make history.

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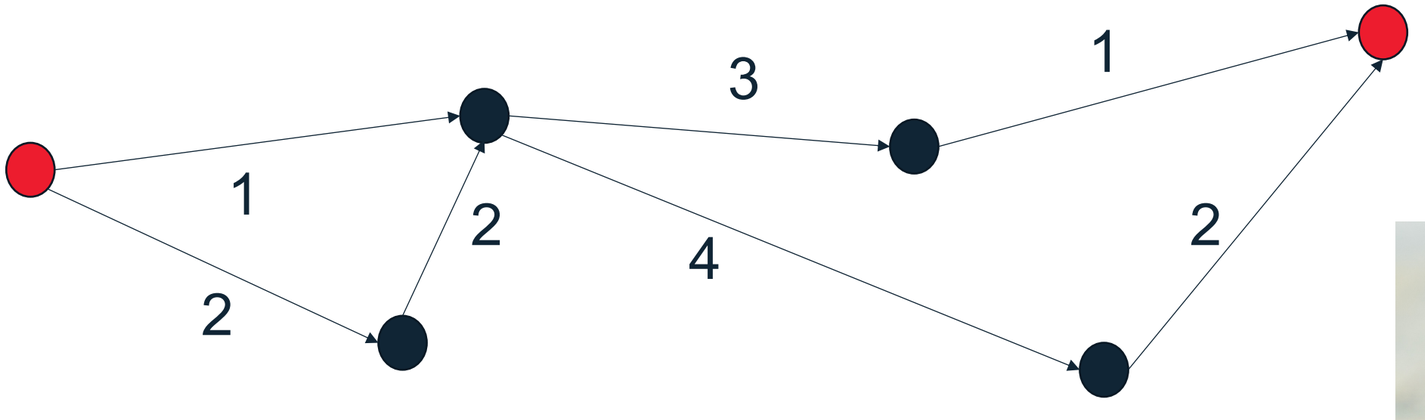
Computational complexity of algorithms

Dr. Anna Kalenkova

Travel application. Shortest route



Travel application. Shortest route. Worst case.

Each point **i** is connected to each point **j**.

Paths without repetitions that contain all the points:

s,1,2,3,e

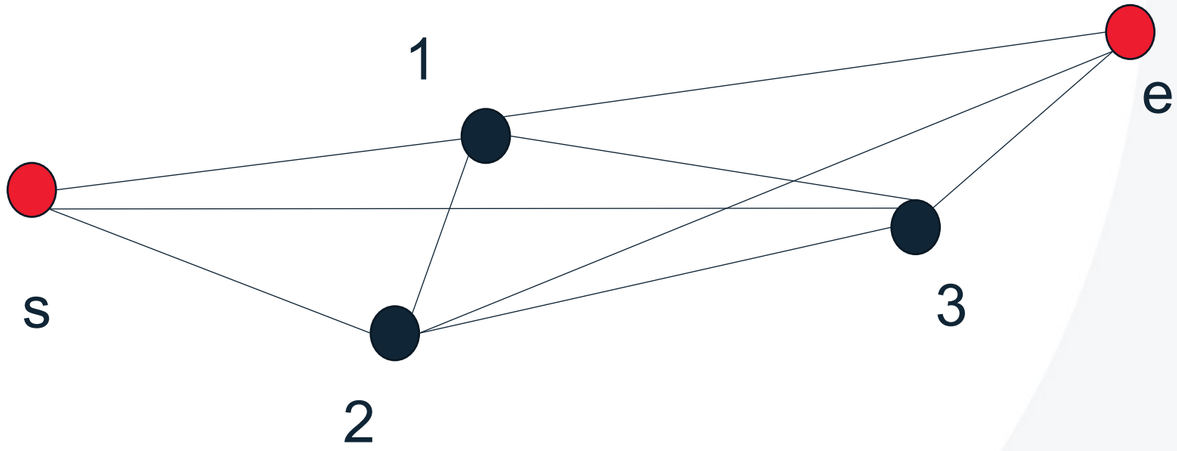
s,1,3,2,e

s,2,1,3,e

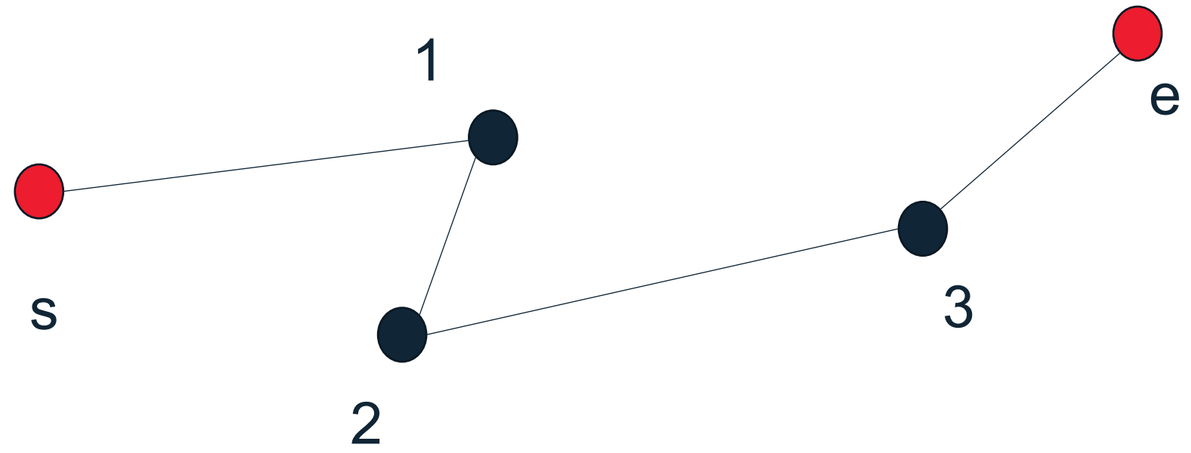
s,2,3,1,e

s,3,1,2,e

s,3,2,1,e



Travel application. Shortest route. Best case.



Exhaustive search algorithm


```
…
for(int i=0; i<n; i++) {
      if (a[i] == value) {
            return i; // found it!!!
      }
      …
}
…
```

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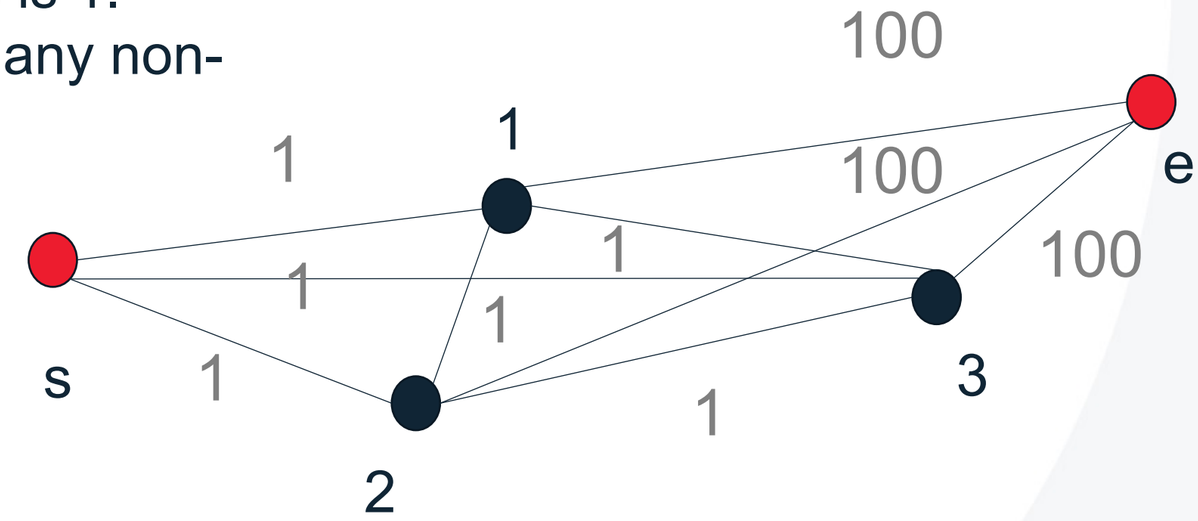
Dijkstra's shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.
Distance from any i to e is larger than any non-cyclic path inside.



