Estrutura de Dados Avançada

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Problema de Ordenação

- Precisa-se ordenar uma sequência de números de forma não-decrescente ou não-crescente.
  - i.e: Dado um vetor **V** de tamanho **N**, ordenar do menor para o maior, ou vice-versa.

- Entrada: Sequência *n* (a_1, a_2, ……., a_n)
- Saída: Permutação (reordenada) (a'_1, a'_2, ……., a'_n) da entrada tal que $a'_1 <= a'_2 <= \ldots\ldots <= a'_n$.

Insertion Sort

- Consiste em posicionar o menor/maior elemento sempre à esquerda, deixando estes ordenados

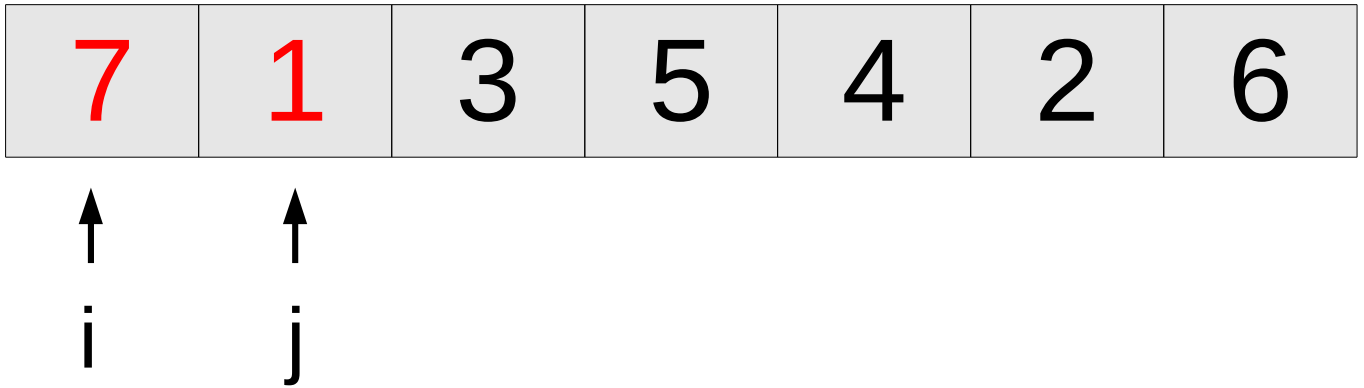
- Variantes
  - Bubble Sort
  - Selection Sort

Insertion Sort

```
InsertionSort(V)
        for i = 0, i < N, i++
            for j = i+1, j < N, j++
                if V[ i ] > V[ j ] then
                    troca(V[ i ],V[ j ])
                end
            end
        end
    end
```

Insertion Sort

Insertion Sort



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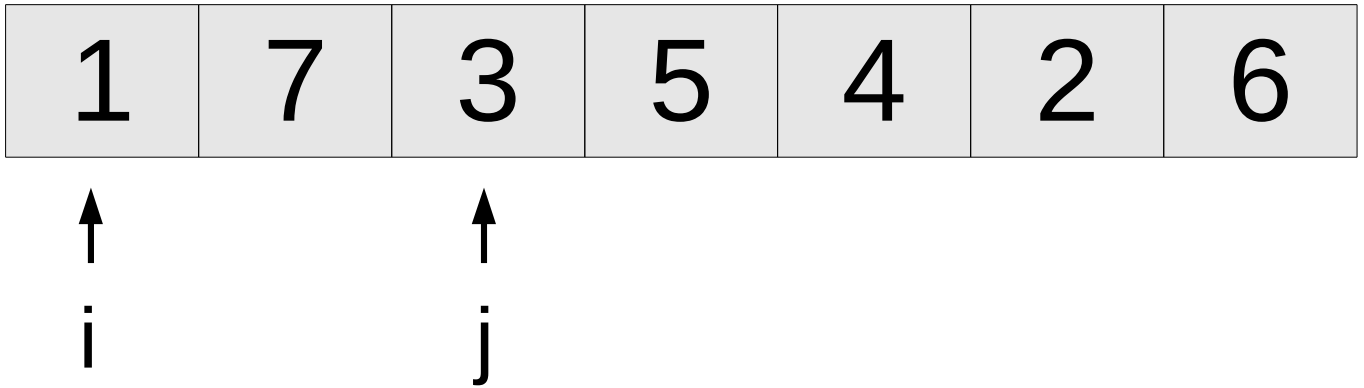

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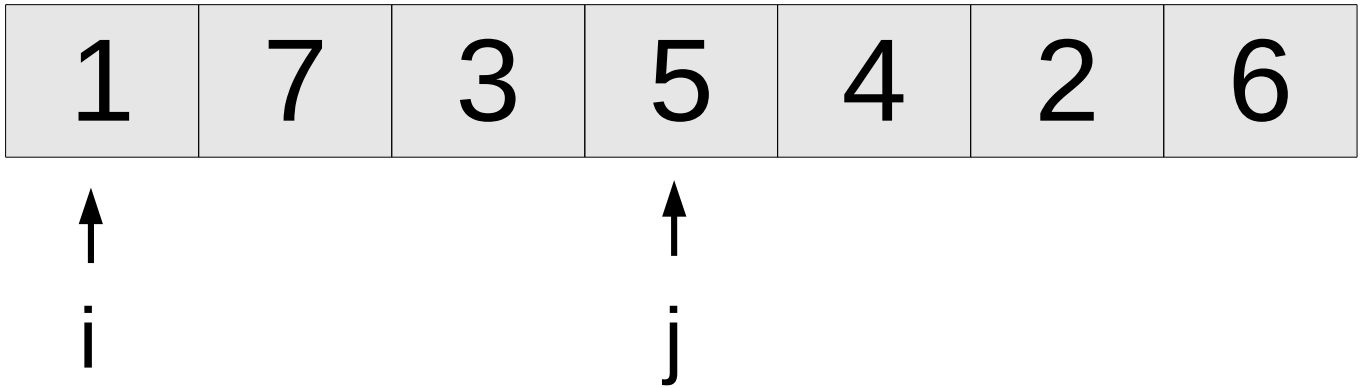

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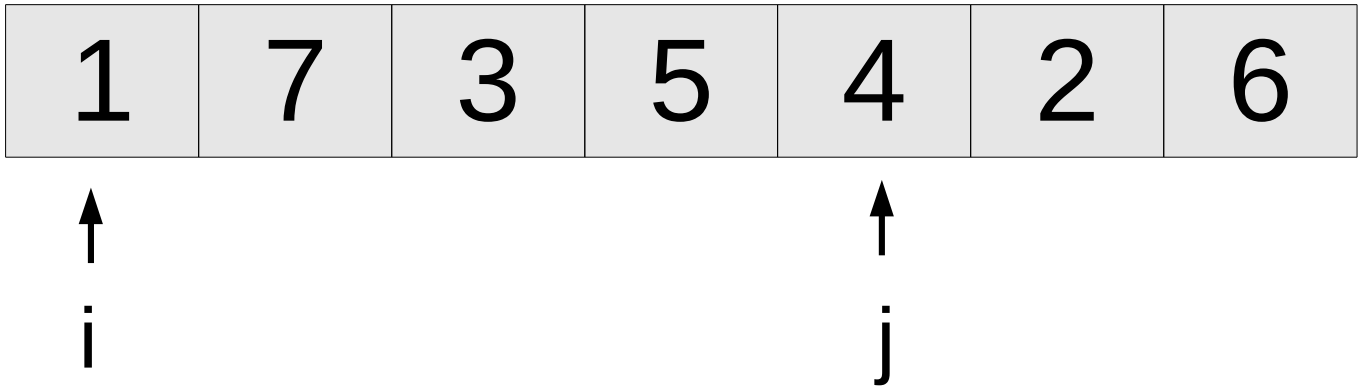

