CS50 for MBAs

Algorithms, Data Structures

Auditing

Name Cards

Slack

cs50.ly/hbs50

Office Hours

cs50.github.io/hbs/hours

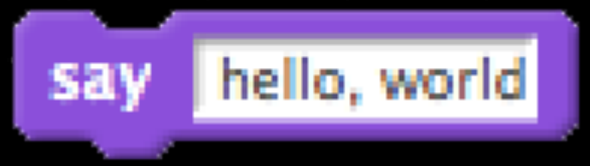
Seminars

cs50.github.io/hbs/seminars

Last Time

Programming Languages


when clicked
say hello, world


say
hello, world


forever
say
hello, world


repeat 50
say hello, world


set i to 0


i
<
50

```
if <x < y> then
    say [x is less than y]
else
    if <x > y> then
        say [x is greater than y]
    else
        say [x is equal to y]
```

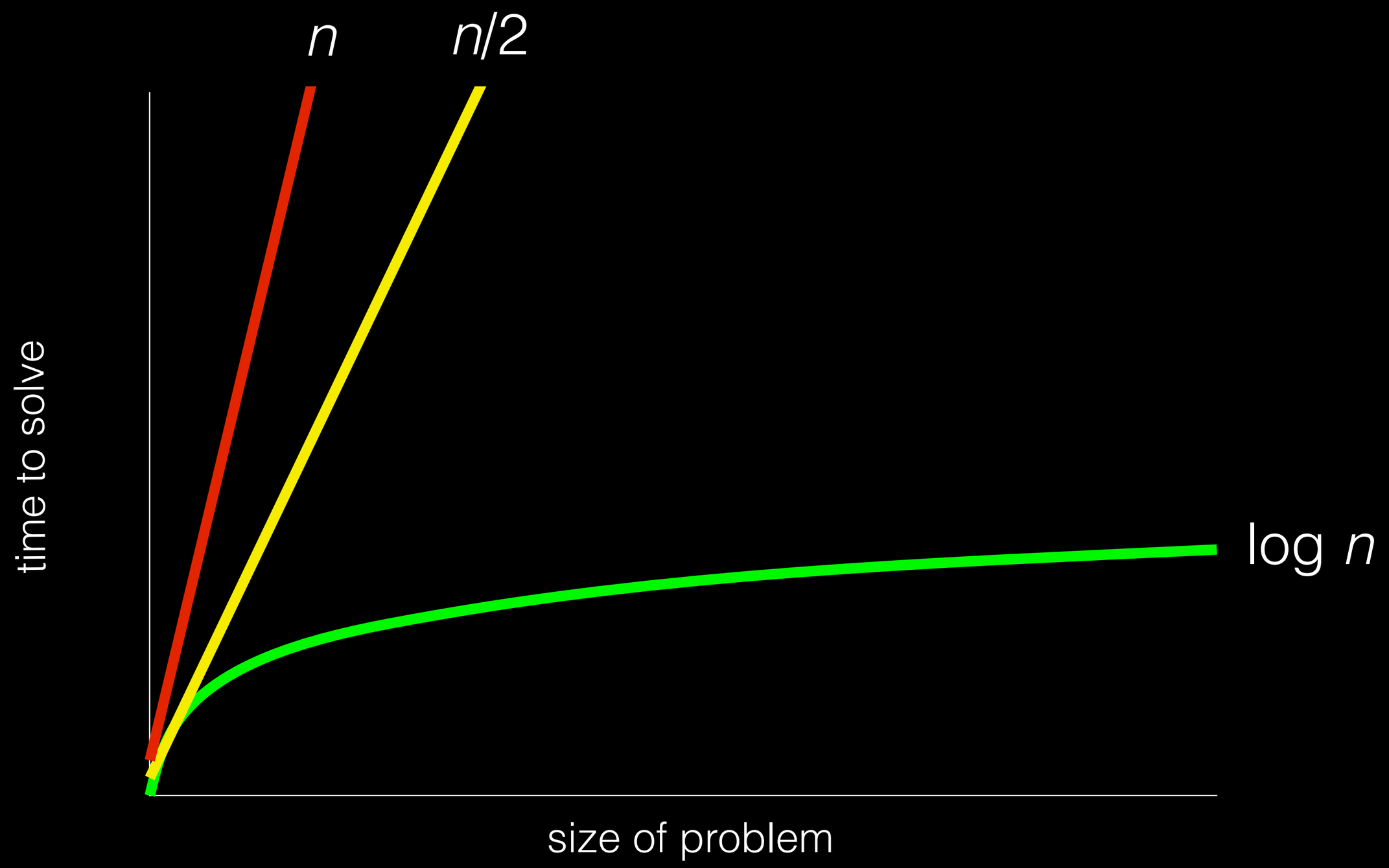
```
#include <stdio.h>

int main(void)
{
    printf("hello, world\n");
}
```

```
01111111 01000101 01001100 01000110 00000010 00000001 00000001 00000000
00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000010 00000000 00111110 00000000 00000001 00000000 00000000 00000000
10110000 00000101 01000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
11010000 00010011 00000000 00000000 00000000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 01000000 00000000 00111000 00000000
00001001 00000000 01000000 00000000 00100100 00000000 00100001 00000000
00000110 00000000 00000000 00000000 00000101 00000000 00000000 00000000
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 01000000 00000000 00000000 00000000 00000000 00000000
01000000 00000000 01000000 00000000 00000000 00000000 00000000 00000000
11111000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
11111000 00000001 00000000 00000000 00000000 00000000 00000000 00000000
00001000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00000011 00000000 00000000 00000000 00000100 00000000 00000000 00000000
00111000 00000010 00000000 00000000 00000000 00000000 00000000 00000000
00111000 00000010 01000000 00000000 00000000 00000000 00000000 00000000
00111000 00000010 01000000 00000000 00000000 00000000 00000000 00000000
00011100 00000000 00000000 00000000 00000000 00000000 00000000 00000000
...
```