(s,0)	(1,∞)	(2,∞)	(3,∞)	(e, ∞)

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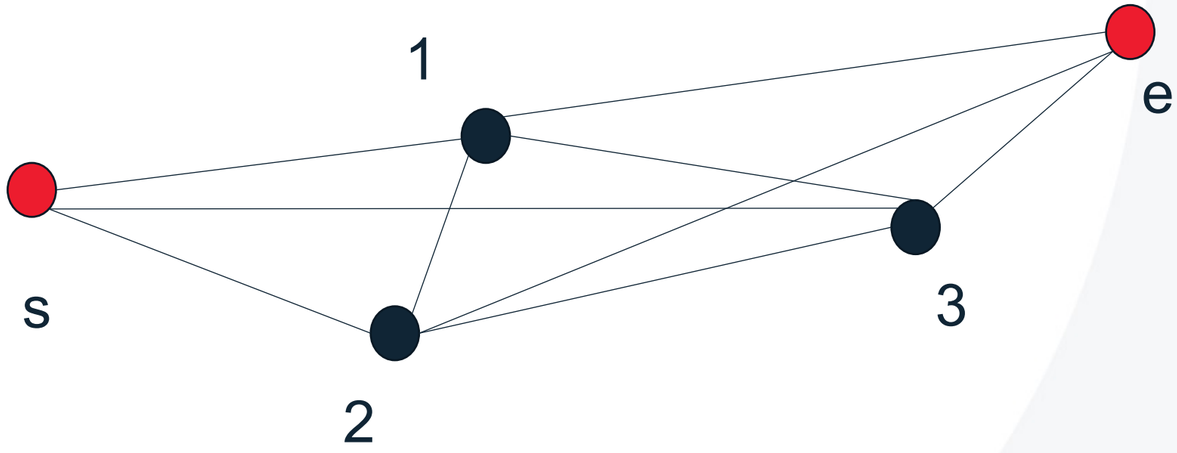
Dijkstra's shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.

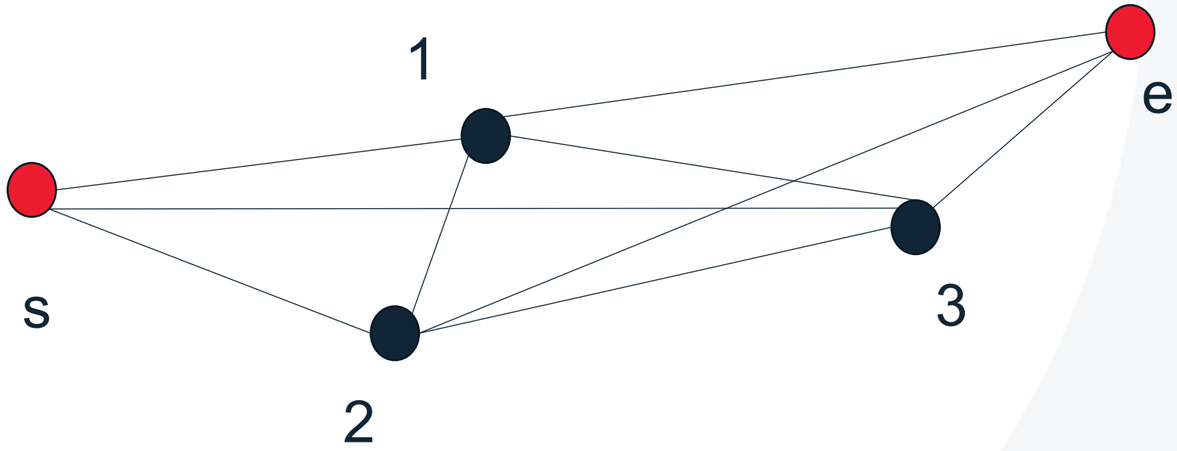


(s,0)	(1,1)	(2,1)	(3,1)	(e, ∞)

consider 4 elements

Dijkstra’s shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.