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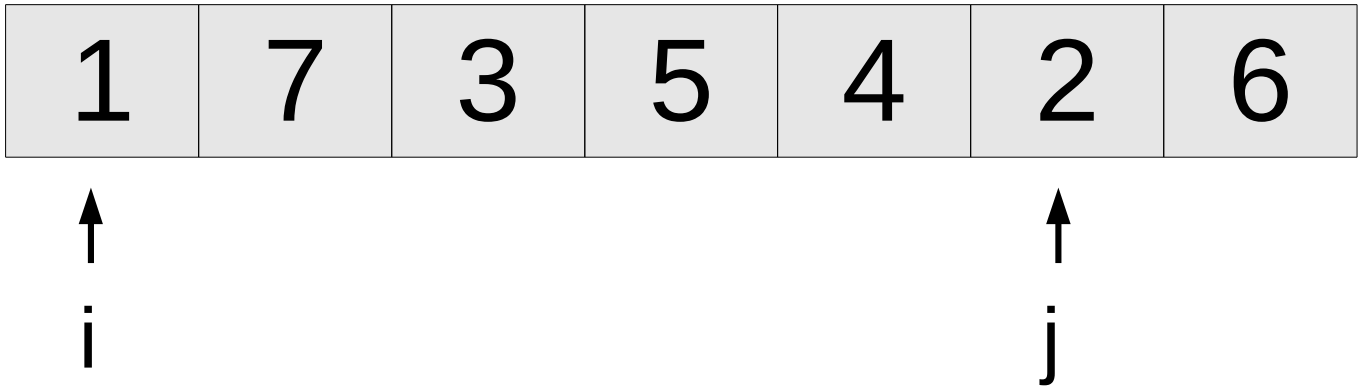

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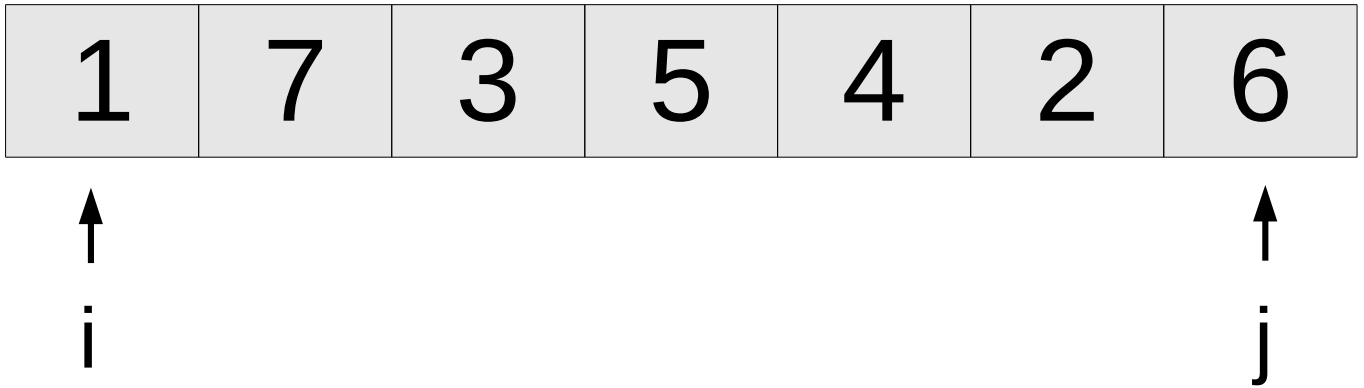

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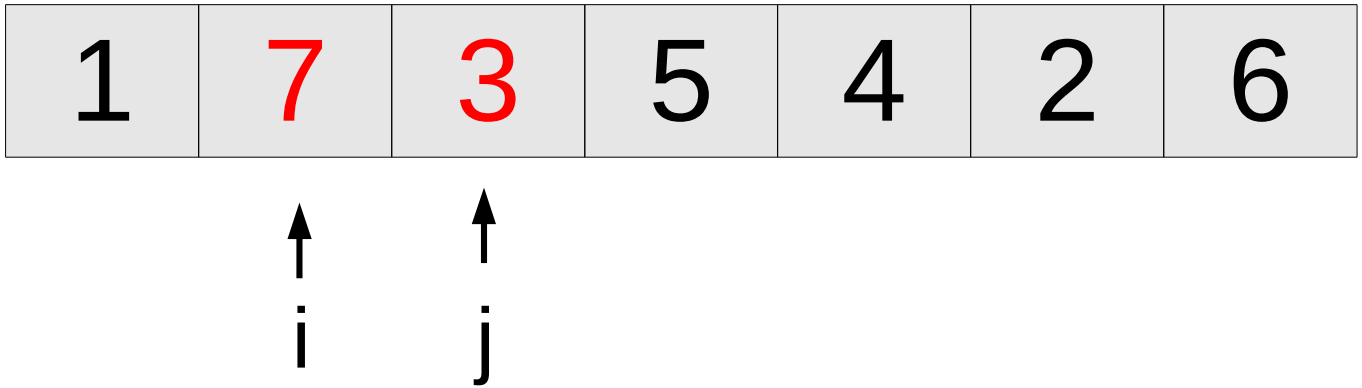

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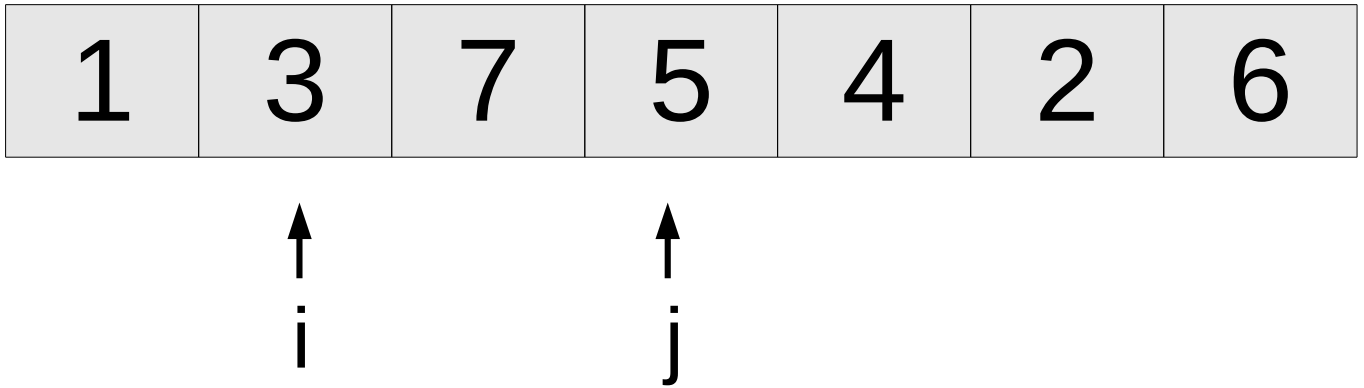