This Time

Algorithms, Data Structures

- correctness, efficiency
- searching, sorting
- arrays, linked lists, trees, hash tables


n
n/2
log n
time to solve
size of problem

0

$O(n^2)$

$O(n \log n)$

$O(n)$

$O(\log n)$

$O(1)$

...

Ω

$\Omega(n^2)$

$\Omega(n \log n)$

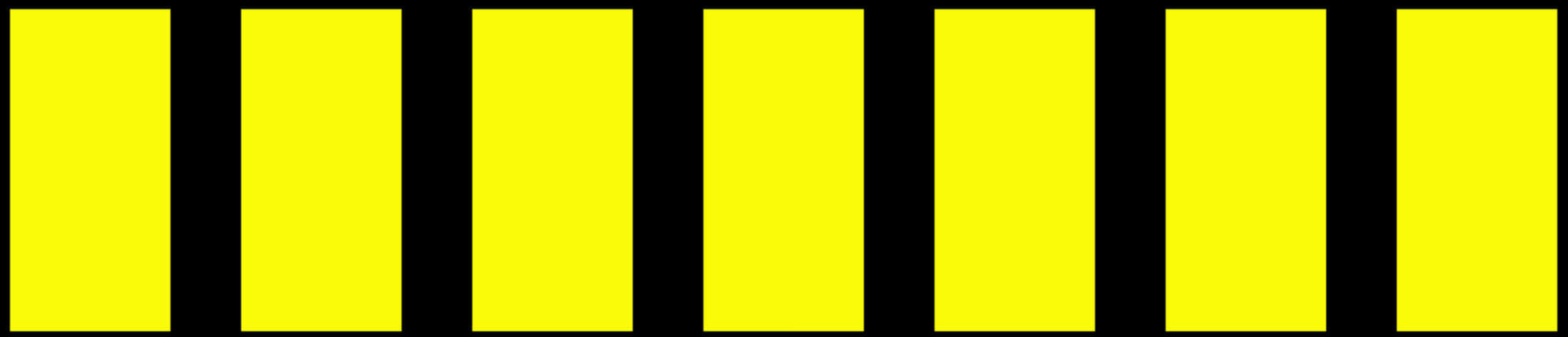
$\Omega(n)$

$\Omega(\log n)$

$\Omega(1)$

…

⊖



? ? ? ? ? ? ? ?

4 2 7 5 6 8 3 1

bubble sort

```
repeat until no swaps
    for i from 0 to n-2
        if i'th and i+1'th elements out of order
            swap them
```

selection sort

```
for i from 0 to n-1
    find smallest element between i'th and n-1'th
    swap smallest with i'th element
```

$$(n - 1)$$

$$(n-1)+(n-2)$$

$$(n-1)+(n-2)+\ldots+1$$

$$(n-1)+(n-2)+\ldots+1$$

$$n(n-1)/2$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$(n - 1) + (n - 2) + \ldots + 1$$

