Beispiele zu Sortierverfahren

Reiner Hüchting

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Überblick

Insertion Sort

Selection Sort

Bubble Sort

Insertion Sort – Ansatz

Einzelschritt

- Betrachte das jeweils nächste Element.
- ▶ Verschiebe es nach links, bis es an der richtigen Stelle ist.

Beobachtung

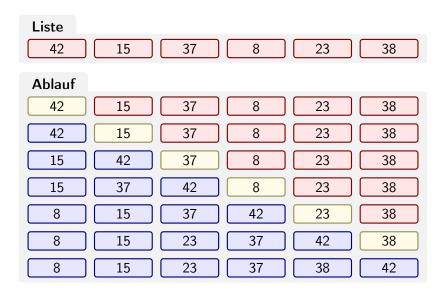
- Der linke Teil der Liste ist immer sortiert.
- Mit jedem Schritt wächst dieser sortierte Teil um ein Element.
- ▶ Nach *n* Wiederholungen ist die gesamte Liste sortiert.

Komplexität

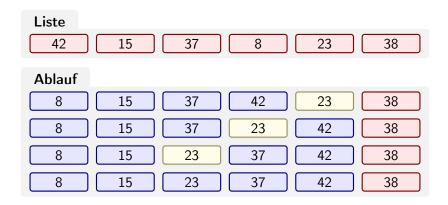
► Einzelschritt: *O*(*n*)n

• Gesamt: $O(n^2)$ n

Insertion Sort - Beispiel: Gesamt-Ablauf



Insertion Sort – Beispiel: Innere Schleife

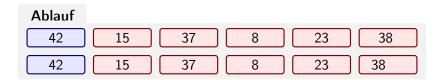


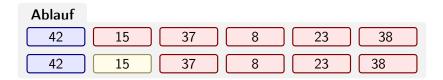


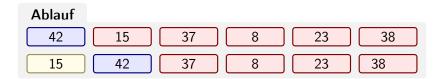


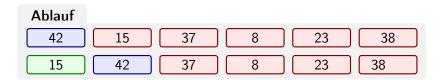


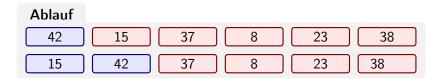


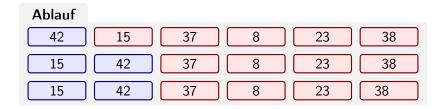


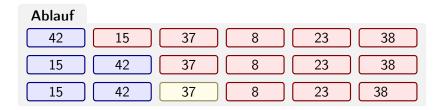


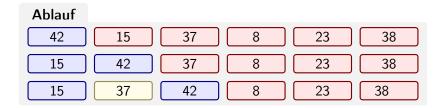


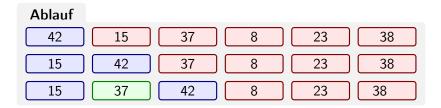


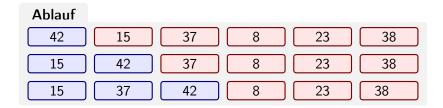


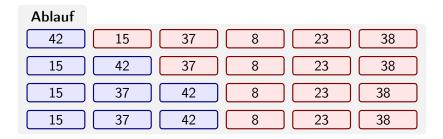


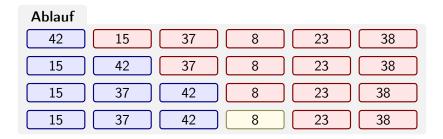