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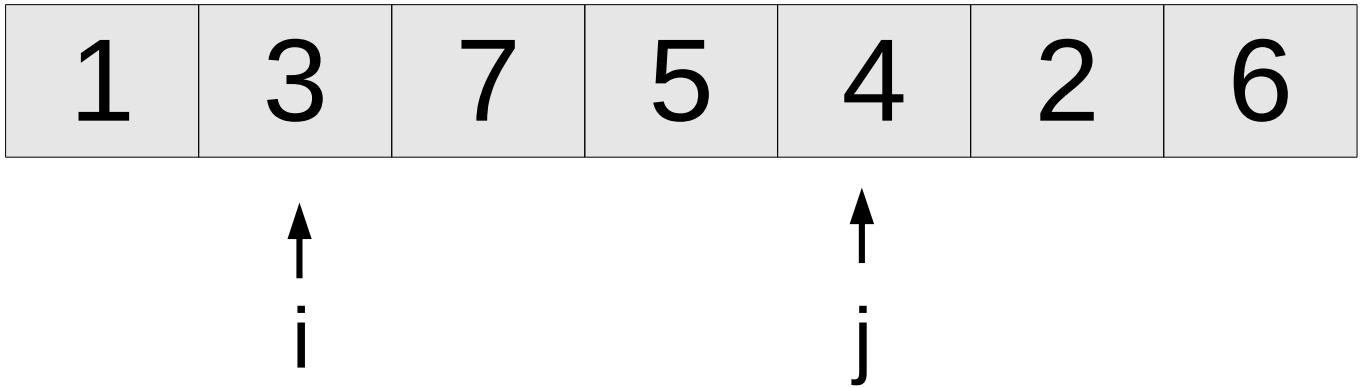

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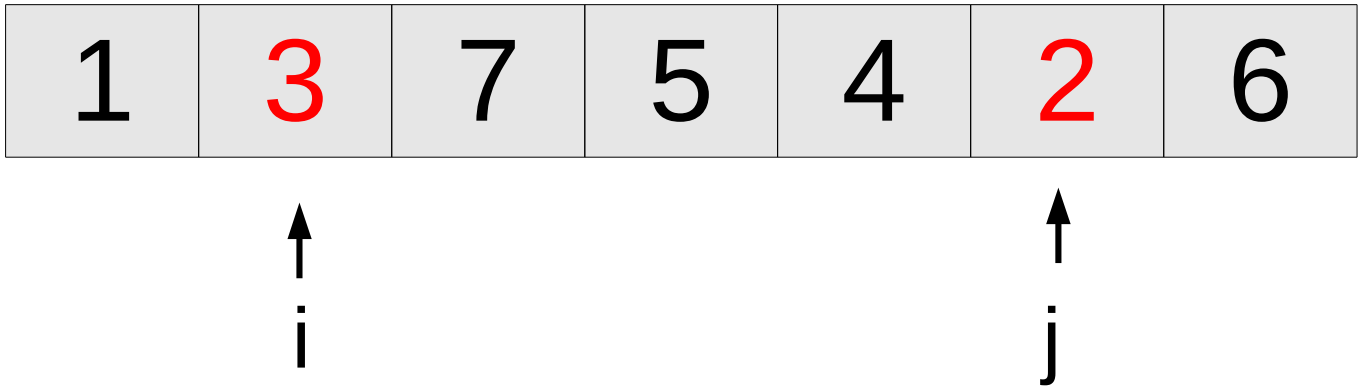

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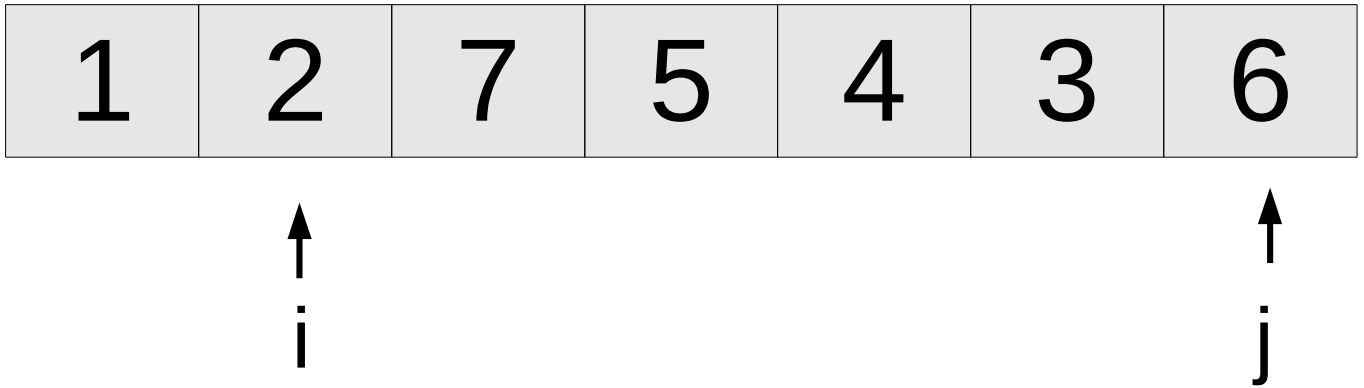

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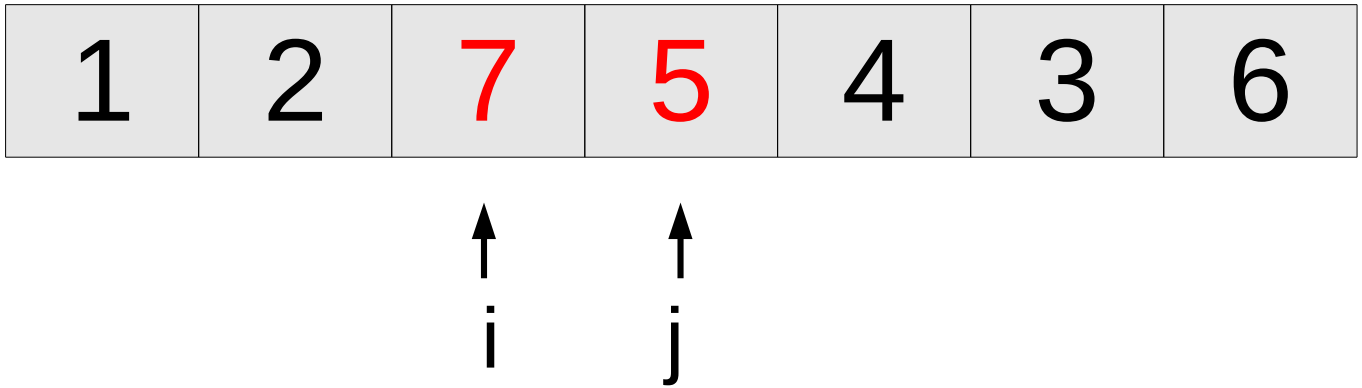

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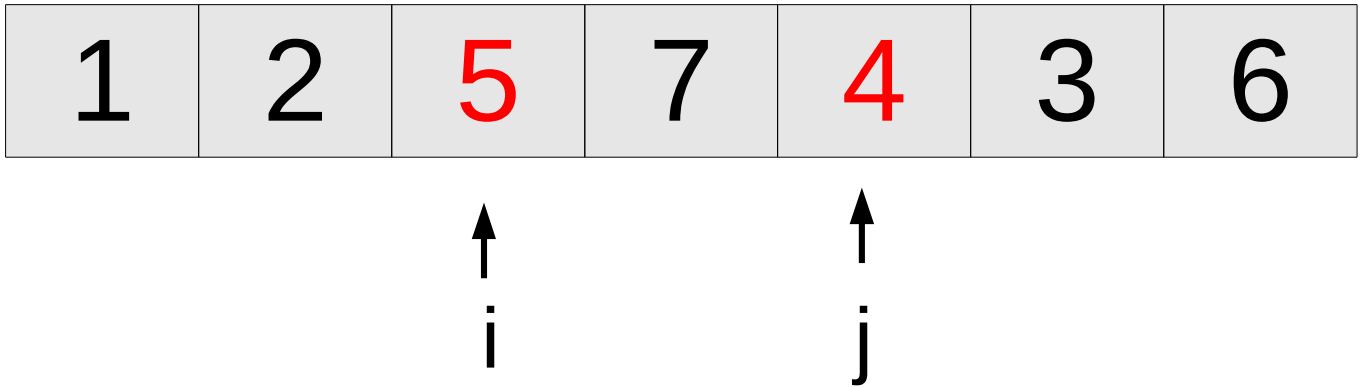

