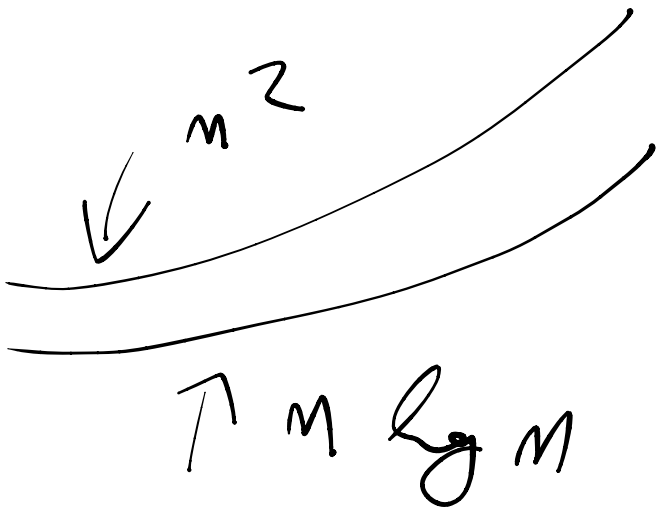
→ INSERTION SORT (n^2)

→ MERGE SORT ($n \log n$)

→ HEAP SORT ($n \log n$)

$$\lim_{n \to \infty} \frac{f(n)}{n^{\log_b(a)}}$$



$O(n^2) > O(n)$

$> O(n \log(n) \ldots > O(1)$

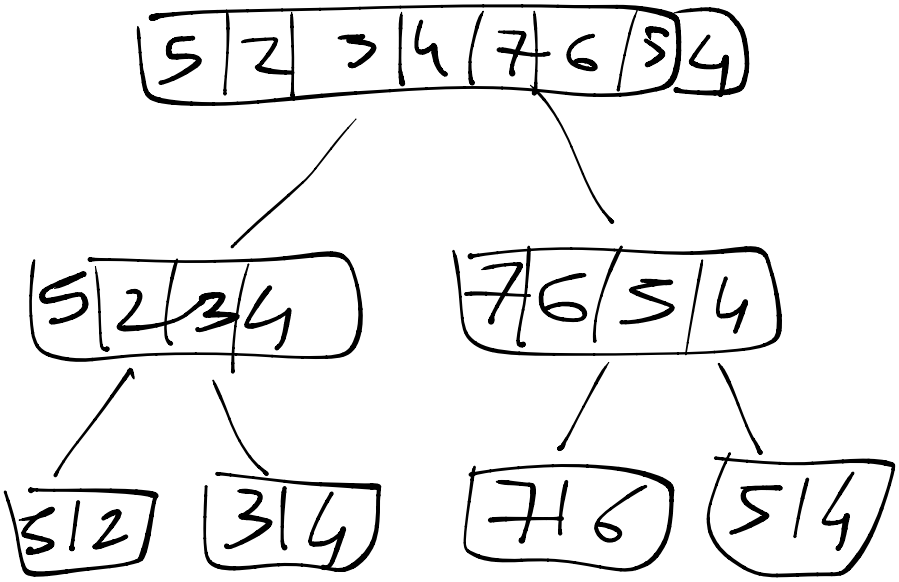
COSTANTE

INSERTION SORT

→ 2 CICLI

MERGE SORT

(DIVIDE ET IMPERA)



$$n \log(n) < n^2$$

↑

SFRUTTANDO

LA SOLUZIONE

IN 1F

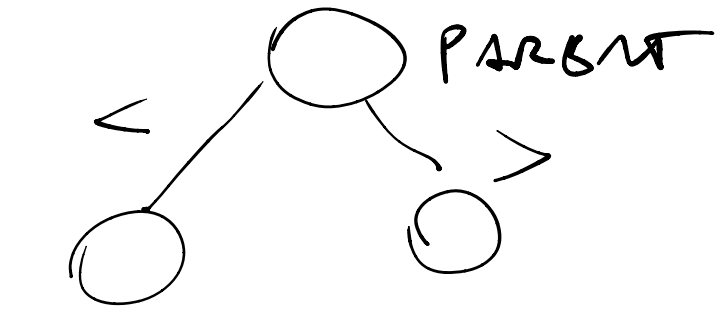
RICORRENZA →

CALCOLO

COMPLESSITÀ

ALGORITMI AD ∞

HEAP

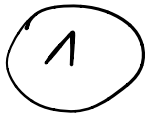


A[1] A[2*1]