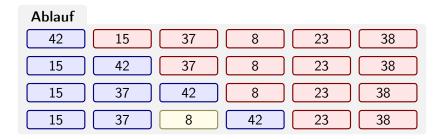


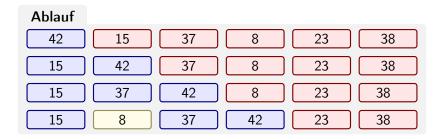


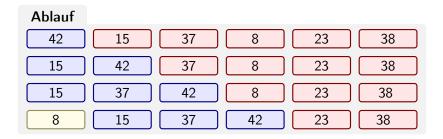


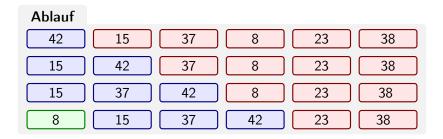


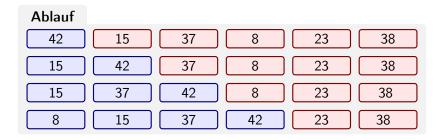


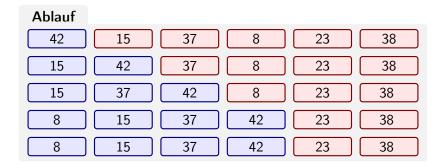


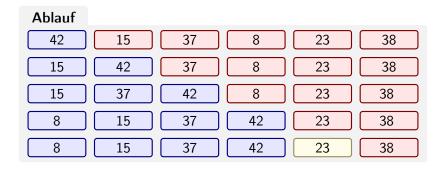


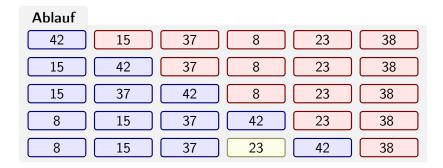


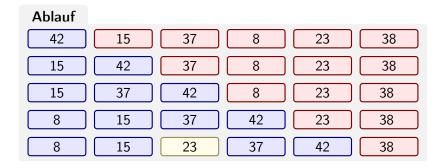


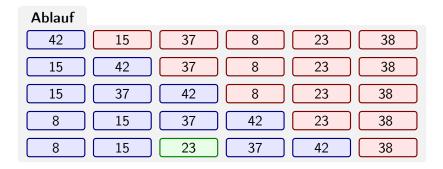


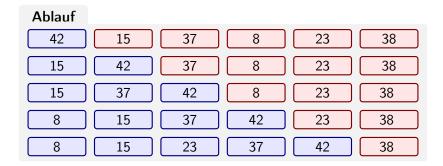




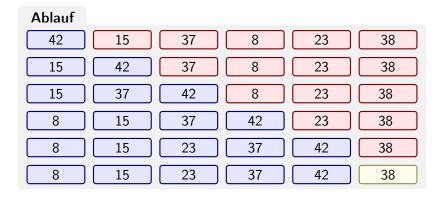


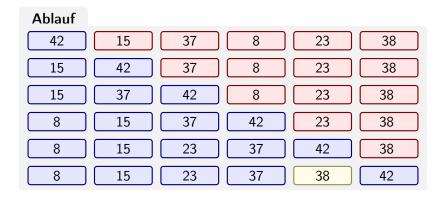


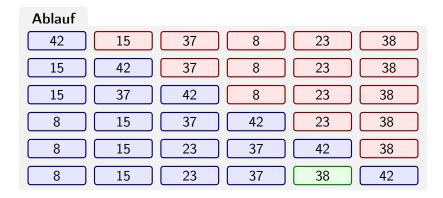




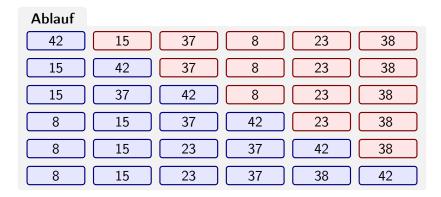
Ablauf				
42	15 37	8	23	38
15	42 37	8	23	38
15	37 42	8	23	38
8	15 37	42	23	38
8	15 23	37	42	38
8	15 23	37	42	38







Insertion Sort – Animiertes Beispiel



Selection Sort - Ansatz

Einzelschritt

- Durchlaufe die Liste von links nach rechts.
- ▶ Suche das kleinste Element rechts von der aktuellen Position.
- Tausche dieses mit dem aktuellen Element.

Beobachtung

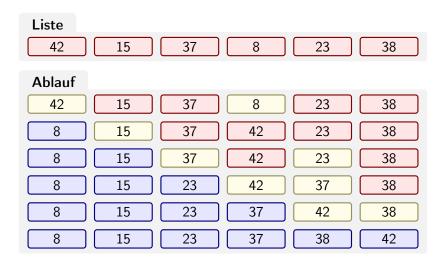
- Links vom aktuellen Element ist die Liste ist immer sortiert.
- Mit jedem Schritt wächst dieser sortierte Teil um ein Element.
- Nach n Wiederholungen ist die gesamte Liste sortiert.

