SVM on mnist dataset

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In [1]:

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

```
Using TensorFlow backend.
```

In [2]:

```
(X_train,y_train),(X_test,y_test)=mnist.load_data()
```

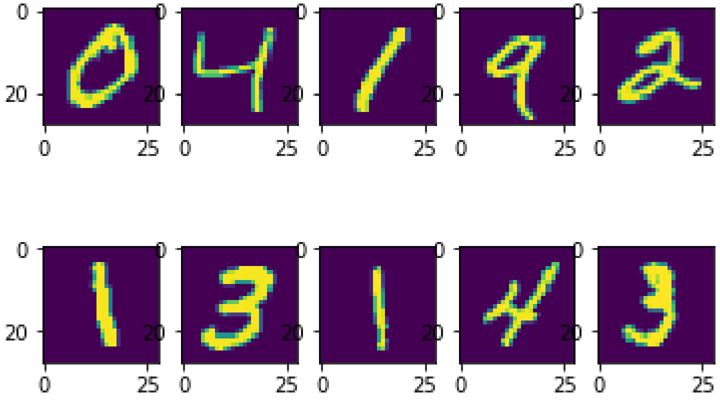
In [3]:

```
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(60000, 28, 28)
(10000, 28, 28)
(60000,)
(10000,)
```

In [4]:

```
for i in range(1,11):
    plt.subplot(2,5,i)
    plt.imshow(X_train[i].reshape([28,28]))
```



In [5]:

```
X_train = X_train.reshape(60000,28*28)
X_test = X_test.reshape(10000,28*28)
```

In [6]:

```
print(X_train.shape)
print(X_test.shape)
```

```
(60000, 784)
(10000, 784)
```

Normlization

In [7]:

```
from sklearn.preprocessing import StandardScaler
```

In [8]:

```
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)
```

Training only 60000 training data

In [9]:

```
from sklearn.svm import SVC
classifier = SVC(kernel='rbf',random_state= 0,gamma='auto')
```

In [10]:

```
import time
start = time.time()
classifier.fit(X_train,y_train)
end = time.time()
print(round((end-start)/60,2)," Mint to train 60000 datasets")
```

```
9.28  Mint to train 60000 datasets
```

Predicting on 10000 test set images

In [11]:

```
start = time.time()
y_pred = classifier.predict(X_test)
end = time.time()
print(round((end-start)/60,2)," Mint to predict 10000")
```

```
2.11  Mint to predict 10000
```

Analysis of performance of the SVM

confusion matrix and accuracy

In [15]:

```
from sklearn.metrics import confusion_matrix,accuracy_score
cm = confusion_matrix(y_test,y_pred)
print(cm)
```

```
[[ 968    0    1    1    0    3    3    2    2    0]
 [    0 1126    3    0    0    1    3    0    2    0]
 [    6    1  994    3    2    0    1   15    9    1]
 [    0    0    4  979    1    7    0   12    7    0]
 [    0    0   11    0  945    2    4    7    3   10]
 [    2    0    1   10    2  855    6    7    7    2]
 [    6    2    1    0    4    8  931    2    4    0]
 [    1    6   14    2    3    0    0  989    0   13]
 [    3    0    4    6    6   11    3   11  927    3]
 [    4    6    4   11   12    1    0   17    3  951]]
```

In [16]:

```
accuracy = accuracy_score(y_test,y_pred)
print(round(accuracy*100,2),'% Accuracy')
```

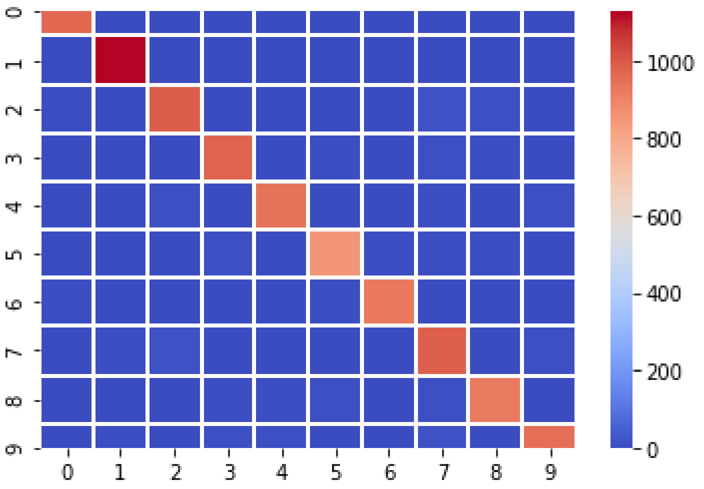
```
96.65 % Accuracy
```

In [17]:

```
import seaborn as sns
sns.heatmap(cm,cmap='coolwarm',linewidth=1)
```

Out[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x23edecae608>
```

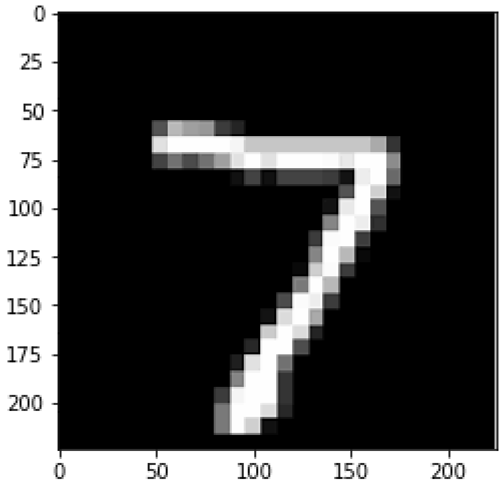


When I train whole 60,000 training set 96.65% accuracy was achieved and on training 6000 we have acheved accuracy of 92%

```
In [19]: seven = plt.imread("seven.png")
```

```
In [21]: plt.imshow(seven)
```

```
Out[21]: <matplotlib.image.AxesImage at 0x23edef92648>
```


0
25
50
75
100
125
150
175
200
0
50
100
150
200