$$n(n - 1)/2$$

$$(n^2 - n)/2$$

$$n^2/2 - n/2$$

1,000,000

$$n^2/2 - n/2$$

$$n^2/2 - n/2$$

$$1{,}000{,}000^2/2 - 1{,}000{,}000/2$$

$$n^2/2 - n/2$$

$$1{,}000{,}000^2/2 - 1{,}000{,}000/2$$

$$500{,}000{,}000{,}000 - 500{,}000$$

$$n^2/2 - n/2$$

$$1{,}000{,}000^2/2 - 1{,}000{,}000/2$$

$$500{,}000{,}000{,}000 - 500{,}000$$

$$499{,}999{,}500{,}000$$

$$n^2/2 - n/2$$

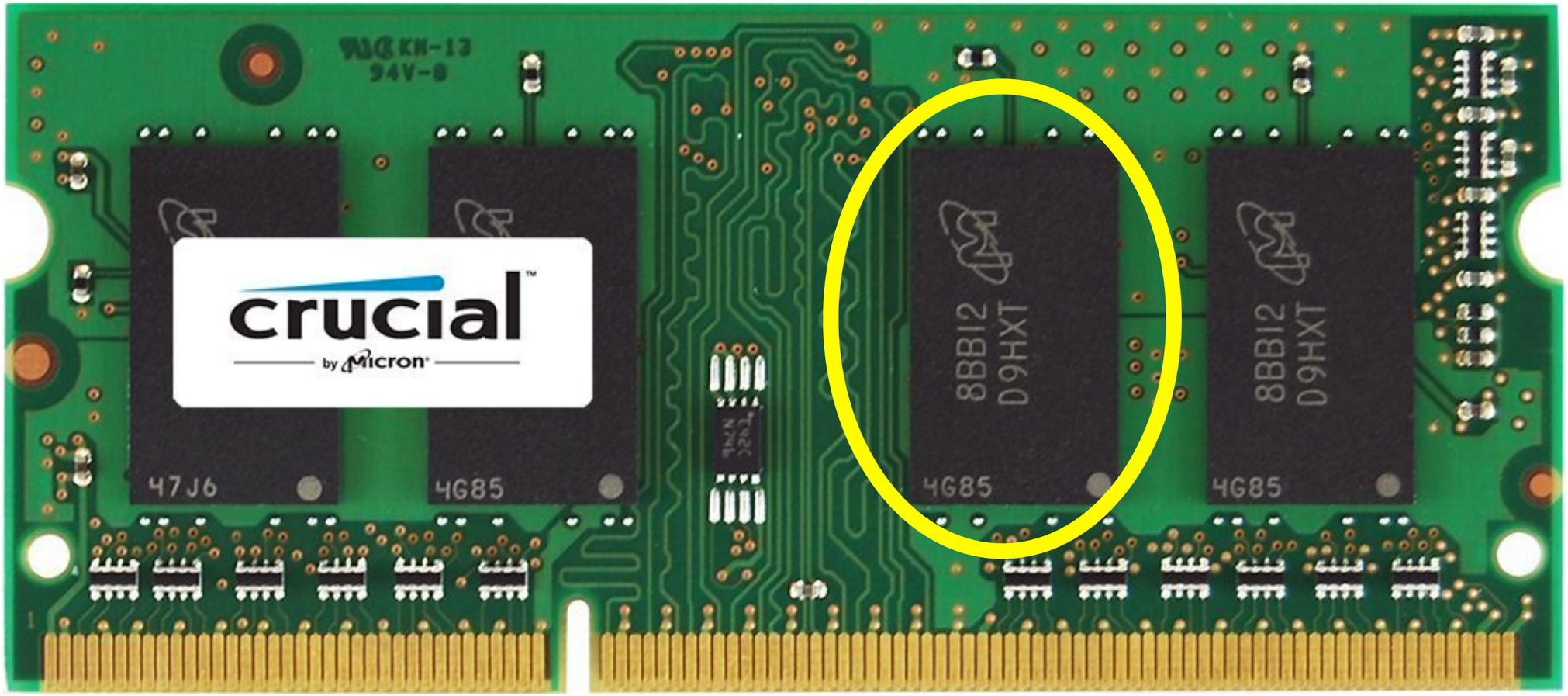
$$O(n^2)$$

https://www.cs.usfca.edu/~galles/visualization/ComparisonSort.html

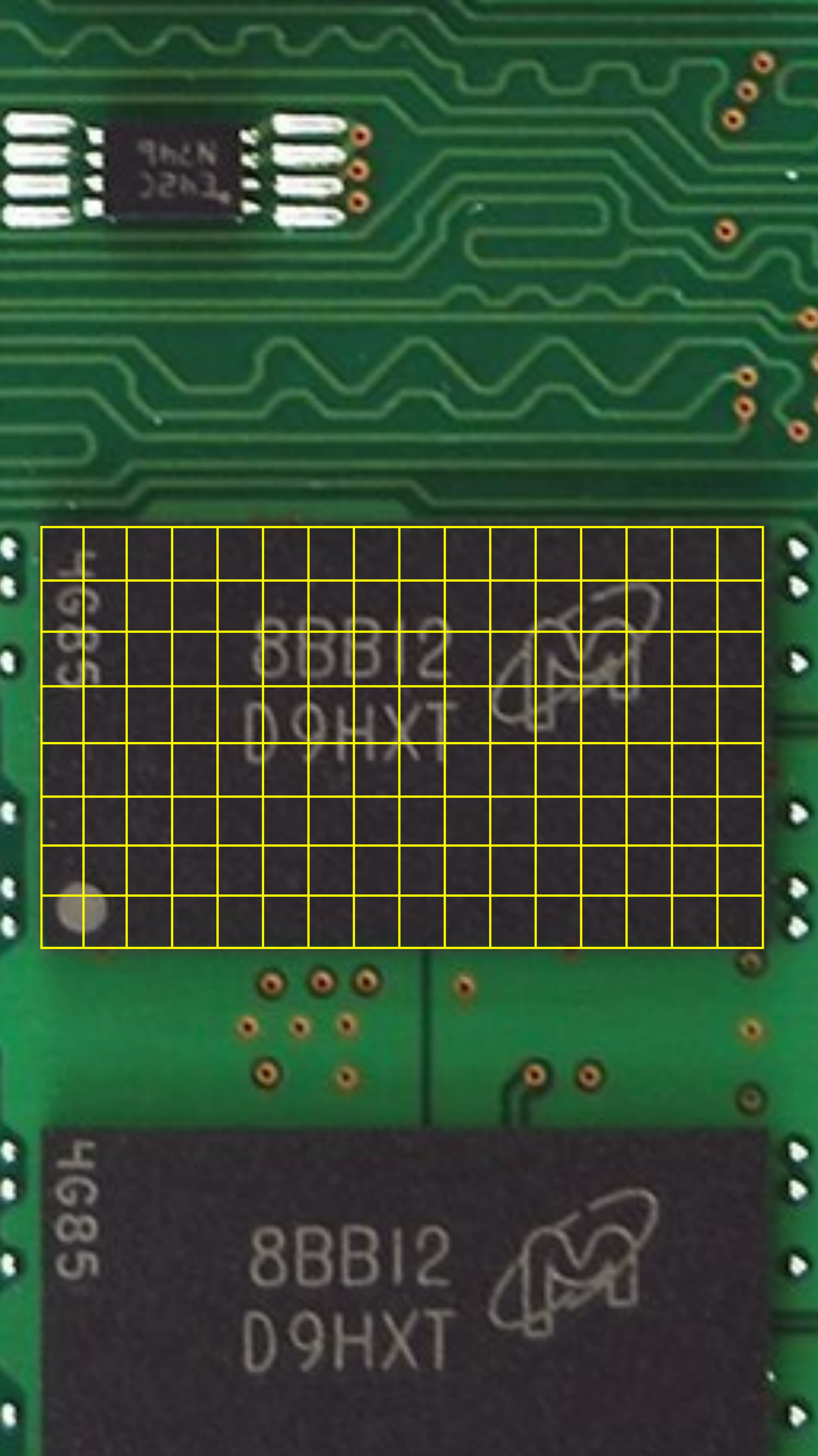
https://www.toptal.com/developers/sorting-algorithms