Komplexität

 \triangleright Einzelschritt: O(n)n

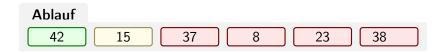
• Gesamt: $O(n^2)$ n

Selection Sort – Beispiel: Gesamt-Ablauf

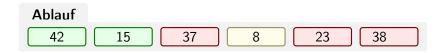


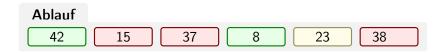










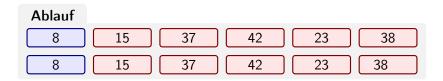


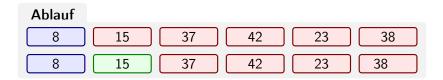


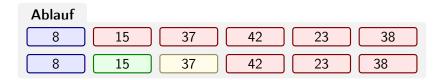


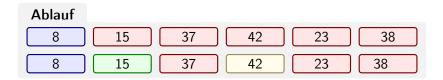


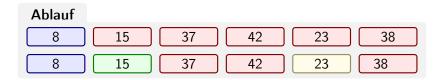


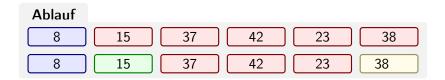


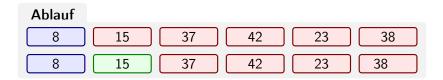


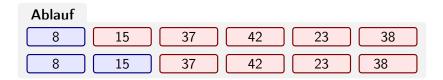


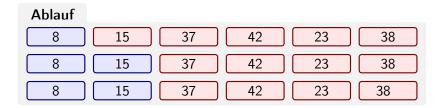


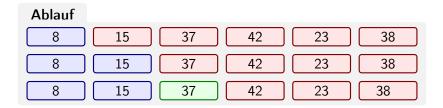


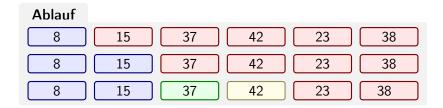


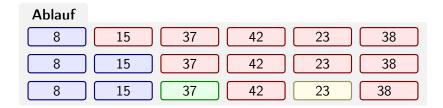


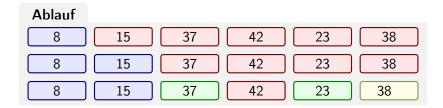


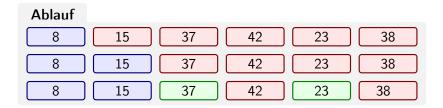


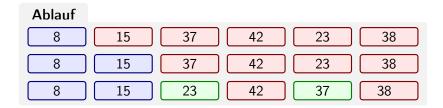


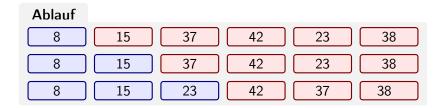


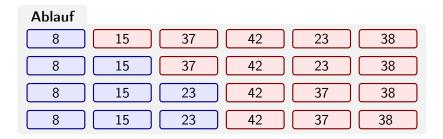


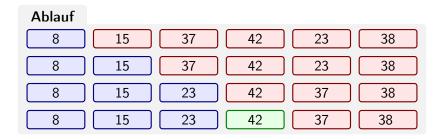


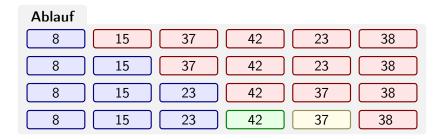




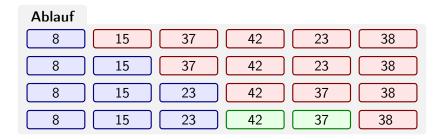




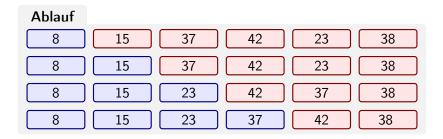




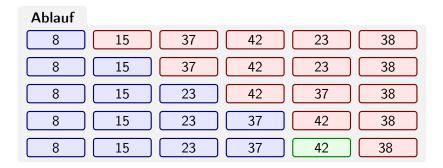




Ablauf	
8	15 37 42 23 38
8	15 37 42 23 38
8	15 23 42 37 38
8	15 23 37 42 38



Ablauf	
8	15 37 42 23 38
8	15 37 42 23 38
8	15 23 42 37 38
8	15 23 37 42 38
8	15 23 37 42 38



Ablauf					
8	15	37	42	23	38
8	15	37	42	23	38
8	15	23	42	37	38
8	15	23	37	42	38
8	15	23	37	42	38

Ablauf		
8	15 37 42 23	38
8	15 37 42 23	38
8	15 23 42 37	38
8	15 23 37 42	38
8	15 23 37 42	38

Ablauf		
8	15 37 42	23 38
8	15 37 42	23 38
8	15 23 42	37 38
8	15 23 37	42 38
8	15 23 37	38 42

Ablauf				
8	15 37	42	23	38
8	15 37	42	23	38
8	15 23	42	37	38
8	15 23	37	42	38
8	15 23	37	38	42

Bubble Sort – Ansatz

Einzelschritt

- Betrachte jeweils zwei benachbarte Elemente.
- ► Vertausche sie, falls das erste größer ist als das zweite.
- Wiederhole dies für alle Positionen in der Liste.

