In [77]:
```
from sklearn.datasets import load_digits
from sklearn.model_selection import train_test_split
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn import metrics
%matplotlib inline
digits = load_digits()
```

In [78]:
```
print("Image Data Shape",digits.data.shape)
print("Label Data Shape",digits.target.shape)
```

```
Image Data Shape (1797, 64)
Label Data Shape (1797,)
```

In [79]:
```
plt.figure(figsize=(20,4))
for index,(image, label) in enumerate(zip(digits.data[0:10], digits.target[0:10])):
    plt.subplot(1,10,index+1)
    plt.imshow(np.reshape(image,(8,8)),cmap=plt.cm.gray)
    plt.title('Training: %i\n' % label, fontsize=20)
```

In [81]:
```
X_train,X_test,Y_train,Y_test = train_test_split(digits.data,digits.target,test_size=0.2
,random_state=2)
```

In [82]:
```
print(X_train.shape)
print(Y_train.shape)
print(X_test.shape)
print(Y_test.shape)
```

```
(1437, 64)
(1437,)
(360, 64)
(360,)
```

In [83]:
```
from sklearn.linear_model import LogisticRegression
regressor=LogisticRegression()
regressor.fit(X_train,Y_train)
```

```
C:\Users\G.SAI KRISHNA\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:76
2: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

Out[83]:
```
LogisticRegression()
```

In [84]:
```
print(regressor.predict(X_test))
```

```
[4 0 9 1 8 7 1 5 1 6 6 7 6 1 5 5 8 6 2 7 4 6 4 1 5 2 9 5 4 6 5 6 3 4 0 9 9
 8 4 6 8 8 5 7 9 8 9 6 1 7 0 1 9 7 3 3 1 8 8 8 9 8 5 8 4 9 3 5 8 4 3 9 3 8
 7 3 3 0 8 7 2 8 5 3 8 7 6 4 6 2 2 0 1 1 5 3 5 7 1 8 2 2 6 4 6 7 3 7 3 9 4
 7 0 3 5 8 5 0 3 9 2 7 3 2 0 8 1 9 2 1 5 1 0 3 4 3 0 8 3 2 2 7 3 1 6 7 2 8
 3 1 1 6 4 8 2 1 8 4 1 3 1 1 9 5 4 8 7 4 8 9 5 7 6 9 4 0 4 0 0 9 0 6 5 8 8
 3 7 9 2 0 8 2 7 3 0 2 1 5 2 7 0 6 9 3 3 1 3 5 2 8 5 2 1 2 9 4 6 5 5 5 9 7
 1 5 9 6 3 7 1 7 5 1 7 2 7 5 5 4 8 6 6 2 8 7 3 7 8 0 3 5 7 4 3 4 1 0 3 3 5
 4 1 3 1 2 5 1 4 0 3 1 5 5 7 4 0 1 0 9 5 5 5 4 0 1 8 6 2 1 1 1 7 9 6 7 9 7
 0 4 9 6 9 2 7 2 1 0 8 2 8 6 5 7 8 4 5 7 8 6 4 2 6 9 3 0 0 8 0 6 6 7 1 4 5
 6 9 7 2 8 5 1 2 4 1 8 8 7 6 0 8 0 6 1 5 7 8 0 4 1 4 5]
```

In [85]:
```
predictions = regressor.predict(X_test)
```

In [86]:
```
score = regressor.score(X_test,Y_test)
print(score)
```

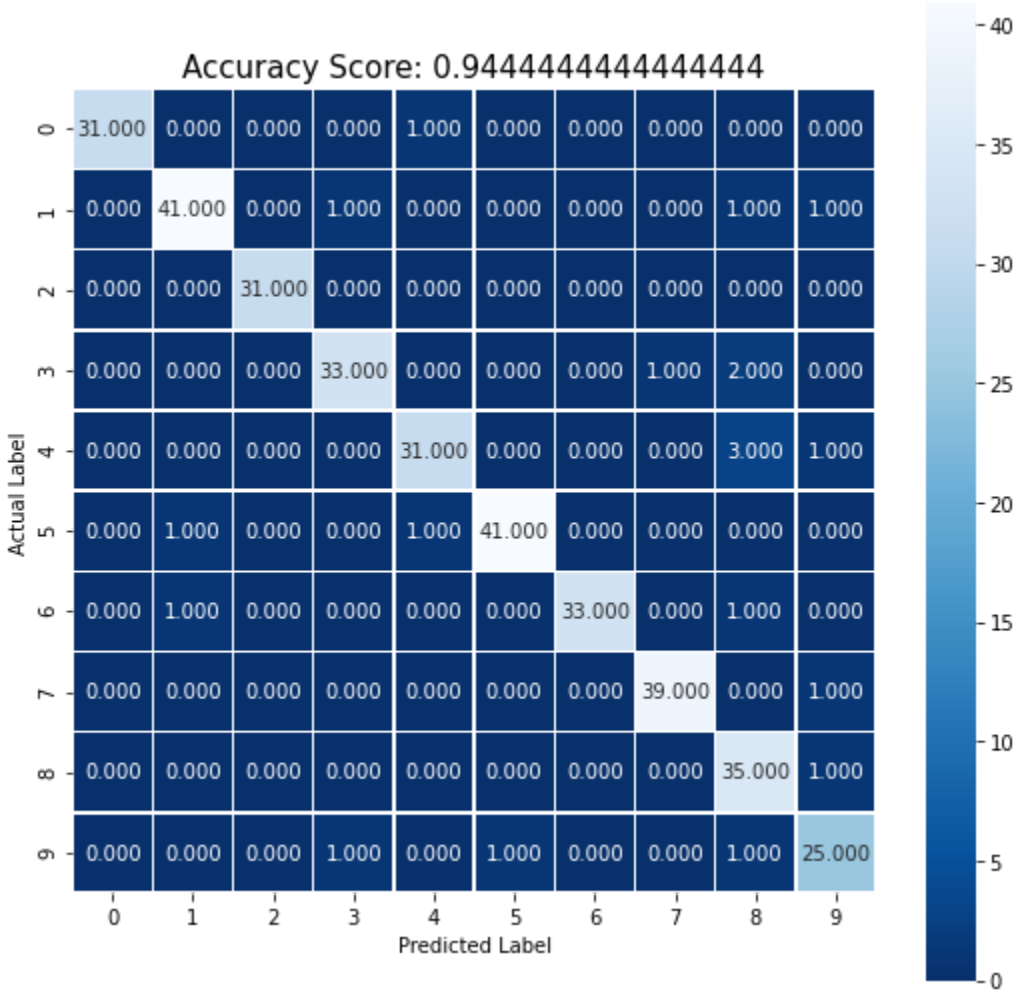
```
0.9444444444444444
```

In [87]:
```
cm = metrics.confusion_matrix(Y_test, predictions)
print(cm)
```

