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

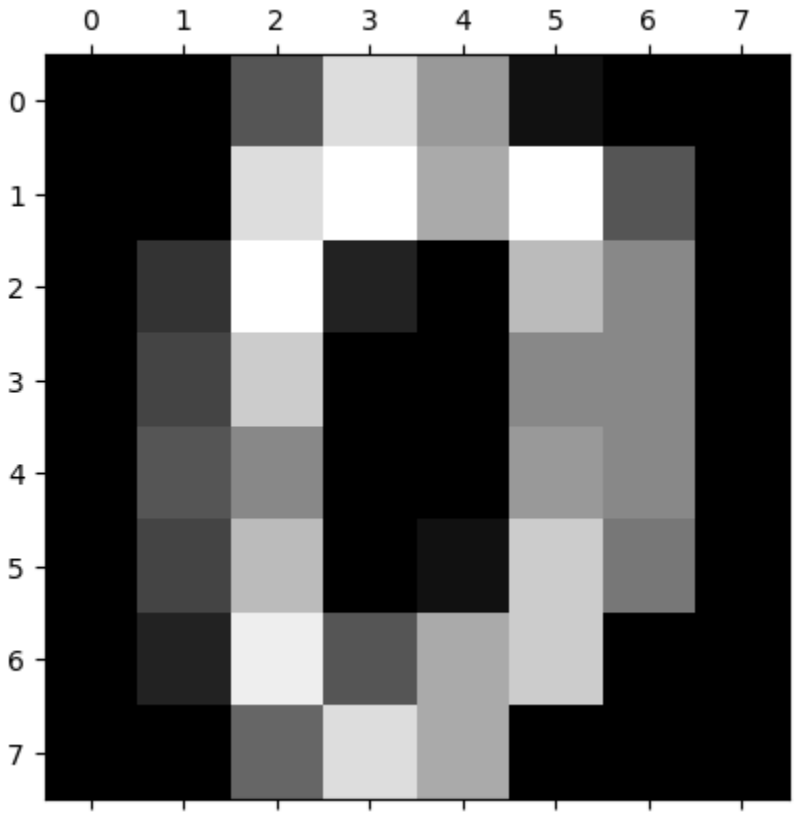
In [2]:
```
dir(digits)
```

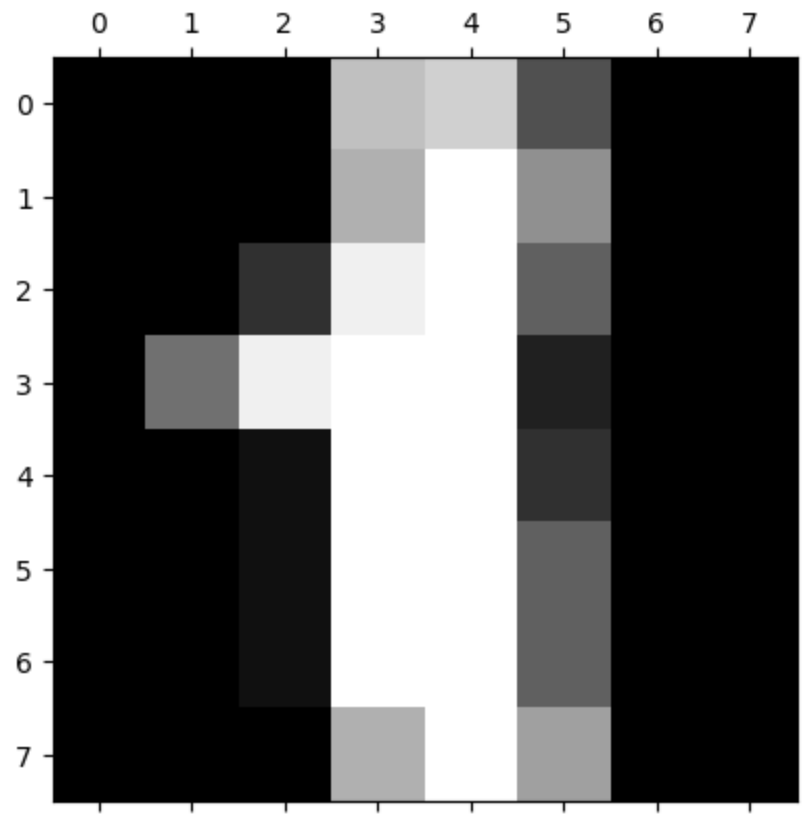
Out[2]:
```
['DESCR', 'data', 'feature_names', 'frame', 'images', 'target', 'target_name
s']
```