Beobachtung

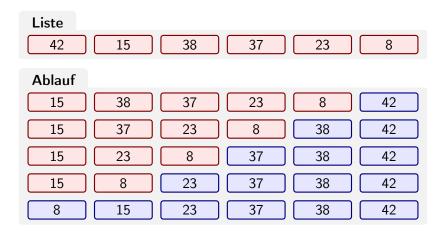
- Ein Einzelschritt bringt das größte Element ans Ende.
- Der rechte Teil der Liste ist immer sortiert.
- Mit jedem Schritt wächst dieser sortierte Teil um ein Element.
- ▶ Nach *n* Wiederholungen ist die gesamte Liste sortiert.

Komplexität

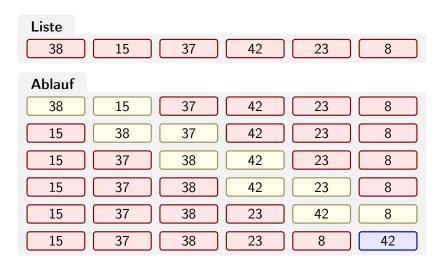
► Einzelschritt: *O*(*n*)n

• Gesamt: $O(n^2)$ n

Bubble Sort - Beispiel: Gesamt-Ablauf



Bubble Sort – Beispiel: Innere Schleife

















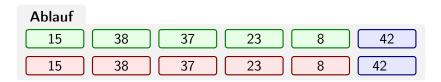


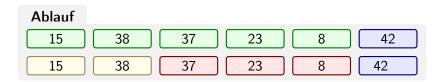


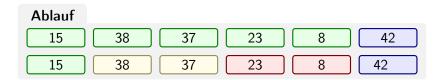


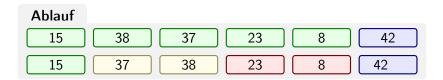


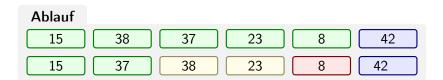


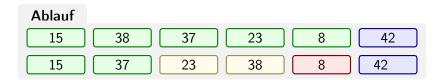


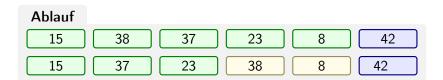


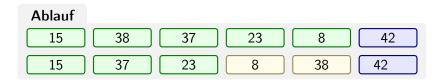


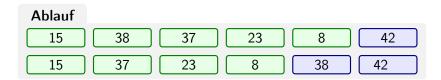


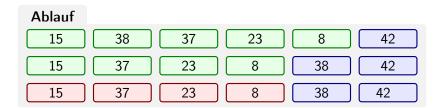




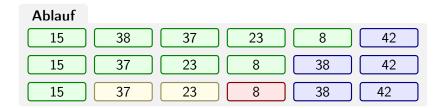


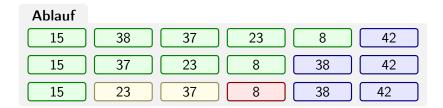


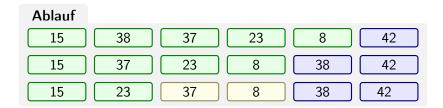


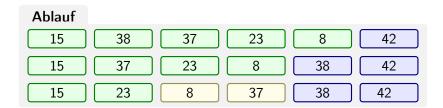


Ablauf					
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15	37	23	8	38	42
15	37	23	8	38	42





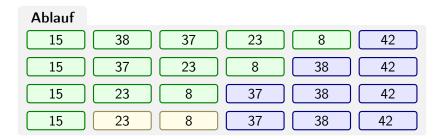




Ablauf					
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15	37	23	8	38	42
15	23	8	37	38	42

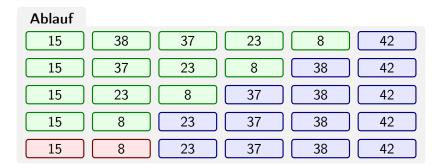
Ablauf					
15	38	37	23	8	42
15	37	23	8	38	42
15	23	8	37	38	42
15	23	8	37	38	42

Ablauf	
15 38 37 23	8 42
15 37 23 8	38 42
15 23 8 37	38 42
15 23 8 37	38 42



Ablauf			
15 38	37 23	8	42
15 37	23 8	38	42
15 23	8 37	38	42
15 8	23 37	38	42

Ablauf					
15	38	37	23	8	42
15	37	23	8	38	42
15	23	8	37	38	42
15	8	23	37	38	42



Ablauf					
15	38	37	23	8	42
15	37	23	8	38	42
15	23	8	37	38	42
15	8	23	37	38	42
15	8	23	37	38	42

Ablauf					
15	38	37	23	8	42
15	37	23	8	38	42
15	23	8	37	38	42
15	8	23	37	38	42
8	15	23	37	38	42

Ablauf					
15	38	37	23	8	42
15	37	23	8	38	42
15	23	8	37	38	42
15	8	23	37	38	42
8	15	23	37	38	42