In [1]:
```
import pandas as pd
from sklearn.datasets import load_digits
digits = load_digits()
```

In [3]:
```
digits.target
```

Out[3]:
```
array([0, 1, 2, ..., 8, 9, 8])
```

In [4]:
```
dir(digits)
```

Out[4]:
```
['DESCR', 'data', 'feature_names', 'frame', 'images', 'target', 'target_names']
```

In [5]:
```
digits.target_names
```

Out[5]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

In [9]:
```
df = pd.DataFrame(digits.data,digits.target)
df.head(10)
```

Out[9]:

	0	1	2	3	4	5	6	7	8	9	...	54	55	56	57	58	59	60	61	62	63
0	0.0	0.0	5.0	13.0	9.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	6.0	13.0	10.0	0.0	0.0	0.0
1	0.0	0.0	0.0	12.0	13.0	5.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	11.0	16.0	10.0	0.0	0.0
2	0.0	0.0	0.0	4.0	15.0	12.0	0.0	0.0	0.0	0.0	...	5.0	0.0	0.0	0.0	0.0	3.0	11.0	16.0	9.0	0.0
3	0.0	0.0	7.0	15.0	13.0	1.0	0.0	0.0	0.0	8.0	...	9.0	0.0	0.0	0.0	7.0	13.0	13.0	9.0	0.0	0.0
4	0.0	0.0	0.0	1.0	11.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	2.0	16.0	4.0	0.0	0.0
5	0.0	0.0	12.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	...	4.0	0.0	0.0	0.0	9.0	16.0	16.0	10.0	0.0	0.0
6	0.0	0.0	0.0	12.0	13.0	0.0	0.0	0.0	0.0	0.0	...	8.0	0.0	0.0	0.0	1.0	9.0	15.0	11.0	3.0	0.0
7	0.0	0.0	7.0	8.0	13.0	16.0	15.0	1.0	0.0	0.0	...	0.0	0.0	0.0	0.0	13.0	5.0	0.0	0.0	0.0	0.0
8	0.0	0.0	9.0	14.0	8.0	1.0	0.0	0.0	0.0	0.0	...	8.0	0.0	0.0	0.0	11.0	16.0	15.0	11.0	1.0	0.0
9	0.0	0.0	11.0	12.0	0.0	0.0	0.0	0.0	0.0	2.0	...	4.0	0.0	0.0	0.0	9.0	12.0	13.0	3.0	0.0	0.0

10 rows × 64 columns

In [10]:
```
df['target'] = digits.target
df.head(20)
```

Out[10]:

	0	1	2	3	4	5	6	7	8	9	...	55	56	57	58	59	60	61	62	63	target
0	0.0	0.0	5.0	13.0	9.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	6.0	13.0	10.0	0.0	0.0	0.0	0
1	0.0	0.0	0.0	12.0	13.0	5.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	11.0	16.0	10.0	0.0	0.0	1
2	0.0	0.0	0.0	4.0	15.0	12.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	3.0	11.0	16.0	9.0	0.0	2
3	0.0	0.0	7.0	15.0	13.0	1.0	0.0	0.0	0.0	8.0	...	0.0	0.0	0.0	7.0	13.0	13.0	9.0	0.0	0.0	3
4	0.0	0.0	0.0	1.0	11.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	2.0	16.0	4.0	0.0	0.0	4
5	0.0	0.0	12.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	9.0	16.0	16.0	10.0	0.0	0.0	5
6	0.0	0.0	0.0	12.0	13.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	1.0	9.0	15.0	11.0	3.0	0.0	6
7	0.0	0.0	7.0	8.0	13.0	16.0	15.0	1.0	0.0	0.0	...	0.0	0.0	0.0	13.0	5.0	0.0	0.0	0.0	0.0	7
8	0.0	0.0	9.0	14.0	8.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	11.0	16.0	15.0	11.0	1.0	0.0	8
9	0.0	0.0	11.0	12.0	0.0	0.0	0.0	0.0	0.0	2.0	...	0.0	0.0	0.0	9.0	12.0	13.0	3.0	0.0	0.0	9
0	0.0	0.0	1.0	9.0	15.0	11.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	1.0	10.0	13.0	3.0	0.0	0.0	0
1	0.0	0.0	0.0	0.0	14.0	13.0	1.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	1.0	13.0	16.0	1.0	0.0	1
2	0.0	0.0	5.0	12.0	1.0	0.0	0.0	0.0	0.0	0.0	...	2.0	0.0	0.0	3.0	11.0	8.0	13.0	12.0	4.0	2
3	0.0	2.0	9.0	15.0	14.0	9.0	3.0	0.0	0.0	4.0	...	0.0	0.0	2.0	12.0	12.0	13.0	11.0	0.0	0.0	3
4	0.0	0.0	0.0	8.0	15.0	1.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	10.0	15.0	4.0	0.0	0.0	4
5	0.0	5.0	12.0	13.0	16.0	16.0	2.0	0.0	0.0	11.0	...	0.0	0.0	4.0	15.0	16.0	2.0	0.0	0.0	0.0	5
6	0.0	0.0	0.0	8.0	15.0	1.0	0.0	0.0	0.0	0.0	...	2.0	0.0	0.0	0.0	7.0	15.0	16.0	11.0	0.0	6
7	0.0	0.0	1.0	8.0	15.0	10.0	0.0	0.0	0.0	3.0	...	0.0	0.0	0.0	0.0	11.0	9.0	0.0	0.0	0.0	7
8	0.0	0.0	10.0	7.0	13.0	9.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	11.0	14.0	5.0	0.0	0.0	0.0	8
9	0.0	0.0	6.0	14.0	4.0	0.0	0.0	0.0	0.0	0.0	...	2.0	0.0	0.0	7.0	16.0	16.0	13.0	11.0	1.0	9

20 rows × 65 columns

In [11]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(df.drop('target',axis='columns'), df.target, test_size=0.3, random_state
In [12]: from sklearn.neighbors import KNeighborsClassifier
         knn = KNeighborsClassifier(n_neighbors=5)
```

```
In [13]: len(X_train)

Out[13]: 1257
```

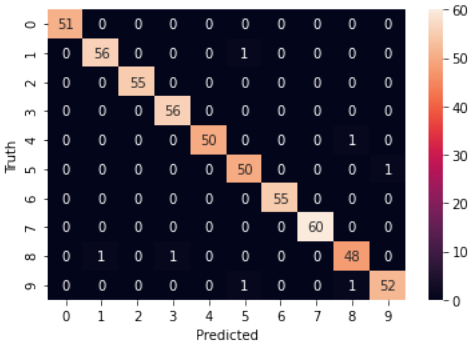
```
In [14]: len(X_test)

Out[14]: 540
```

```
In [16]: knn.fit(X_train,y_train)

Out[16]: KNeighborsClassifier()
```

```
In [17]: knn.score(X_test,y_test)

Out[17]: 0.987037037037037
```

```
In [19]: from sklearn.metrics import confusion_matrix
         y_pred = knn.predict(X_test)
         cm = confusion_matrix(y_test,y_pred)
         cm

Out[19]: array([[51,  0,  0,  0,  0,  0,  0,  0,  0,  0],
                [ 0, 56,  0,  0,  0,  1,  0,  0,  0,  0],
                [ 0,  0, 55,  0,  0,  0,  0,  0,  0,  0],
                [ 0,  0,  0, 56,  0,  0,  0,  0,  0,  0],
                [ 0,  0,  0,  0, 50,  0,  0,  0,  1,  0],
                [ 0,  0,  0,  0,  0, 50,  0,  0,  0,  1],
                [ 0,  0,  0,  0,  0,  0, 55,  0,  0,  0],
                [ 0,  0,  0,  0,  0,  0,  0, 60,  0,  0],
                [ 0,  1,  0,  1,  0,  0,  0,  0, 48,  0],
                [ 0,  0,  0,  0,  0,  1,  0,  0,  1, 52]], dtype=int64)
```

```
In [21]: %matplotlib inline
         import matplotlib.pyplot as plt
         import seaborn as sn
         sn.heatmap(cm, annot=True)
         plt.xlabel('Predicted')
         plt.ylabel('Truth')

Out[21]: Text(33.0, 0.5, 'Truth')
```



```
In [ ]:
```