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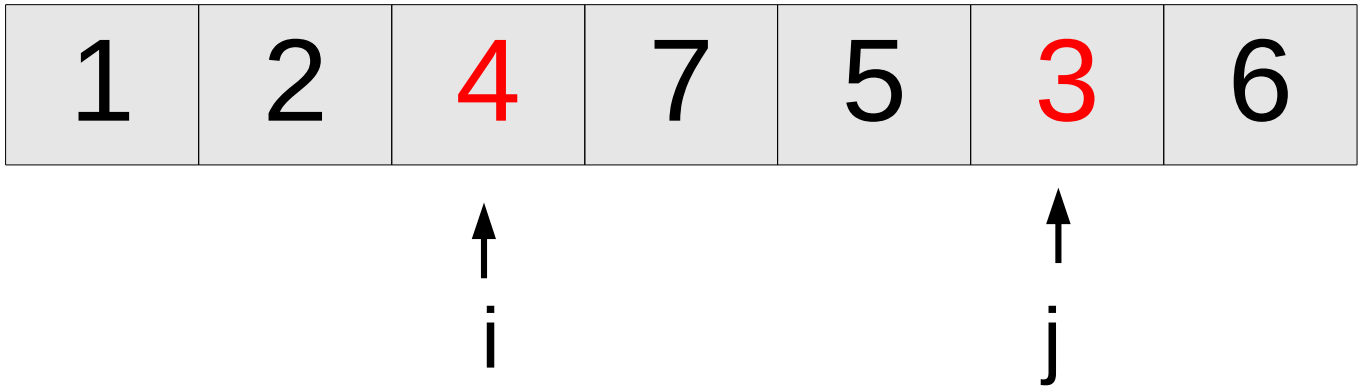

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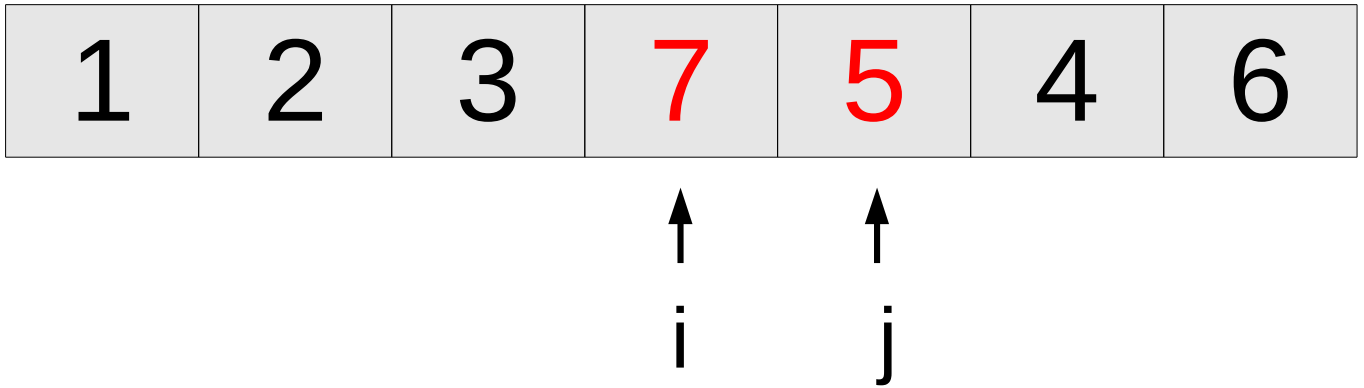

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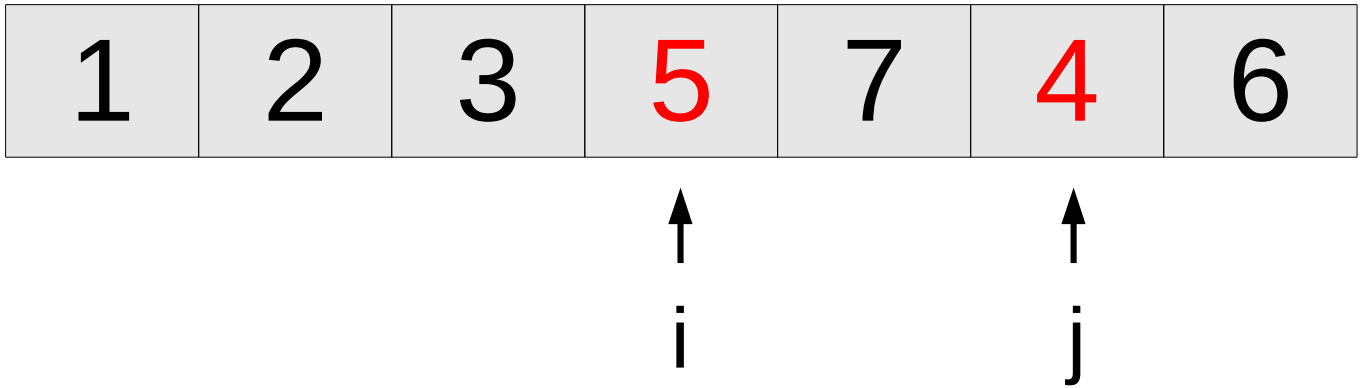

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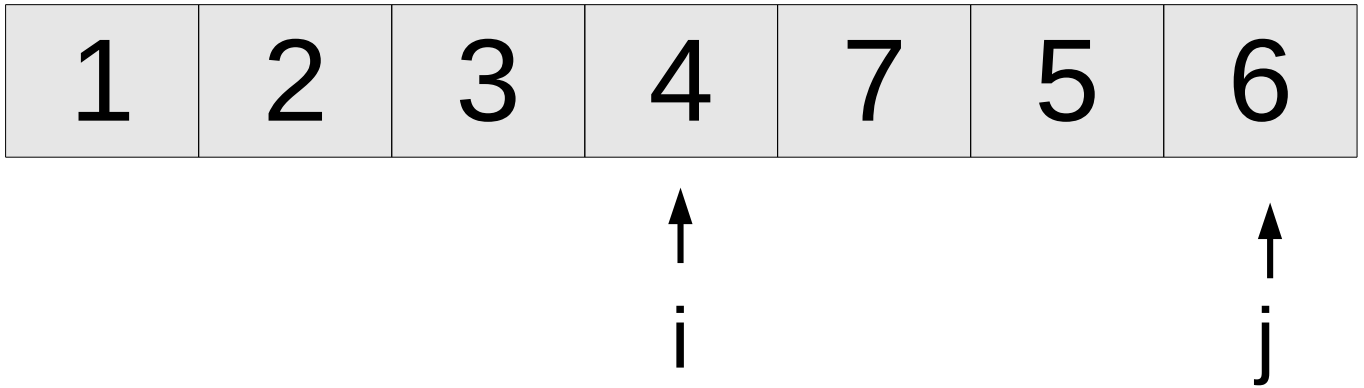