```
[[31  0  0  0  1  0  0  0  0  0]
 [ 0 41  0  1  0  0  0  0  1  1]
 [ 0  0 31  0  0  0  0  0  0  0]
 [ 0  0  0 33  0  0  0  1  2  0]
 [ 0  0  0  0 31  0  0  0  3  1]
 [ 0  1  0  0  1 41  0  0  0  0]
 [ 0  1  0  0  0  0 33  0  1  0]
 [ 0  0  0  0  0  0  0 39  0  1]
 [ 0  0  0  0  0  0  0  0 35  1]
 [ 0  0  0  1  0  1  0  0  1 25]]
```

In [88]:
```
plt.figure(figsize=(9,9))
sns.heatmap(cm, annot=True, fmt=".3f", linewidth=.5,square=True, cmap="Blues_r")
plt.xlabel('Predicted Label')
plt.ylabel('Actual Label')
all_sample_title = 'Accuracy Score: {0}'.format(score)
plt.title(all_sample_title,size=15)
```

Out[88]:
```
Text(0.5, 1.0, 'Accuracy Score: 0.9444444444444444')
```



In [89]:
```
index = 0
missClassifiedIndex = []
for predict,actual in zip(predictions,Y_test):
    if predict==actual:
        missClassifiedIndex.append(index)
    index+=1
plt.figure(figsize=(20,3))
for plotIndex,wrong in enumerate(missClassifiedIndex[0:5]):
    plt.subplot(1,5,plotIndex+1)
    plt.imshow(np.reshape(X_test[wrong],(8,8)),cmap=plt.cm.gray)
    plt.title("Predicted: {},Actual: {}".format(predictions[wrong],Y_test[wrong]))
```