

2-4 Treasure Hunting — Mergesort

(Wednesday, April 11, 2018 ~ Sunday, April 15, 2018)

Hengfeng Wei

hfwei@nju.edu.cn

April 11, 2018





Analysis of Mergesort in CLRS (# of Comparisons; $a_i : \infty$ not Counted)

- (a) Analyze the **worst case** $W(n)$ and the **best case** $B(n)$ time complexity of mergesort *as accurately as possible*.

Explore the relation between them and the binary representations of numbers.

Plot $W(n)$ and $B(n)$ and explain what you observe.

- (b) Analyze the **average case** $A(n)$ time complexity of mergesort.

Plot $A(n)$ and explain what you observe.

- (c) **Prove that:** The minimum number of comparisons needed to merge two sorted arrays of equal size m is $2m - 1$.

Analysis of Mergesort in CLRS (# of Comparisons; $a_i : \infty$ not Counted)

- (a) Analyze the **worst case** $W(n)$ and the **best case** $B(n)$ time complexity of mergesort *as accurately as possible*.

Explore the relation between them and the binary representations of numbers.

Plot $W(n)$ and $B(n)$ and explain what you observe.

- (b) Analyze the **average case** $A(n)$ time complexity of mergesort.

Plot $A(n)$ and explain what you observe.

- (c) **Prove that:** The minimum number of comparisons needed to merge two sorted arrays of equal size m is $2m - 1$.



(WED., April 11, 2018)

$W(n)$: Consider $W(n + 1)$



(THU, April 12, 2018)

$$W(n) = \begin{cases} 0, & n = 1 \\ W(\lfloor \frac{n}{2} \rfloor) + W(\lceil \frac{n}{2} \rceil) + (n - 1), & o.w. \end{cases}$$

$$W(n+1) - W(n)$$

The total number of bits in the binary representations
of *all the numbers less than n* .



(FRI, April 13, 2018)

$$B(n) = \begin{cases} 0, & n = 1 \\ B(\lfloor \frac{n}{2} \rfloor) + B(\lceil \frac{n}{2} \rceil) + \lfloor \frac{n}{2} \rfloor, & o.w. \end{cases}$$

The total number of **1s** in the binary representations
of *all the numbers less than n* .



(SAT, April 14, 2018)

A pink rectangular poster featuring a grey heart at the top. Below the heart, the text 'KEEP CALM AND STAY TUNED' is written in a bold, grey, sans-serif font, arranged in four lines.

KEEP
CALM
AND
STAY
TUNED



(SUN, April 15, 2018)



**KEEP
CALM
AND
STAY
TUNED**

Thank
You!



Office 302

Mailbox: H016

hfwei@nju.edu.cn