(1,1)	(2,1)	(3,1)	(e, ∞)

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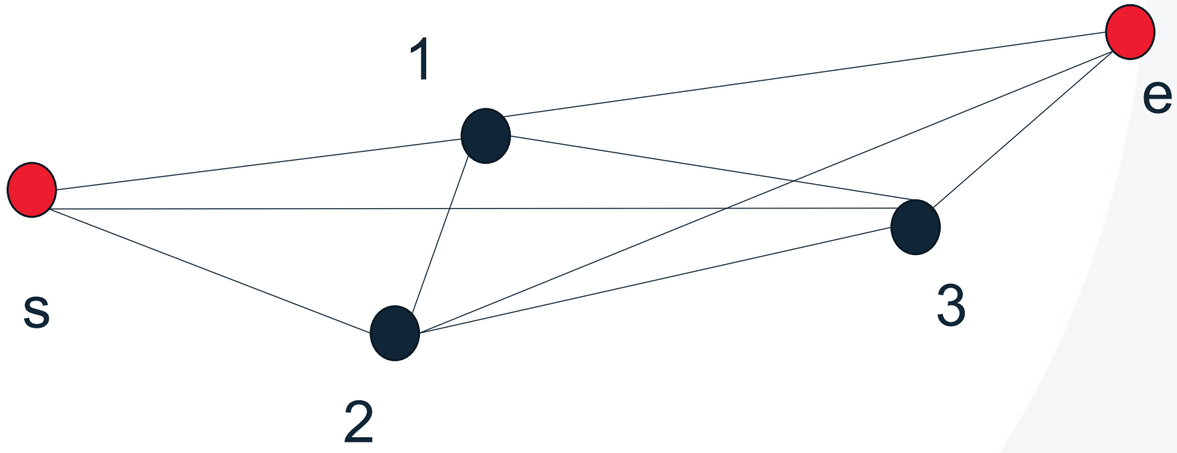
Dijkstra’s shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.

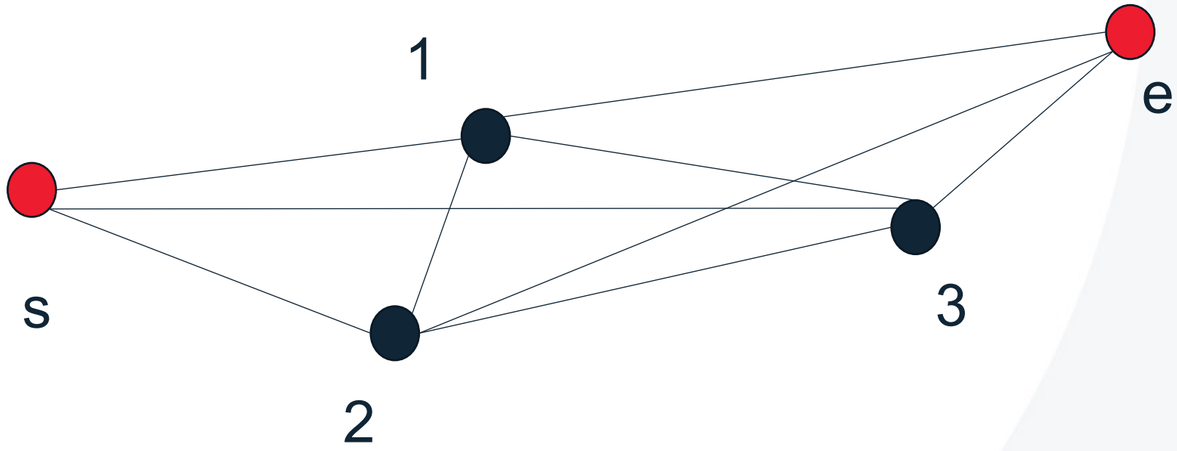


(1,1)	(2,1)	(3,1)	(e,100)