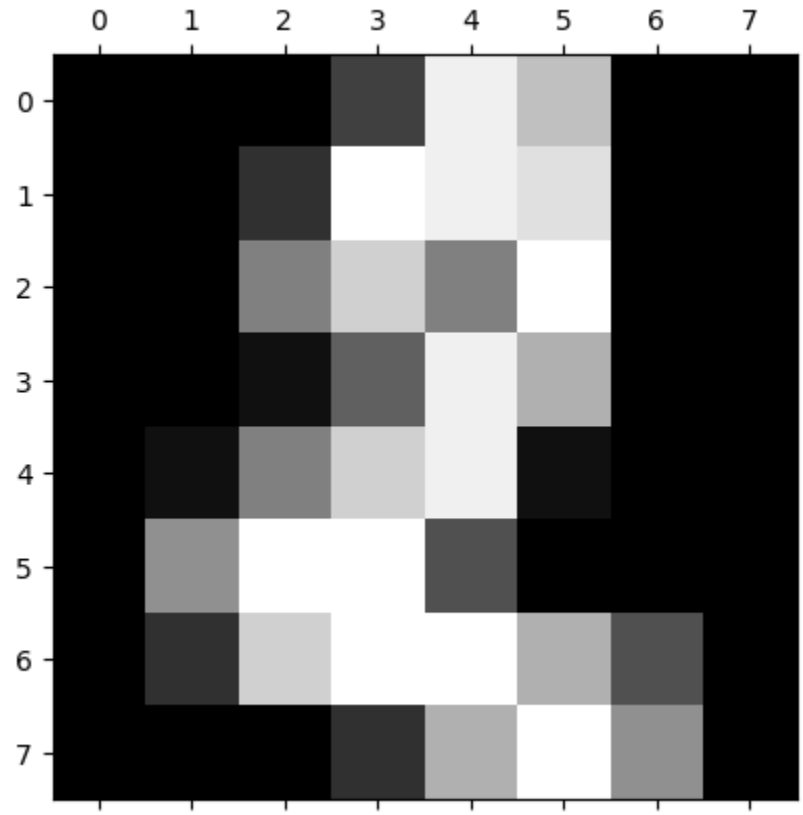
In [3]:
```
%matplotlib inline
import matplotlib.pyplot as plt
```