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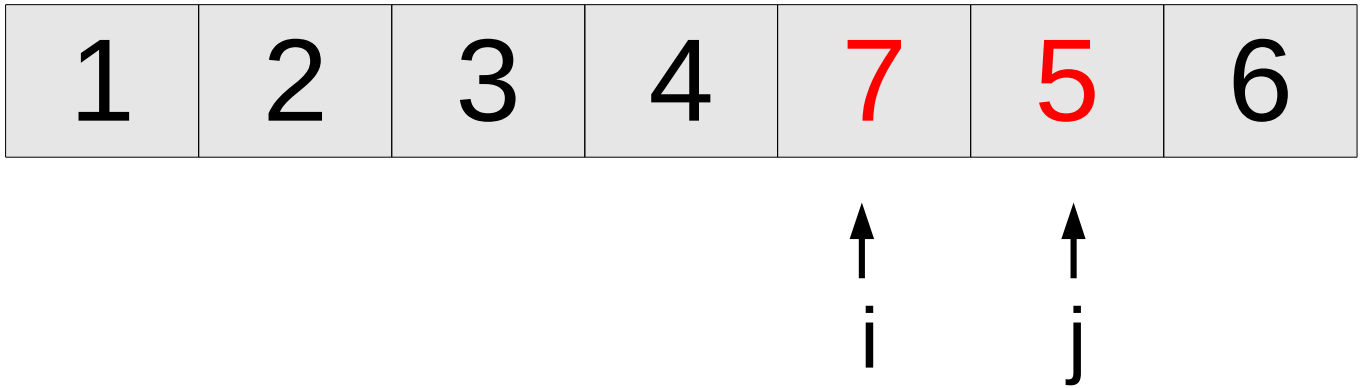

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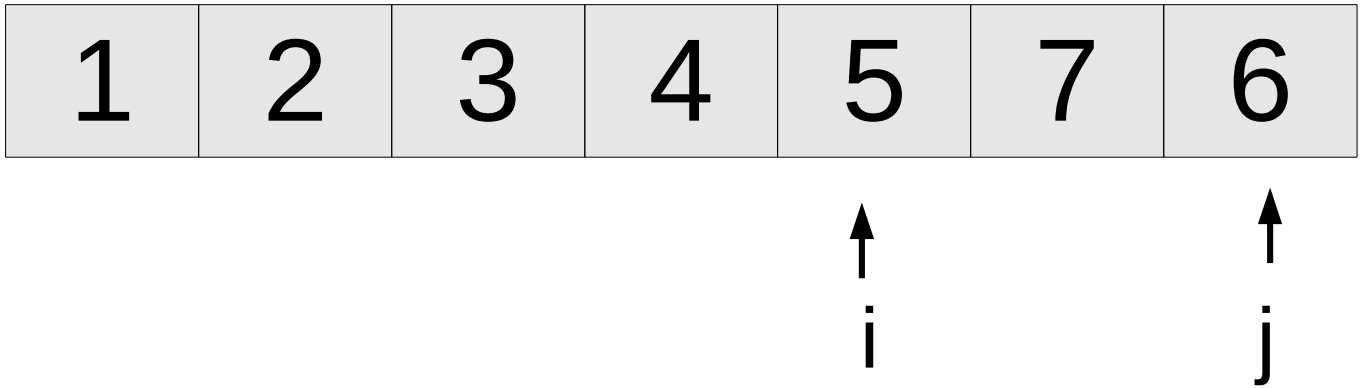

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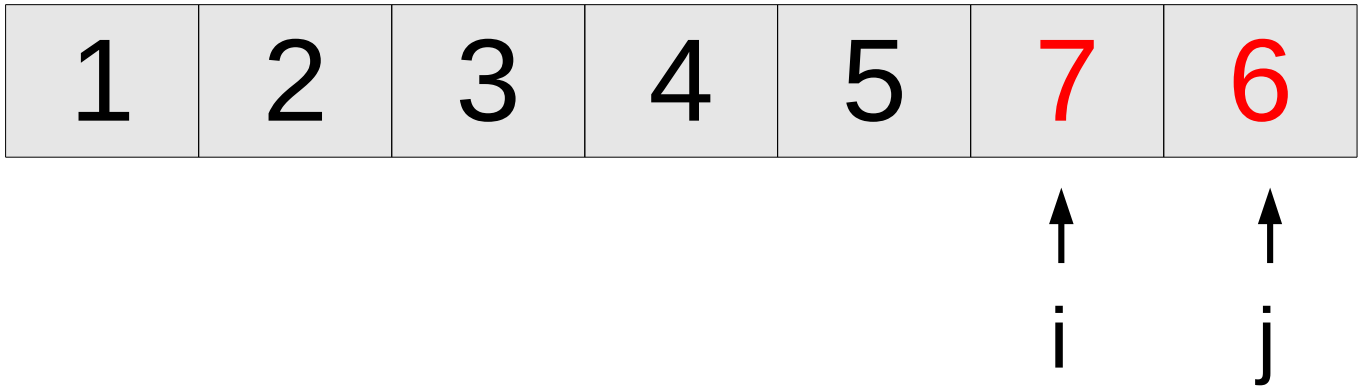

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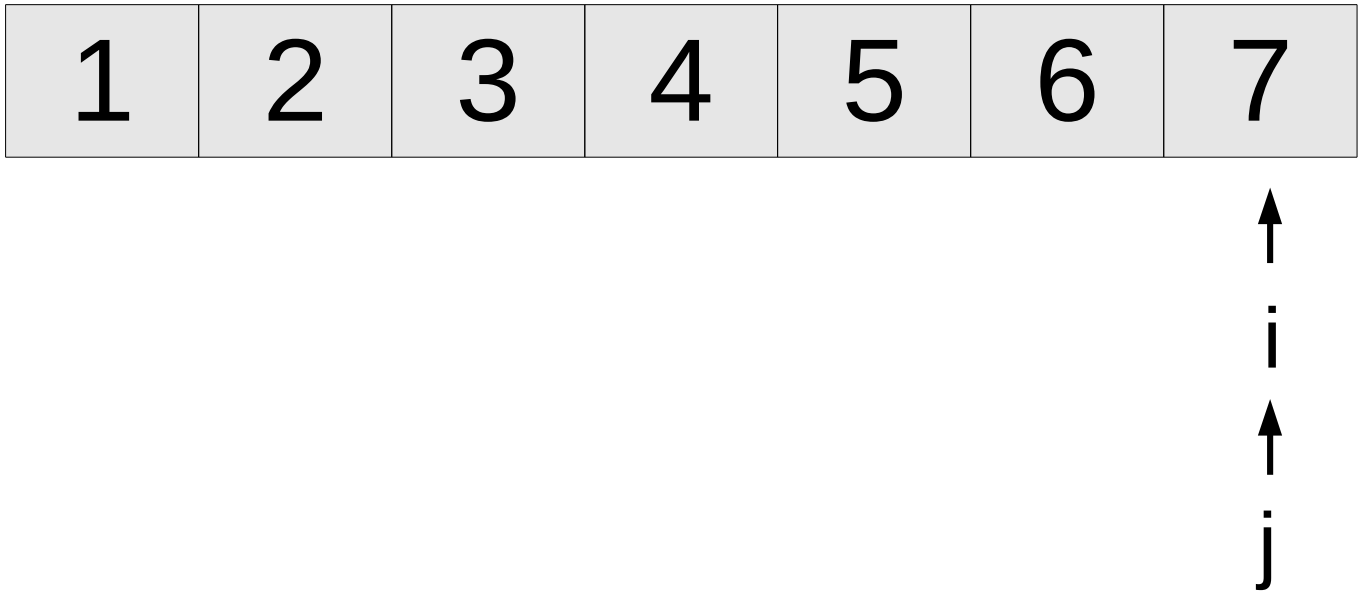