consider 3 elements

Dijkstra’s shortest route. Worst case

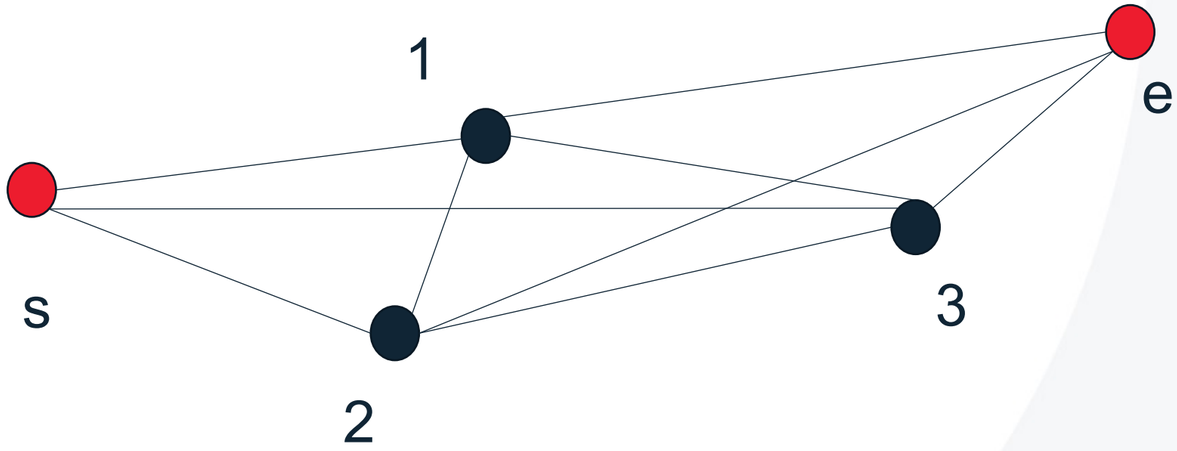
Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.



(2,1)	(3,1)	(e,100)

Dijkstra’s shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.

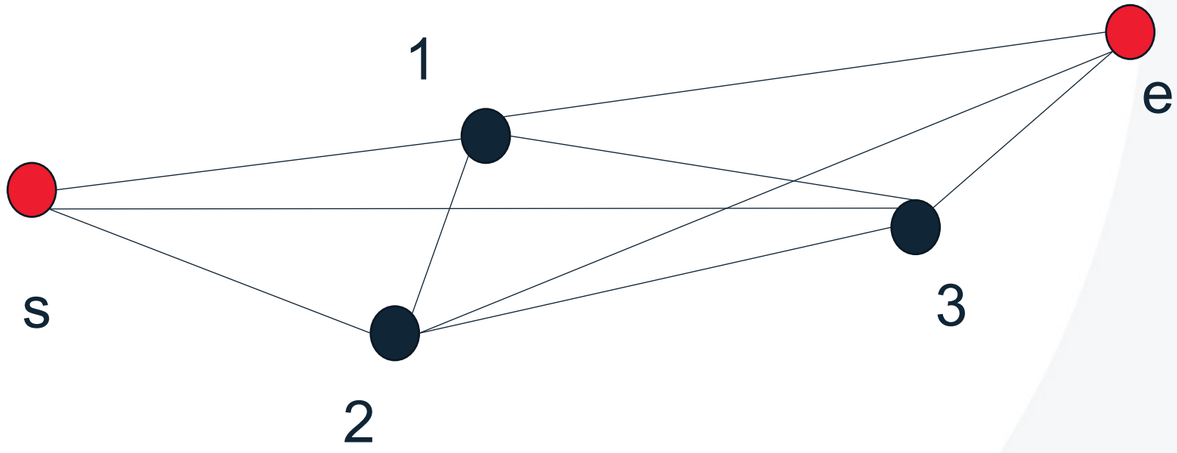


(2,1)	(3,1)	(e,100)

consider 2 elements

Dijkstra’s shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.