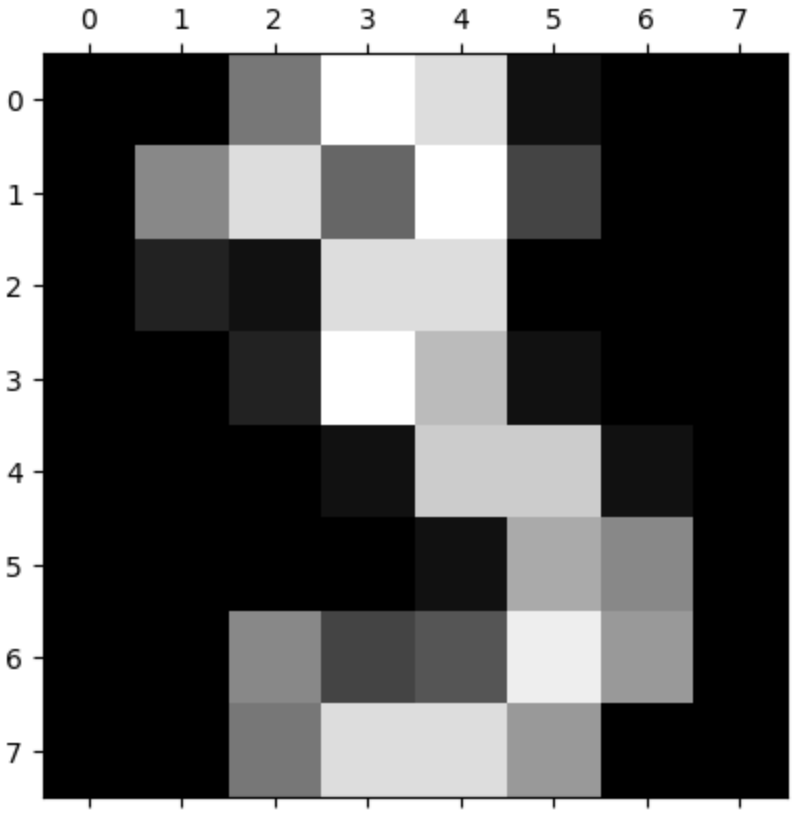
In [5]:
```
plt.gray()
for i in range(4):
    plt.matshow(digits.images[i])
```

```
<Figure size 640x480 with 0 Axes>
```




0 1 2 3 4 5 6 7
0
1
2
3
4
5
6
7


0 1 2 3 4 5 6 7
0
1
2
3
4
5
6
7



In [7]:
```
df = pd.DataFrame(digits.data)
df.head()
```

Out[7]:

	0	1	2	3	4	5	6	7	8	9	...	54	55	56	57	58	59
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
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
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
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
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

5 rows × 64 columns

In [8]:
```
df['target'] = digits.target
```

In [9]:
```
df[0:12]
```

Out[9]:

	0	1	2	3	4	5	6	7	8	9	...	55	56	57	58	59
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
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
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
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
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
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
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
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
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
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
10	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
11	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