Prós e Cons

- Prós:
  - Ótimo quando N é pequeno
  - Muito bom quando o vetor está “quase” ordenado
- Cons:
  - Péssimo com N muito grande
  - Alto custo de movimentação dos elementos no vetor

Análise da ordenação

Número de operações:

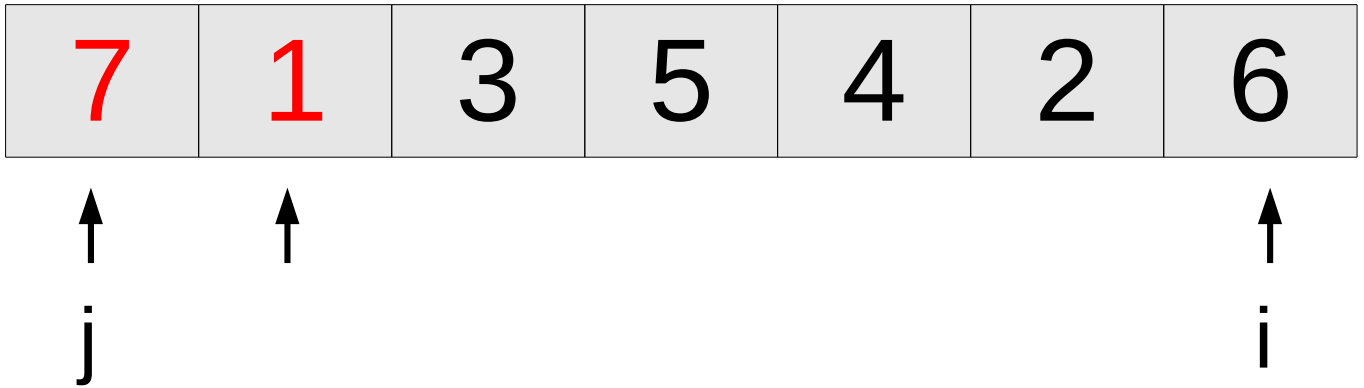
$$cN + c(N-1) + c(N-2) + \ldots + 3 + 2 + 1$$

$$N*(N-1)/2$$

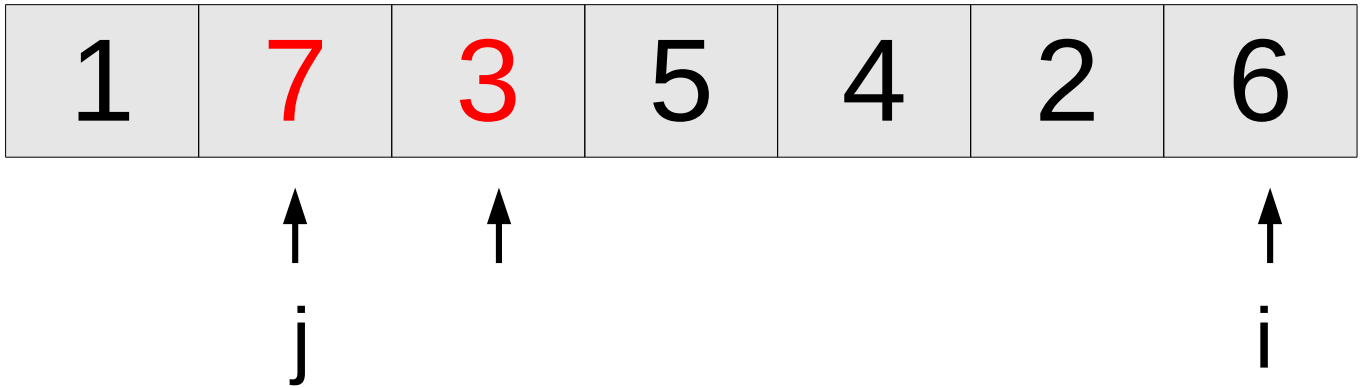
Bubble Sort

- Cada elemento da posição j será comparado com o próximo elemento (j+1). Caso o elemento j for maior que o da posição j+1, eles trocam de lugar e assim sucessivamente.

Bubble Sort



Bubble Sort



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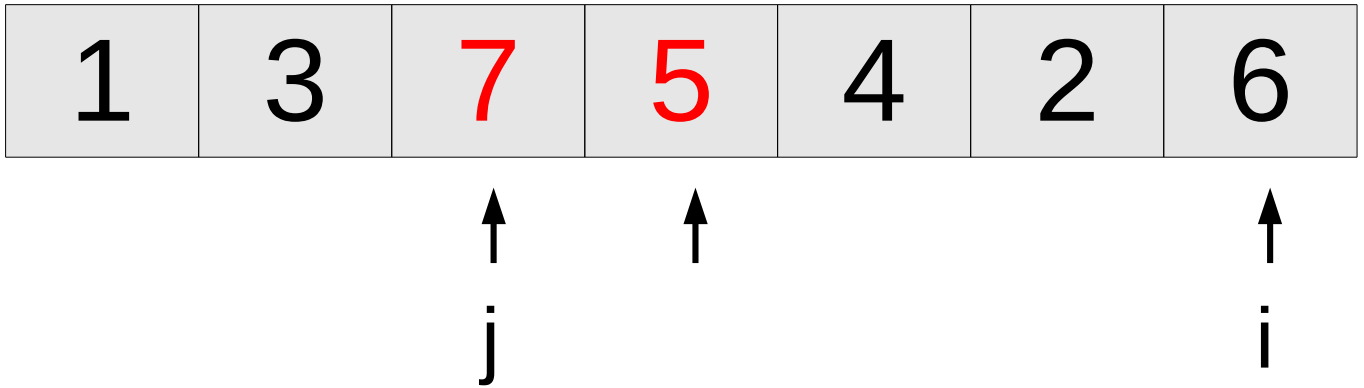

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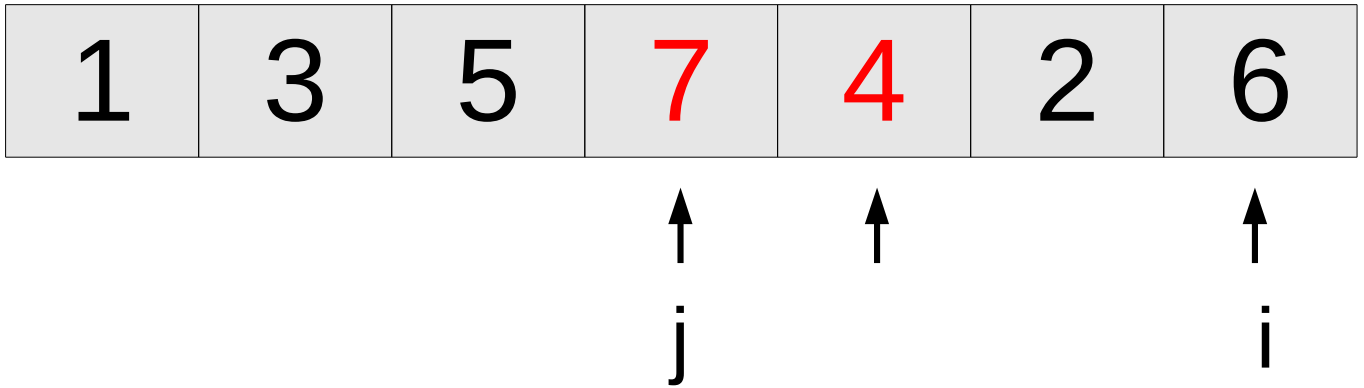

