

Insertion Sort: Codes

DEF insertion_sort(A):

For i in 2..|A|:

// $\Theta(|A|)$
iterations

J ← i

while (J > 1 AND

$A[J] < A[J-1]$)

// $\Omega(1)$

$\Theta(i)$
iteration

SWAP(A, J, J-1)

J ← J-1

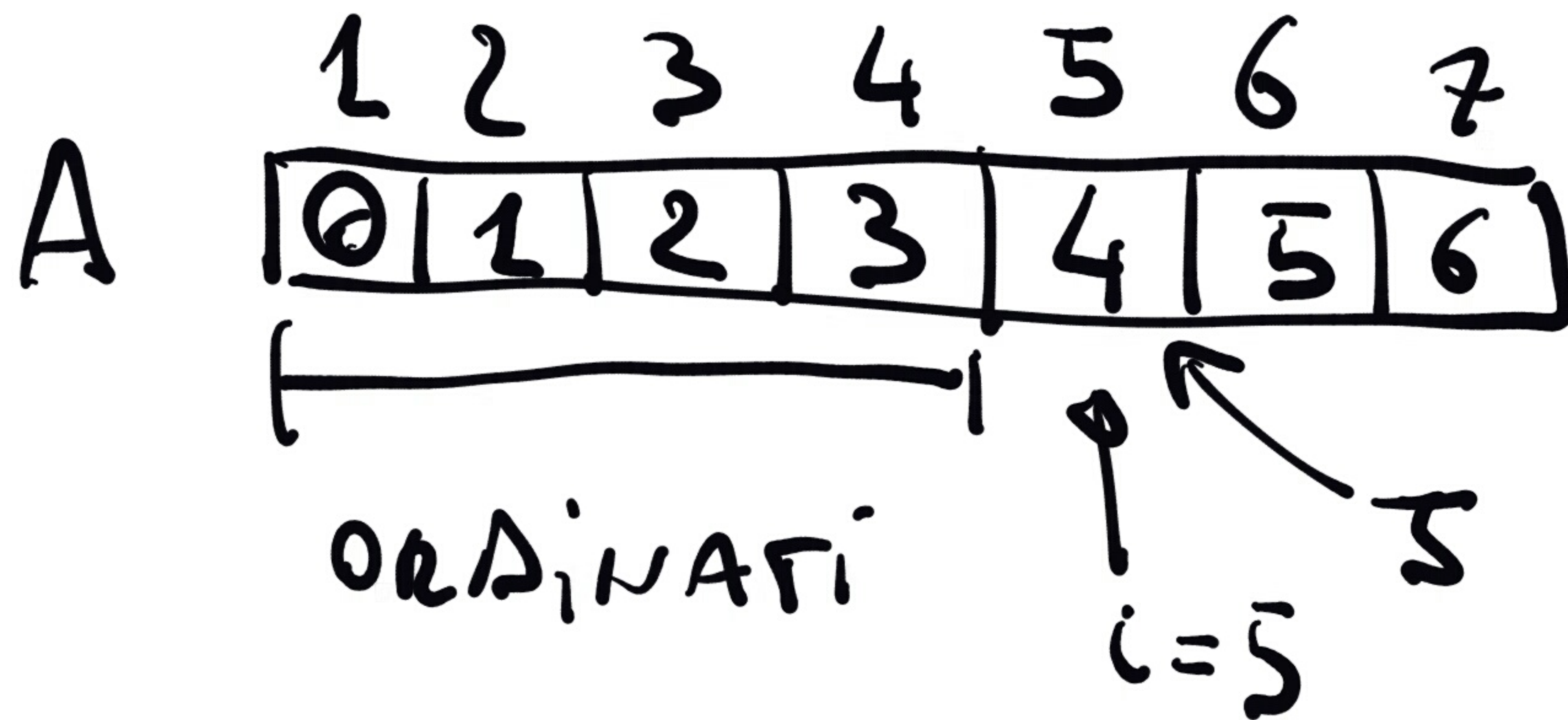
| $\Theta(1)$

END while

END FOR

END DEF

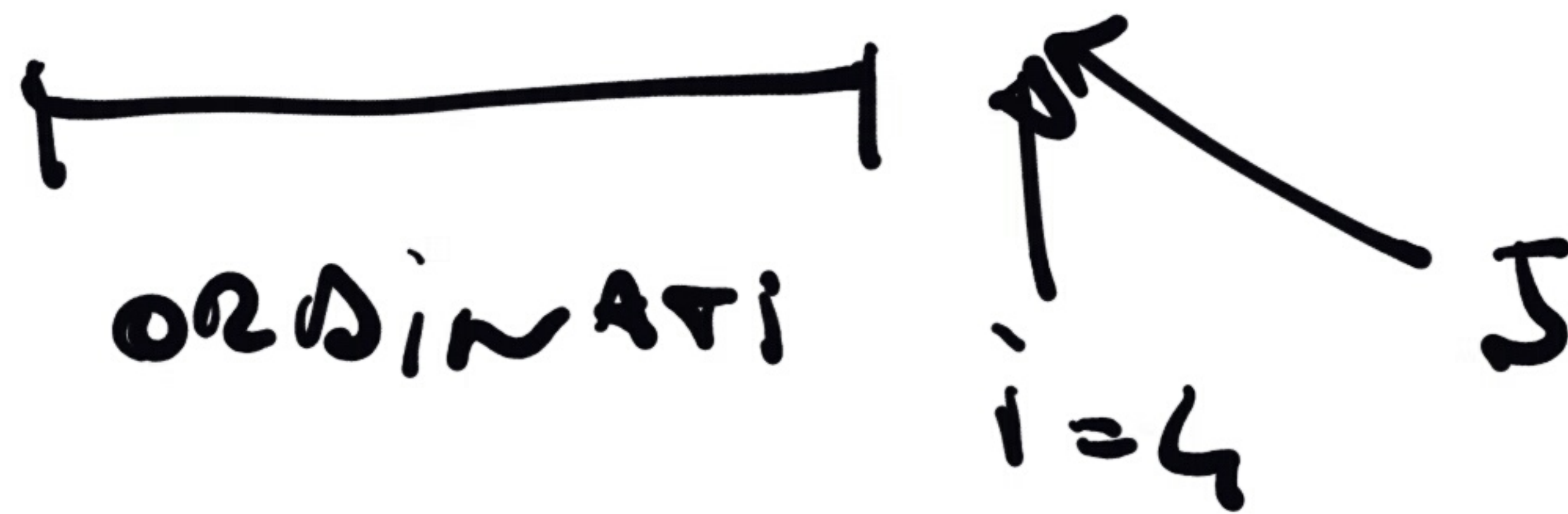
Caso Fortunato



$$4 = A[5] < A[5-1] 3$$

(CASO Sfortunato)

$A = \begin{array}{c|c|c|c|c|c} 1 & 2 & 3 & 4 & 5 & 6 \\ \hline 3 & 4 & 5 & 2 & 1 & 0 \end{array}$



$$A[5] < A[5-1]$$

(Codice di Swap)

DEF SWAP(A, i, j):

 TMP \leftarrow A[i]

 A[i] \leftarrow A[j]

 A[j] \leftarrow TMP

END DEF

$\Theta(1)$

COMPLESSITÀ DI INSERTION SORT

$$T_i(|A|) \leq \sum_{i=2}^{|A|} \sum_{j=1}^i \underbrace{\Theta(1)}_{\text{while}} \quad \leftarrow \quad \begin{matrix} O(n^2) \\ \vee \\ \sum_{i=1}^n i = \left(\frac{n \cdot (n+1)}{2} \right) \end{matrix}$$

FOR

$$\sum_{i=2}^{|A|} O(i) = O(|A|^2)$$

Limite DAL BASSO

$$T_i(|A|) \geq \sum_{i=2}^{|A|} \sum_{s=1}^1 \Theta(1)$$

FOR

WHILE

BLOCCO while

$$\geq \sum_{i=2}^{|A|} \Omega(1) = \Omega(|A|)$$