LEFT

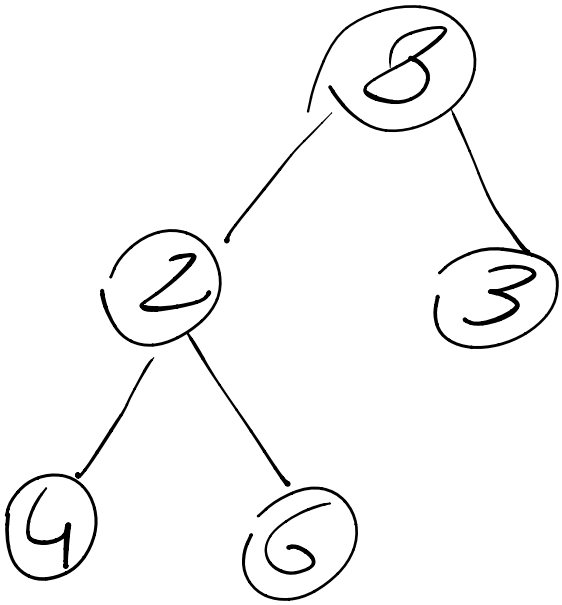
HSAPIFY

1, 2, 3, 4, 5, 6, 7



$A[1/2] \leq A[p]$

8, 2, 3, 4, 6

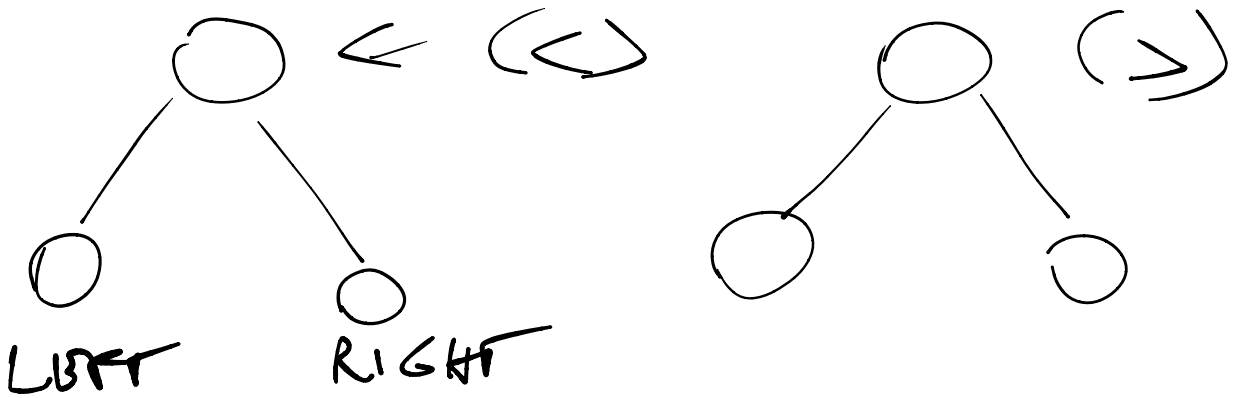


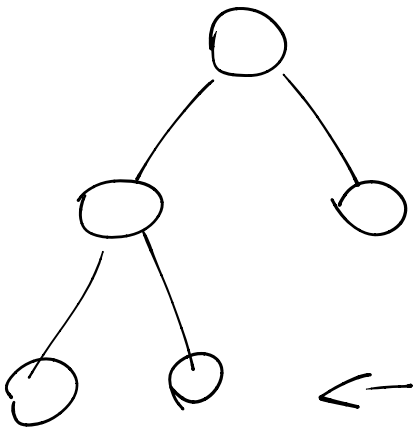
8, 10, 12, 14

PADRE > FIGLI $\forall$ LIVELLO

→ VOGLIAMO
RIMPIAZZARE LIVELLO

MIN-HEAP / MAX-HEAP





$O(h)$

$= O(\lfloor \lg(n) + 1 \rfloor)$

$$\lim_{n\to\infty} \frac{f(n)}{n^{\log_b(a)}}$$

- 1 (O)
- 2 (Θ)
- 3 (Ω)

$$T(n) = aT\left(\frac{n}{b}\right) + f(n)$$

STRUTTURA FISSA RICORRENTE!

TRAD.

- O → SOPRA
- Θ → METÀ
- Ω → SOTTO

$a = 1$ ↓ n

$$T(n) = 1\,T(n-2) + 2n$$

$T(n-2)$ ↑ $T\left(\frac{n}{b}\right)$ — $2n$ ~ $f(n)$

$$\lim_{n\to\infty} \frac{2(n) \to f(n)}{n^{\log_b(a)} \to n^{\log 1}} = \frac{2}{1} = 2$$

CASO 2 ↓ COSTANTE

$\lim_{n \to \infty} (\ldots) \to 0 \to \frac{1}{0} = \infty$

$\to$ K = COSTANTE

(Θ)

$\to c = \frac{1}{\infty} \geq 0$

$O \to T(n) \leq c(n)$

$\Omega \to T(n) \geq d(n)$

$\forall$

$\Theta \to T(n) \leq c(n)$

$\to T(n) \geq d(n)$

$n = 2 \to n^k$

$\to T(n) \leq O(n^2)$

$\to T(n) \geq o(n^2)$

$T(n) \leq cn^2$

↑

SOLUZIONI

→ n → VALE $\exists$!

→ c → VALORE DI c e di n

$c \geq \frac{4}{3}$

$c \geq 2 \quad \forall \; n \geq 1$

$T(n) \leq c(n^2)$

$\leq (T(n-2))^2 + 2n$

$\Rightarrow c(n-2)^2 + 2n \leq cn^2$

$c(n^2 + 4 - 4n) + 2n \leq cn^2$

$cn^2 + 4c - 4cn + 2n \leq cn^2$

$4c - 4cn + 2n \leq 0$

$\left[c \geq \frac{1}{2}, n \geq 1 \right]$

$T(n) \geq d(n^2)$

$\geq d(n-2)^2 + 2n$

...

$d \geq 1, \forall n \in \mathbb{N}$

→ (1) RICORRENZA

EQUAZIONE

DIV.

→ (2) DIMOSTRA CHE

$T(n) = O(n \lg n)$

CASO 3

↳ CONDIZIONE DI REGOLARITÀ

CASO 3 →

$a f\left(\frac{n}{b}\right) \leq k f(n)$

PER RISOLVERE UN CASO 3
DEVO USARE QUESTA!

SCQUIZZATO