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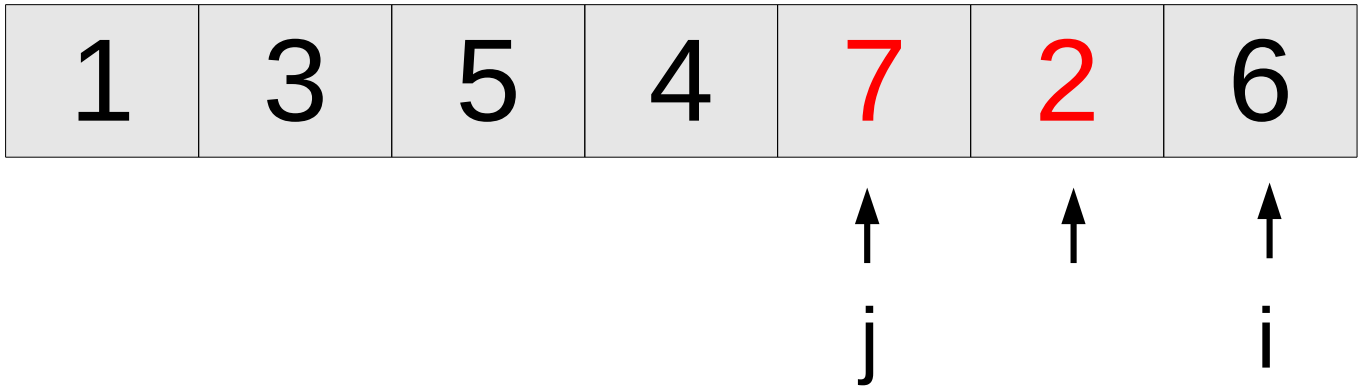

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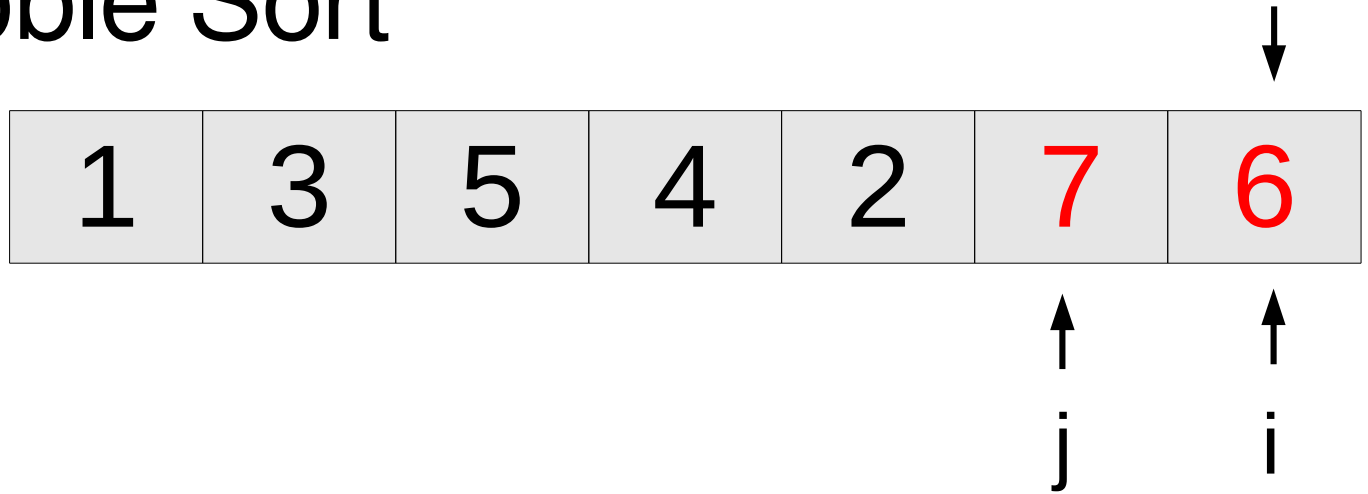

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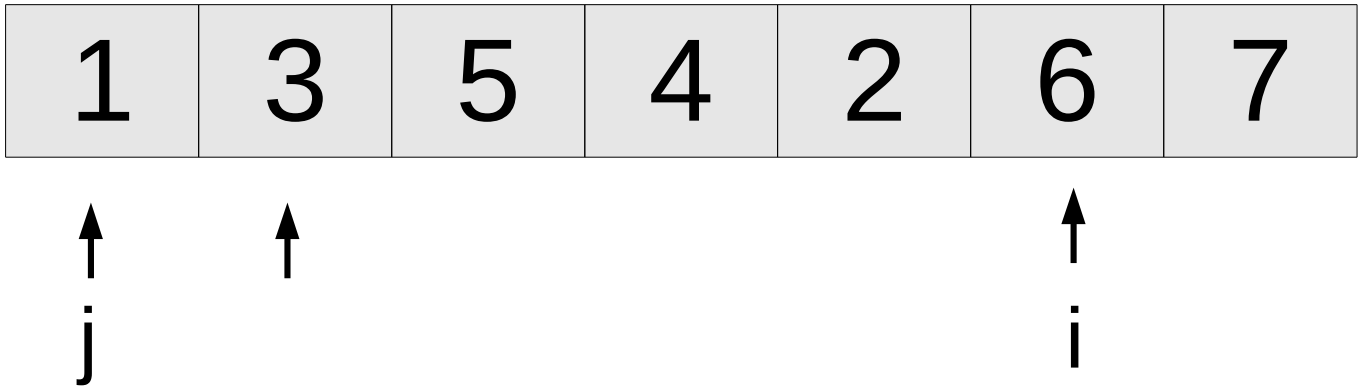
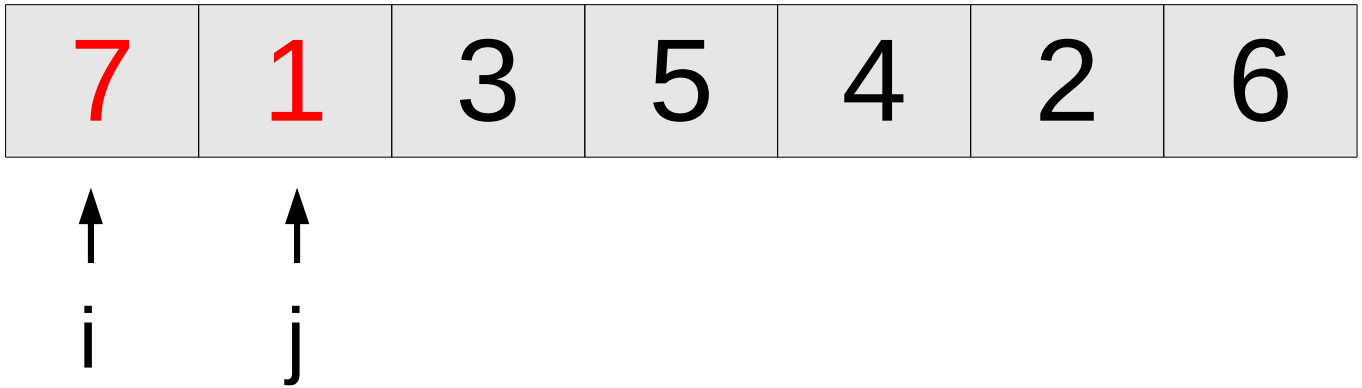


Selection Sort

- Seleciona-se um número a partir do primeiro, este número é comparado com os números da da sua direita, quando encontrado um número menor, o número selecionado ocupa a posição do menor número encontrado, que passa a ser o número selecionado e agora ocupa a primeira posição.