GOO

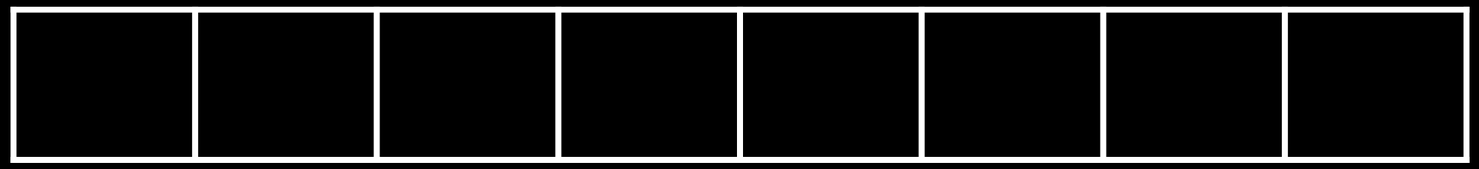

crucial
by Micron
47J6
4G85
8BB12
D9HXT
4G85
8BB12
D9HXT
4G85


crucial
by Micron
47J6
4G85
8BB12
D9HXT
4G85
8BB12
D9HXT
4G85


8BBI2
D9HXT
4G85
8BBI2
D9HXT
4G85


8BB12
D9HXT
4685
8BB12
D9HXT
4685

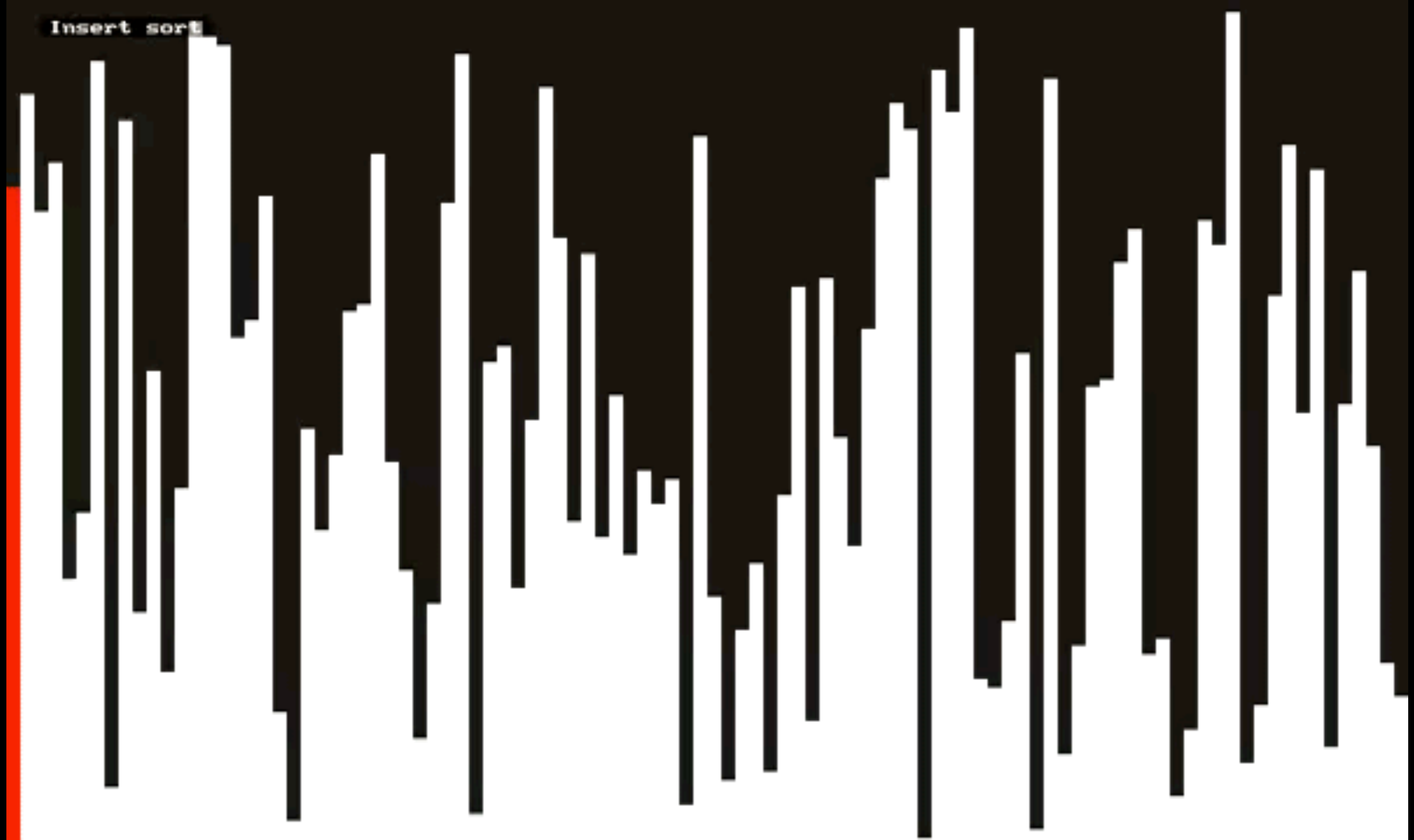
M	a	r	i	a			



Assignment 1

Seminar

Programming with Python


Insert sort

Next Time

Internet Technologies

CS50 for MBAs

Algorithms, Data Structures