

## HW: K-Nearest-Neighbor Handwritten Number classification

In this homework you will use K-Nearest-Neighbor to classify handwritten numbers. The data has the following format:

```

      |----- 16 -----|
-    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    | 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0
    | 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
    | 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0
    | 0 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
16  | 1 1 1 1 0 0 0 0 0 0 0 1 1 1 1 0 0
    | 1 1 1 0 0 0 0 0 0 0 0 0 0 1 1 1 0
    | 1 1 1 0 0 0 0 0 0 0 0 0 0 0 1 1 1
    | 0 1 1 1 0 0 0 0 0 0 0 0 0 1 1 1 0
    | 0 1 1 1 1 0 0 0 0 0 0 0 0 1 1 1 0
    | 0 0 1 1 1 1 1 0 0 1 1 1 1 1 0 0
    | 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0
    | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
-    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0, 0

```

The data is arranged into 16x16 blocks. The value after the comma is the block label, "zero" in the data above.

In your repository, the data is loaded as a string from the "digits.js" file.

```
var input = require('./digits.js');
```

Note: there are no tests for this homework. You can check your work by running:

```
node run.js
```

### Question 1

Write a function to process the data from the "digits.js" file. Organize the data into an array of objects. Every object contains a block of digit data and the corresponding label.

```
▼ Object {label: 8, digits: Array[256]}
  ► digits: Array[256]
    label: 8
```

### Question 2

After reading and processing the data, randomly split the data set in half, into two arrays. You will train on one piece and test on the other.

```
> data
< ▼ Object {train: Array[796], test: Array[797]}
  ▼ test: Array[797]
    ► [0 ... 99]
    ► [100 ... 199]
    ► [200 ... 299]
    ► [300 ... 399]
    ► [400 ... 499]
    ► [500 ... 599]
    ► [600 ... 699]
    ► [700 ... 796]
    length: 797
    ► __proto__: Array[0]
  ▼ train: Array[796]
    ► [0 ... 99]
    ► [100 ... 199]
    ► [200 ... 299]
    ► [300 ... 399]
    ► [400 ... 499]
    ► [500 ... 599]
    ► [600 ... 699]
    ► [700 ... 795]
    length: 796
    ► __proto__: Array[0]
  ► __proto__: Object
```

### Question 3

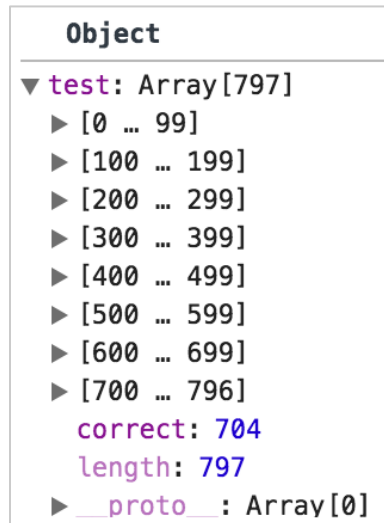
Write a function to measure the distance between test and training data points.

#### Question 4

Classify your test digit data using nearest neighbors.

#### Question 5

Return the number of correct classifications



#### Note

You may write as many supporting functions as you like. For example:

```
exercise.one = function(){
  var split = exercise.split();
  var trim = exercise.trim(split);
  var digits = exercise.digits(trim);
  var labels = exercise.labels(digits);
  var data = exercise.data(digits, labels);
  return data;
};
```