Selection Sort



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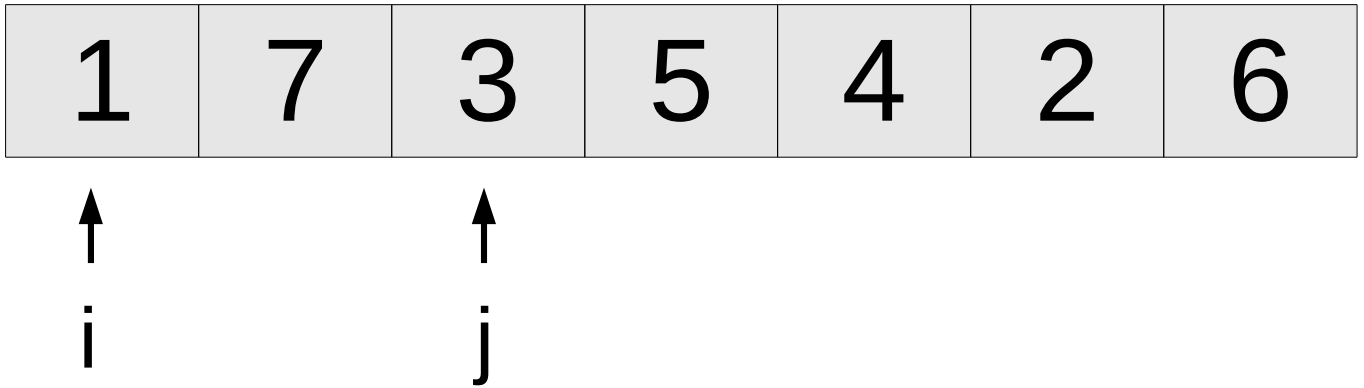

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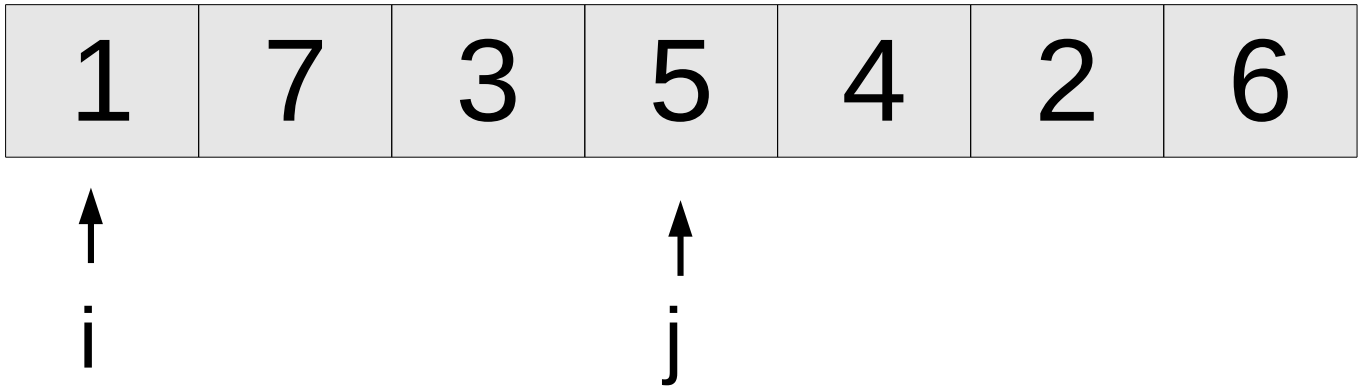

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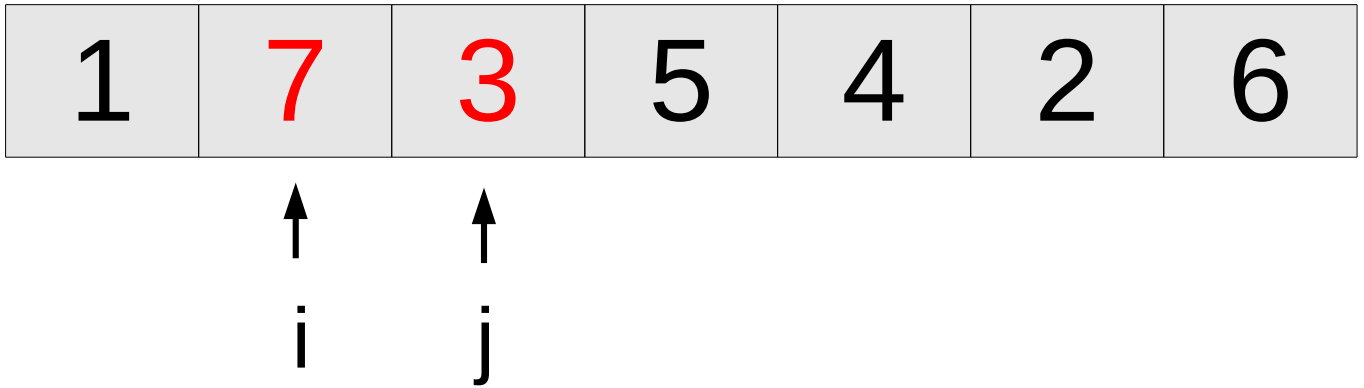

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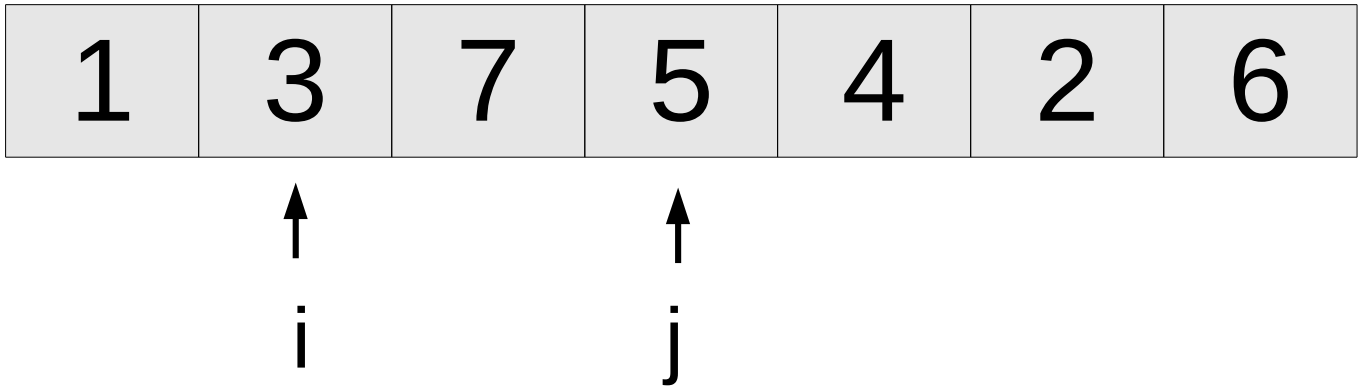

Exercícios

- Implementar os algoritmos BubbleSort e SelectionSort para a ordenação de um vetor de tamanho N de forma não-decrescente.

Bibliografia

Cormen, Thomas H. et al. Algoritmos.; [tradução Arlete Simille]. 3ª ed - Rio de Janeiro - Elsevier, 2011.

Soares Neto, Carlos de Salles. Notas de Aula Disciplina EDII - UFMA