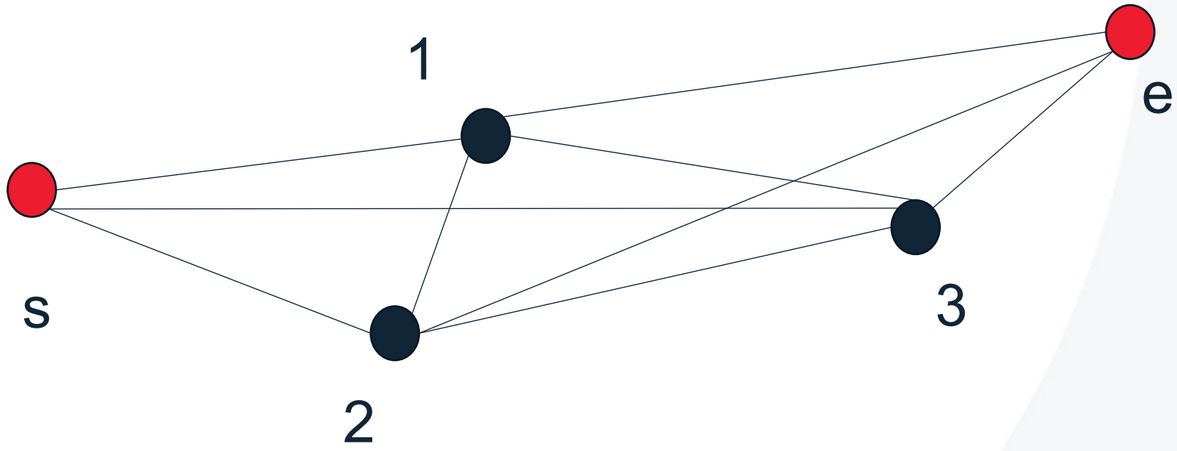


(3,1)	(e,100)

consider 1 element

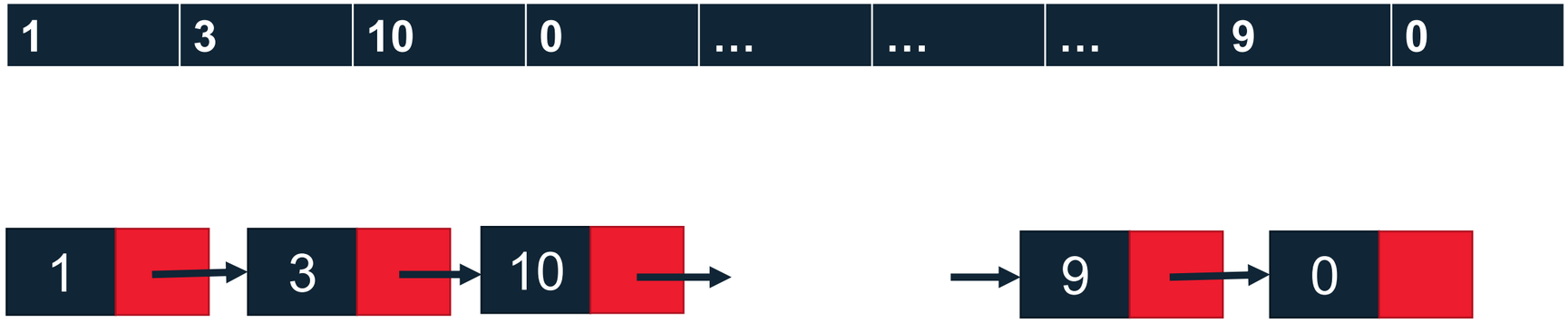
Dijkstra’s shortest route. Worst case

Each point i is connected to each point j.
Distance between any i and any j (i≠j) is 1.



(e,100)

Arrays vs Linked /Lists



- Access using index i
- Adding/removing elements at index i