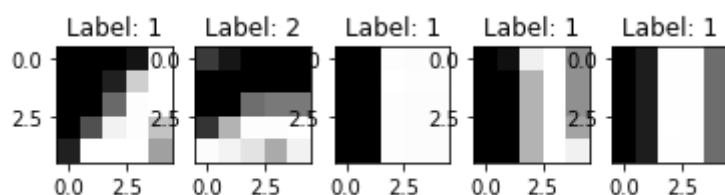
```python
avg = np.zeros((x_train_01.shape[0],))
for i in range(len(x_train_01)):
```

```python
    avg[i]=np.sum(x_train_01[i,blank5:blank6, blank7:blank8])/blank9
print(avg)
```

```
    [123.4  102.44 151.56 ...  11.36   0.52  77.44]
```

```python
#Creating validation set
num_train_img=x_train.shape[0]
train_ind=np.arange(0,num_train_img)
train_ind_s=np.random.permutation(train_ind)


#20% of the training set -> validation set
x_valid=x_train[train_ind_s[0:int(blank10*num_train_img)],:,:]
y_valid=y_train[train_ind_s[0:int(blank11*num_train_img)]]

#The rest of the training set
x_train=x_train[train_ind_s[int(blank12*num_train_img):],:,:]
y_train=y_train[train_ind_s[int(blank13*num_train_img):]]


print('The number of images in training set is',x_train.shape[0])
print('The number of images in validation set is',x_valid.shape[0])
print('The number of images in testing set is',x_test.shape[0])
```

```
    The number of images in training set is 29400
    The number of images in validation set is 12600
    The number of images in testing set is 10000
```

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