12 rows × 65 columns

In [11]:
```
x = df.drop('target', axis='columns')
y = df.target
```

In [12]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size = 0.2)
```

In [13]:
```
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier(n_estimators=20)
model.fit(X_train, y_train)
```

Out[13]:

RandomForestClassifier

Parameters

n_estimators	20
criterion	'gini'
max_depth	None
min_samples_split	2
min_samples_leaf	1
min_weight_fraction_leaf	0.0
max_features	'sqrt'
max_leaf_nodes	None
min_impurity_decrease	0.0
bootstrap	True
oob_score	False
n_jobs	None
random_state	None
verbose	0
warm_start	False
class_weight	None
ccp_alpha	0.0
max_samples	None
monotonic_cst	None

In [16]:
```
model.score(X_test, y_test)
```

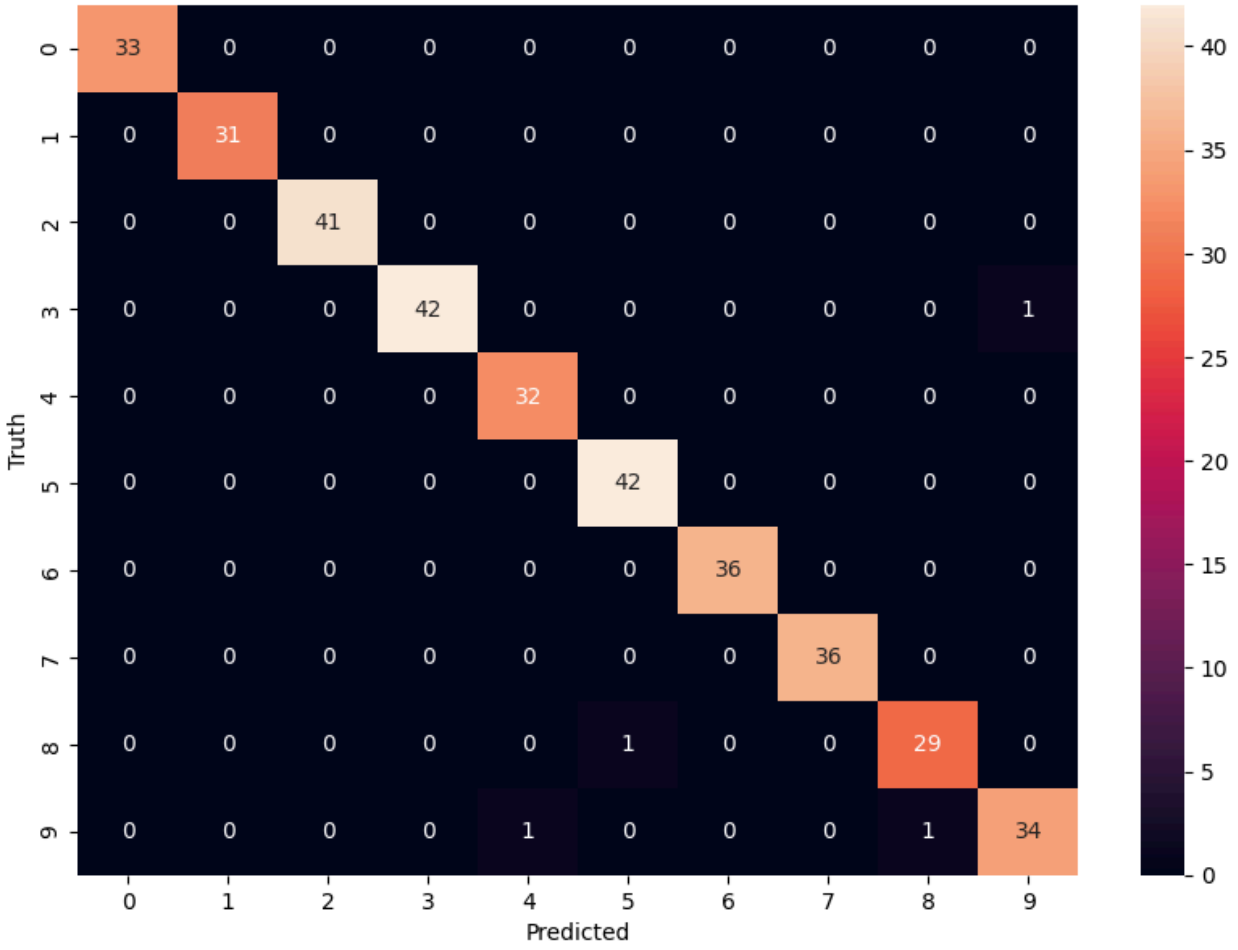
Out[16]: 0.9888888888888889

In [17]:
```
from sklearn.metrics import confusion_matrix
y_predicted = model.predict(X_test)
cm = confusion_matrix(y_test, y_predicted)
cm
```

Out[17]:
```
array([[33,  0,  0,  0,  0,  0,  0,  0,  0,  0],
       [ 0, 31,  0,  0,  0,  0,  0,  0,  0,  0],
       [ 0,  0, 41,  0,  0,  0,  0,  0,  0,  0],
       [ 0,  0,  0, 42,  0,  0,  0,  0,  0,  1],
       [ 0,  0,  0,  0, 32,  0,  0,  0,  0,  0],
       [ 0,  0,  0,  0,  0, 42,  0,  0,  0,  0],
       [ 0,  0,  0,  0,  0,  0, 36,  0,  0,  0],
       [ 0,  0,  0,  0,  0,  0,  0, 36,  0,  0],
       [ 0,  0,  0,  0,  0,  1,  0,  0, 29,  0],
       [ 0,  0,  0,  0,  1,  0,  0,  0,  1, 34]])
```

In [19]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
plt.figure(figsize=(10,7))
sns.heatmap(cm, annot=True)
plt.xlabel('Predicted')
plt.ylabel('Truth')
```

Out[19]: Text(95.72222222222221, 0.5, 'Truth')



In [ ]: