Load MNIST data using the mnist package

In [1]:
```
import mnist

train_images = mnist.train_images()
train_labels = mnist.train_labels()

test_images = mnist.test_images()
test_labels = mnist.test_labels()
```

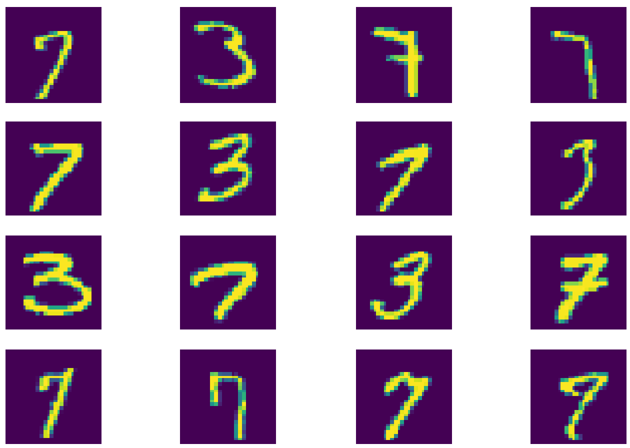
Data processing, label images of 3 as 0, and images of 7 as 1. Flatten the 2D image into 1D array.

In [2]:
```
import numpy as np

train_images_3 = train_images[train_labels == 3]
train_images_3 = train_images_3.reshape(train_images_3.shape[0], 28*28)
train_labels_3 = np.zeros(train_images_3.shape[0])
train_images_7 = train_images[train_labels == 7]
train_images_7 = train_images_7.reshape(train_images_7.shape[0], 28*28)
train_labels_7 = np.ones(train_images_7.shape[0])
X_train = np.concatenate((train_images_3, train_images_7), axis=0)
Y_train = np.concatenate((train_labels_3, train_labels_7), axis=0)

test_images_3 = test_images[test_labels == 3]
test_images_3 = test_images_3.reshape(test_images_3.shape[0], 28*28)
test_labels_3 = np.zeros(test_images_3.shape[0])
test_images_7 = test_images[test_labels == 7]
test_images_7 = test_images_7.reshape(test_images_7.shape[0], 28*28)
test_labels_7 = np.ones(test_images_7.shape[0])
X_test = np.concatenate((test_images_3, test_images_7), axis=0)
Y_test = np.concatenate((test_labels_3, test_labels_7), axis=0)


print ("Train set data shape:")
print ("X:", X_train.shape)
print ("Y:", Y_train.shape)
print ("Test set data shape:")
print ("X:", X_test.shape)
print ("Y:", Y_test.shape)
```

```
Train set data shape:
X: (12396, 784)
Y: (12396,)
Test set data shape:
X: (2038, 784)
Y: (2038,)
```

Plot some sample data

In [7]:
```
import matplotlib.pyplot as plt
import matplotlib.image as mpimg

samples = np.random.random_integers(0, X_train.shape[0]-1, size=16)
count = 1
for sample in samples:
    plt.subplot(4,4, count)
    plt.axis('off')
    plt.imshow(X_train[sample].reshape(28,28))
    count += 1
```



Linear kernel implementation

In [4]:
```
from sklearn import svm
import time

linear_svc = svm.SVC(kernel='linear')
start_time = time.time()
linear_svc.fit(X_train, Y_train)
end_time = time.time()

print ("Training time is:", end_time-start_time)
print ("Accuracy score is:", linear_svc.score(X_test, Y_test))
```

```
Training time is: 12.602896928787231
Accuracy score is: 0.9764474975466143
```

Poly kernel implementation ¶

In [5]:
```python
from sklearn import svm

poly_svc = svm.SVC(kernel='poly')
start_time = time.time()
poly_svc.fit(X_train, Y_train)
end_time = time.time()

print ("Training time is:", end_time-start_time)
print ("Accuracy score is:", poly_svc.score(X_test, Y_test))
```

```
Training time is: 7.354567050933838
Accuracy score is: 0.9955839057899902
```

RBF kernel implementation

In [6]:
```python
from sklearn import svm

rbf_svc = svm.SVC(kernel='rbf')
start_time = time.time()
rbf_svc.fit(X_train, Y_train)
end_time = time.time()

print ("Training time is:", end_time-start_time)
print ("Accuracy score is:", rbf_svc.score(X_test, Y_test))
```

```
Training time is: 452.00220489501953
Accuracy score is: 0.5044160942100098
```