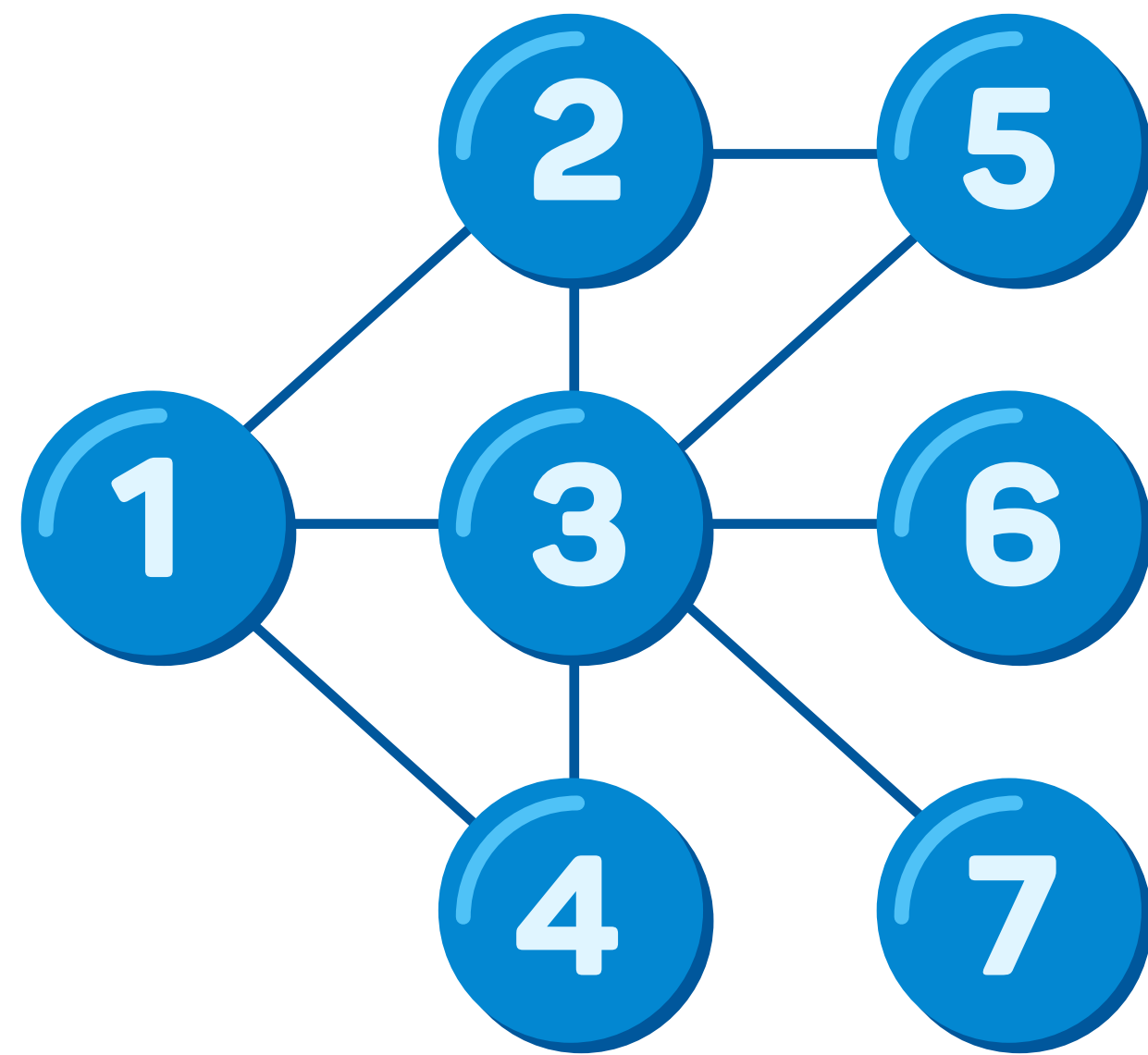
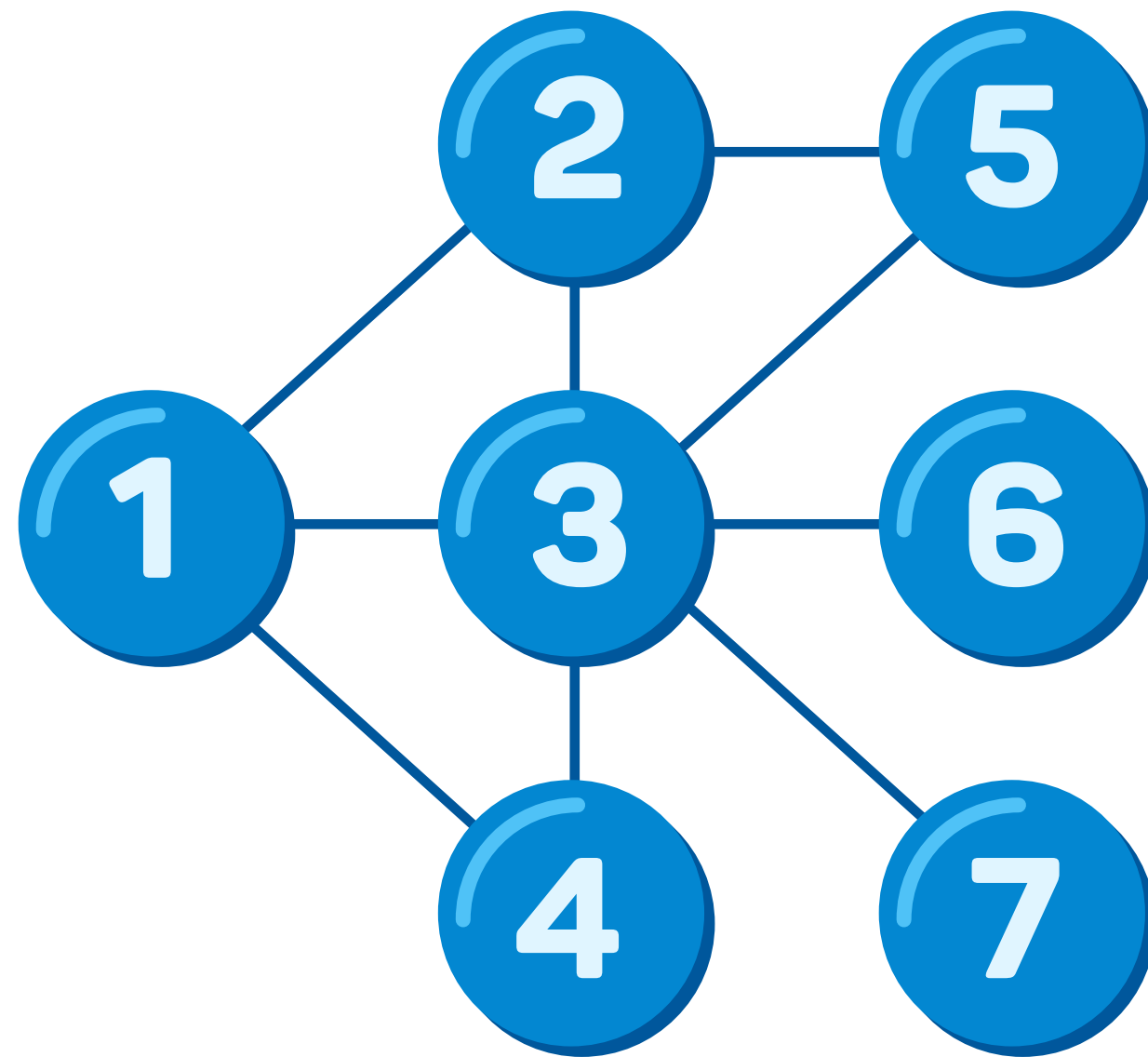


Graph representation



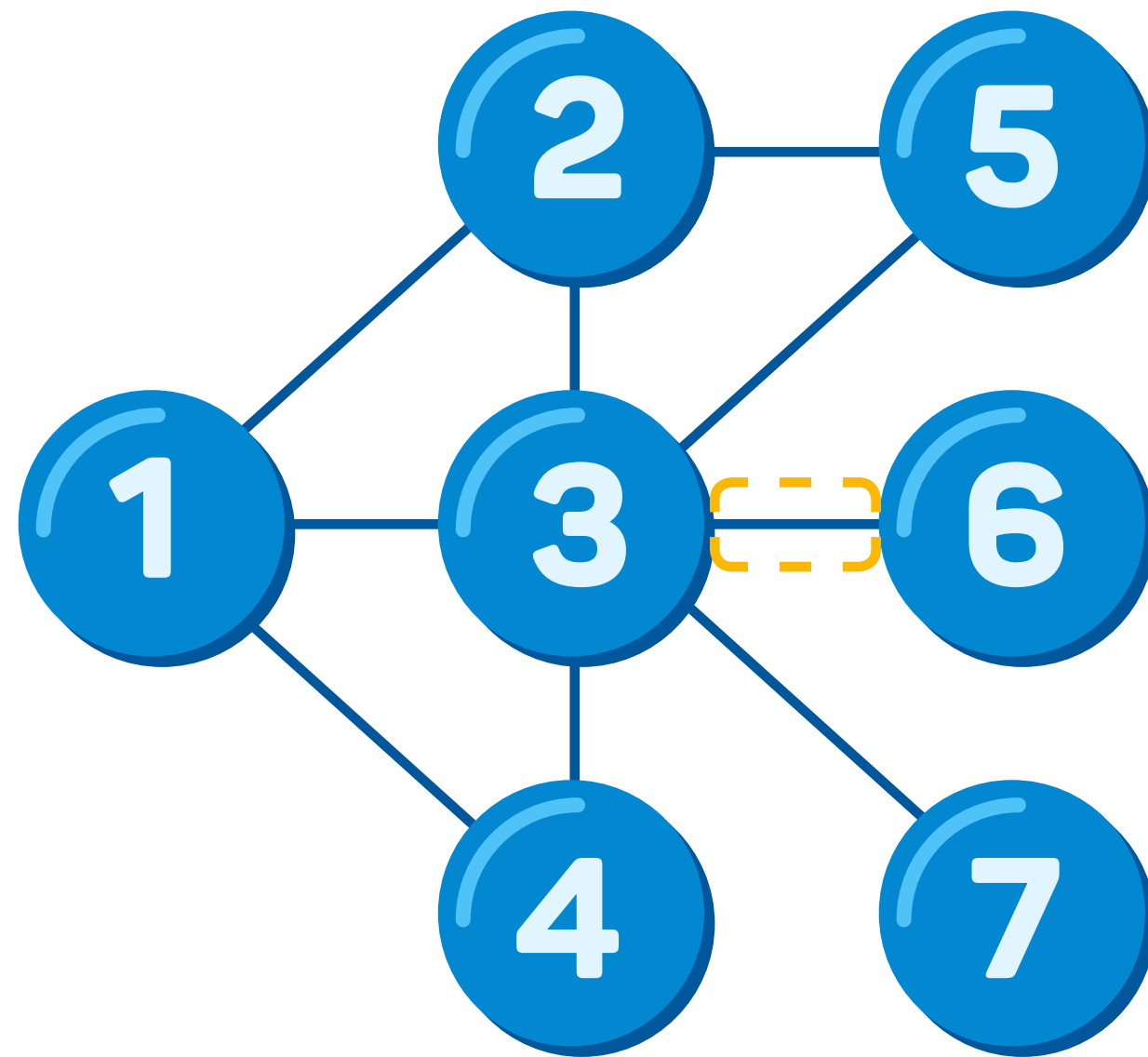
Edge list

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



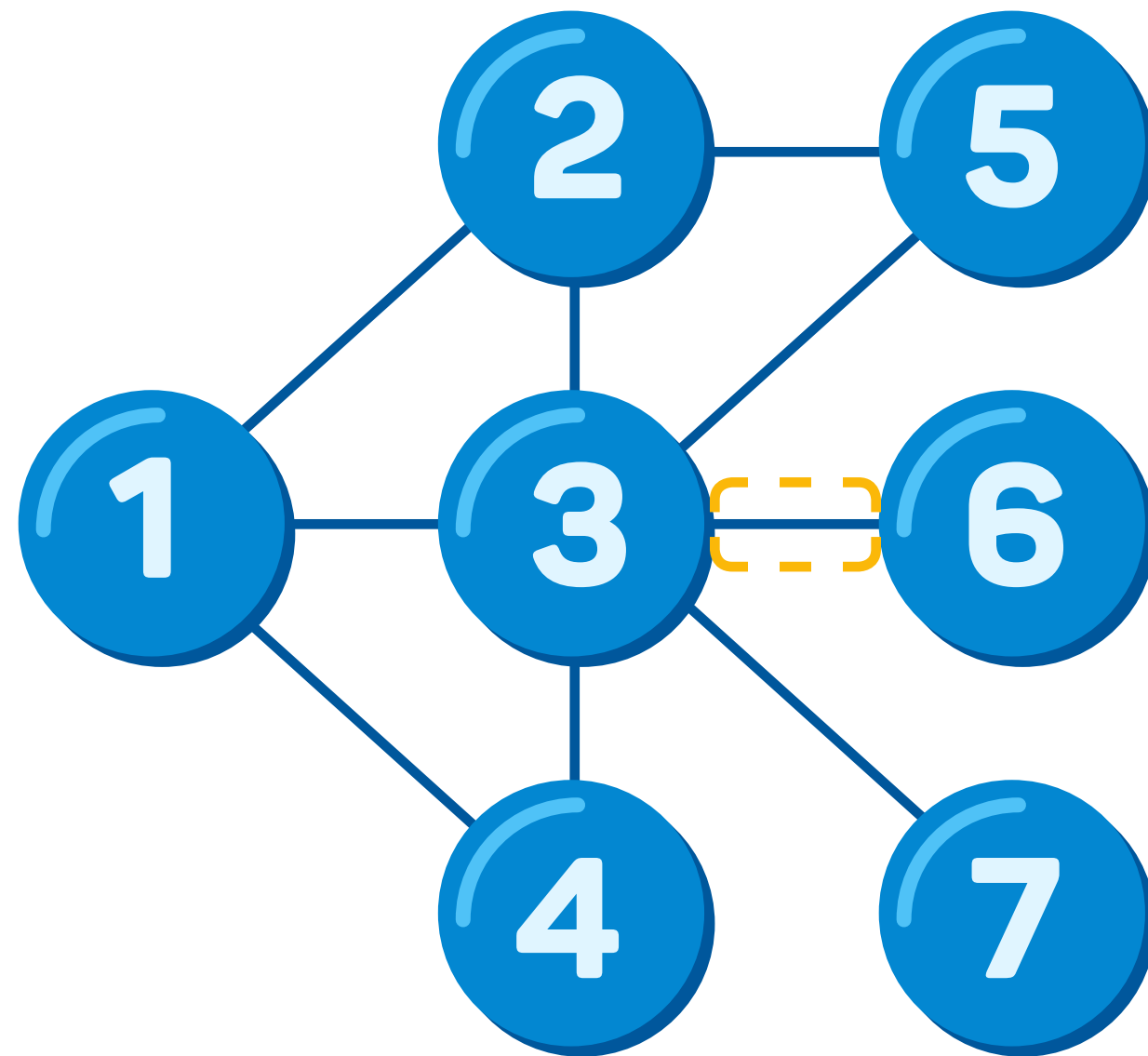
Edge list

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

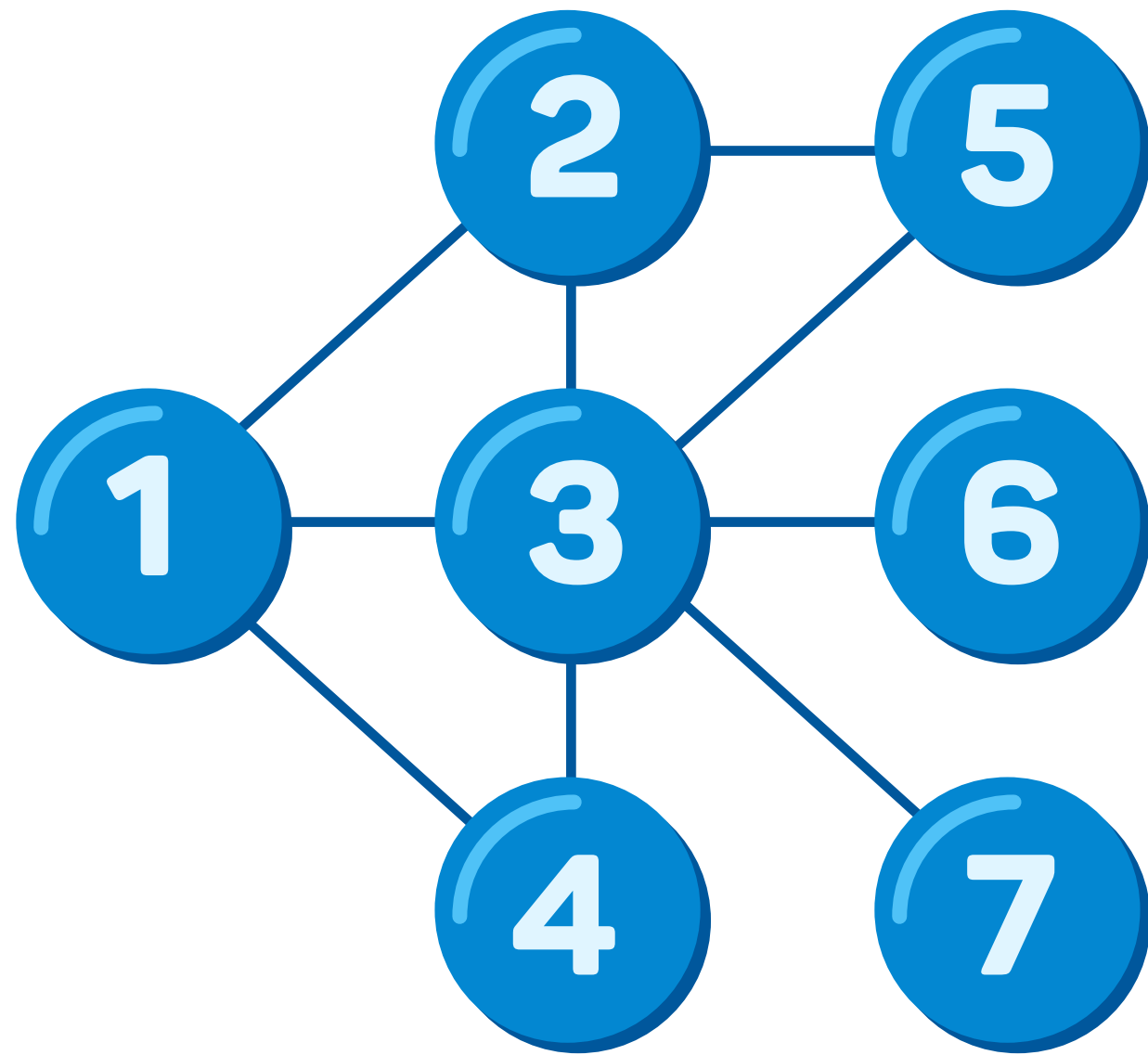


Edge list

→
[[1,2], [1,3], [1,4], [2,3], [2,5], [3,4], [3,5], [3,6], [3,7]]

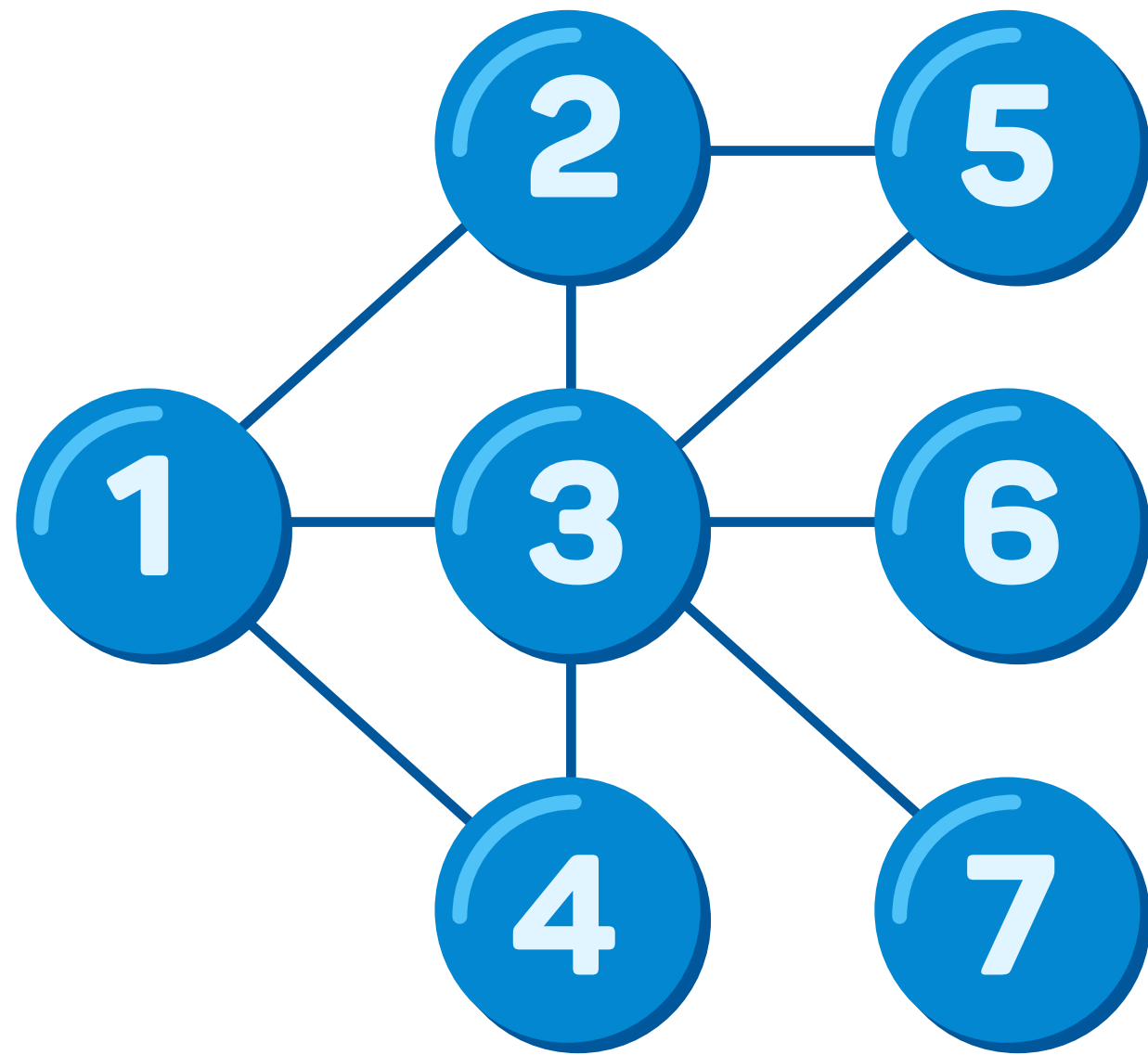


Adjacency matrix



```
[ [0, 1, 1, 1, 0, 0, 0],  
  [1, 0, 1, 0, 1, 0, 0],  
  [1, 1, 0, 1, 1, 1, 1],  
  [1, 0, 1, 0, 0, 0, 0],  
  [0, 1, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0]]
```

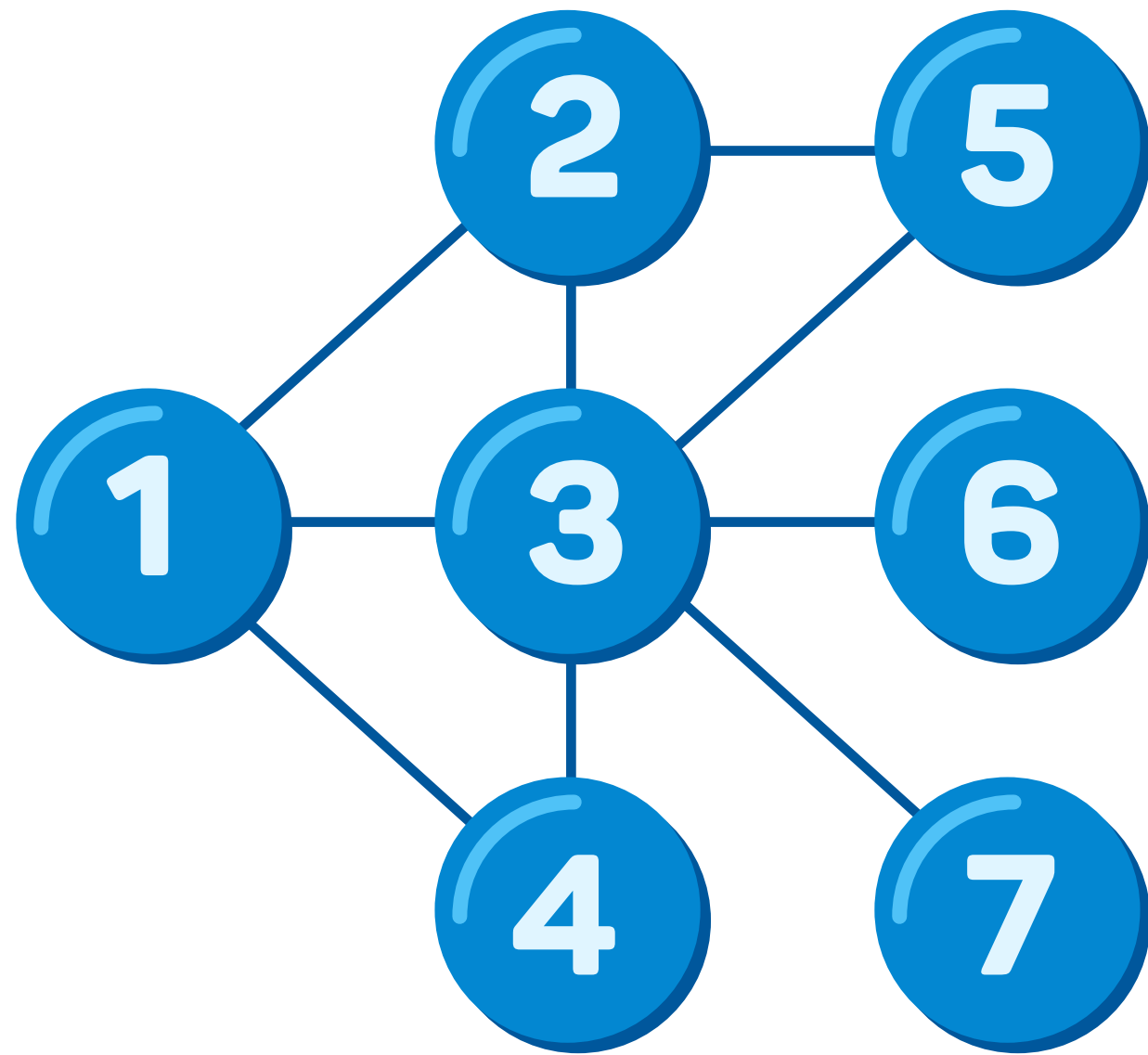
Adjacency matrix



v

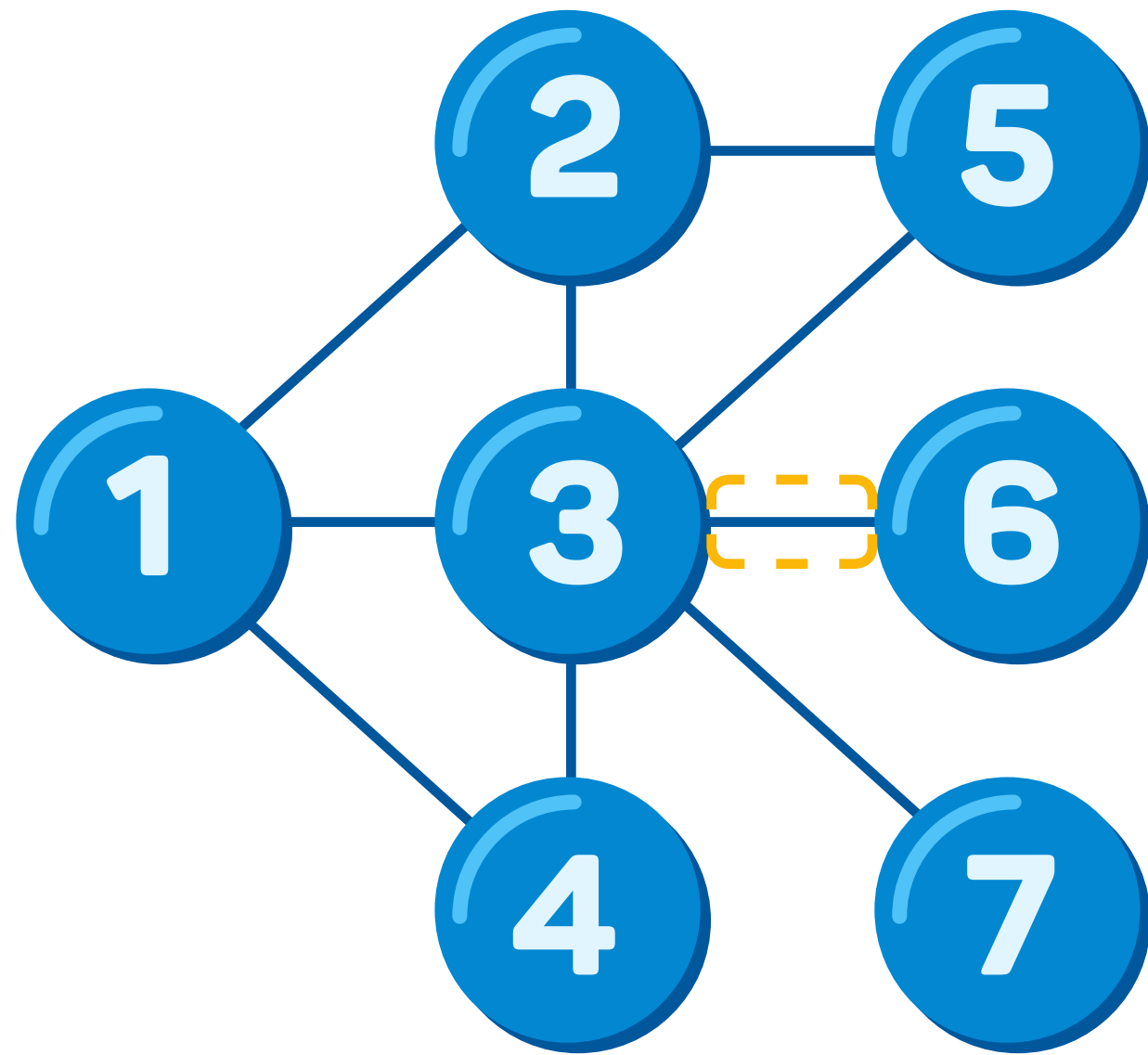
[[0, 1, 1, 1, 0, 0, 0],
[1, 0, 1, 0, 1, 0, 0],
[1, 1, 0, 1, 1, 1, 1],
[1, 0, 1, 0, 0, 0, 0],
[0, 1, 1, 0, 0, 0, 0],
[0, 0, 1, 0, 0, 0, 0],
[0, 0, 1, 0, 0, 0, 0]]

Adjacency matrix



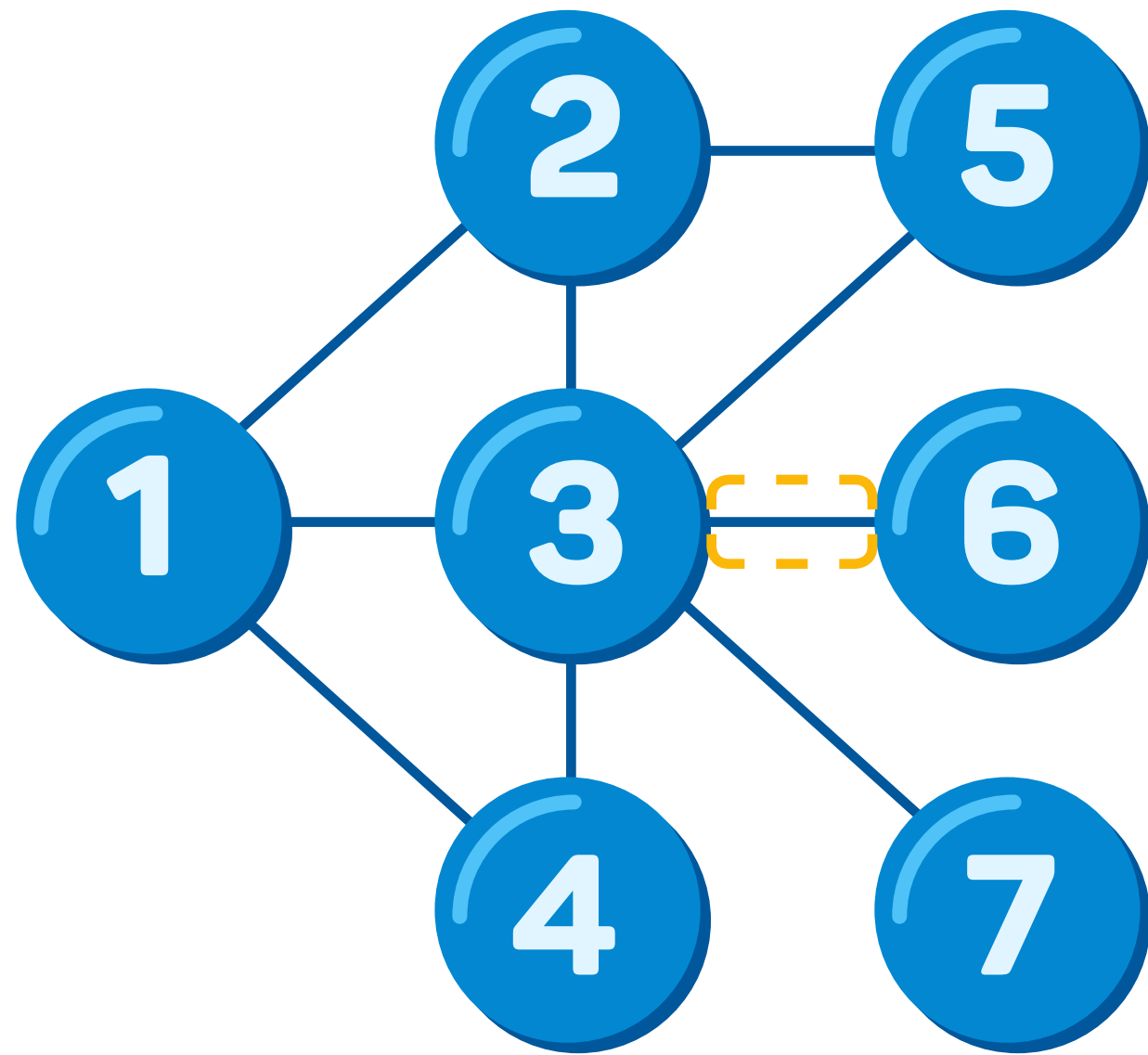
	v						
v	[0, 1, 1, 1, 0, 0, 0],						
	[1, 0, 1, 0, 1, 0, 0],						
	[1, 1, 0, 1, 1, 1, 1],						
	[1, 0, 1, 0, 0, 0, 0],						
	[0, 1, 1, 0, 0, 0, 0],						
	[0, 0, 1, 0, 0, 0, 0],						
	[0, 0, 1, 0, 0, 0, 0],						

Adjacency matrix



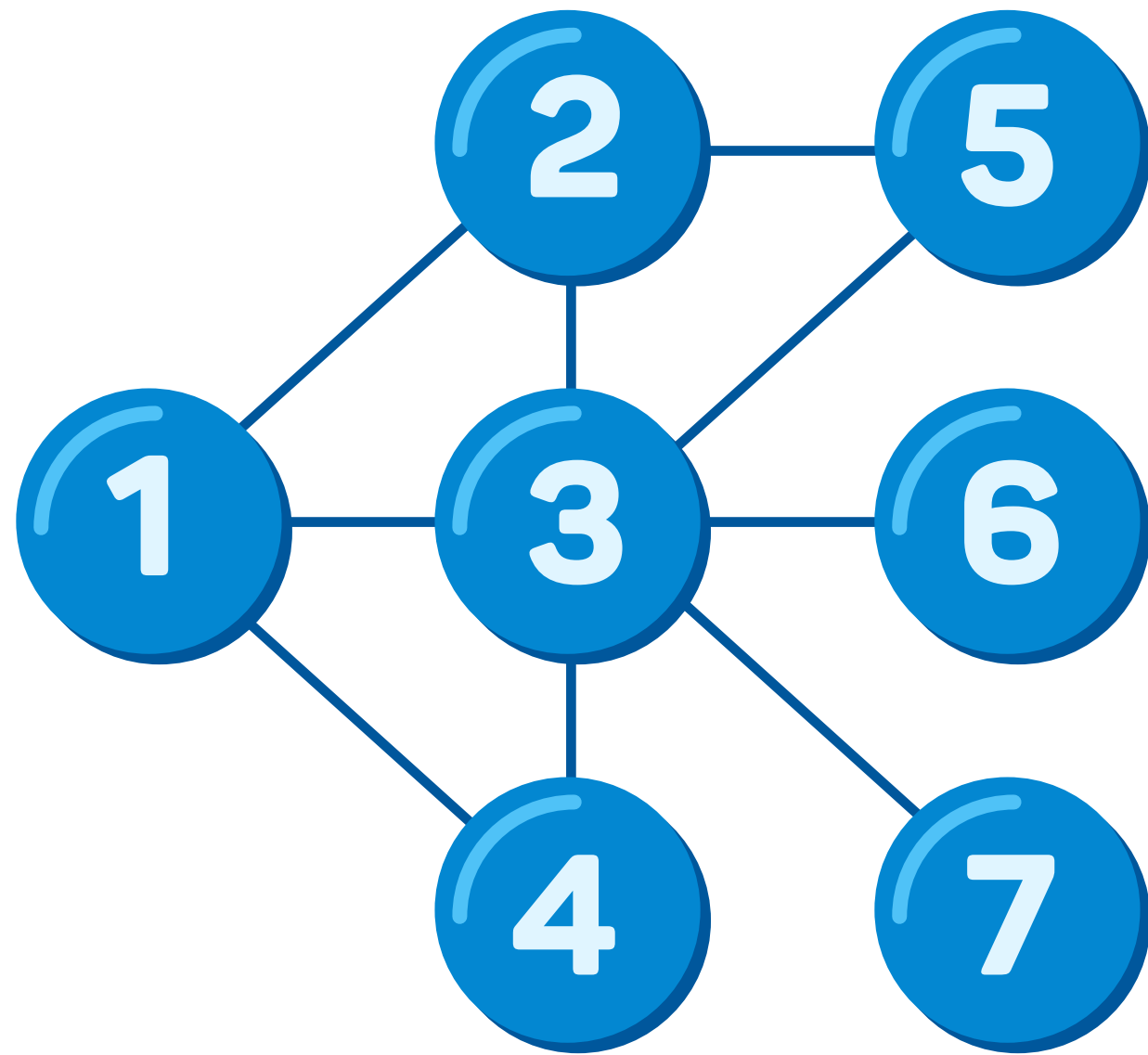
```
[ [0, 1, 1, 1, 0, 0, 0],  
  [1, 0, 1, 0, 1, 0, 0],  
  [1, 1, 0, 1, 1, 1, 1],  
  [1, 0, 1, 0, 0, 0, 0],  
  [0, 1, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0]]
```

Adjacency matrix



```
[ [0, 1, 1, 1, 0, 0, 0],  
  [1, 0, 1, 0, 1, 0, 0],  
  [1, 1, 0, 1, 1, 1, 1],  
  [1, 0, 1, 0, 0, 0, 0],  
  [0, 1, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0]]
```

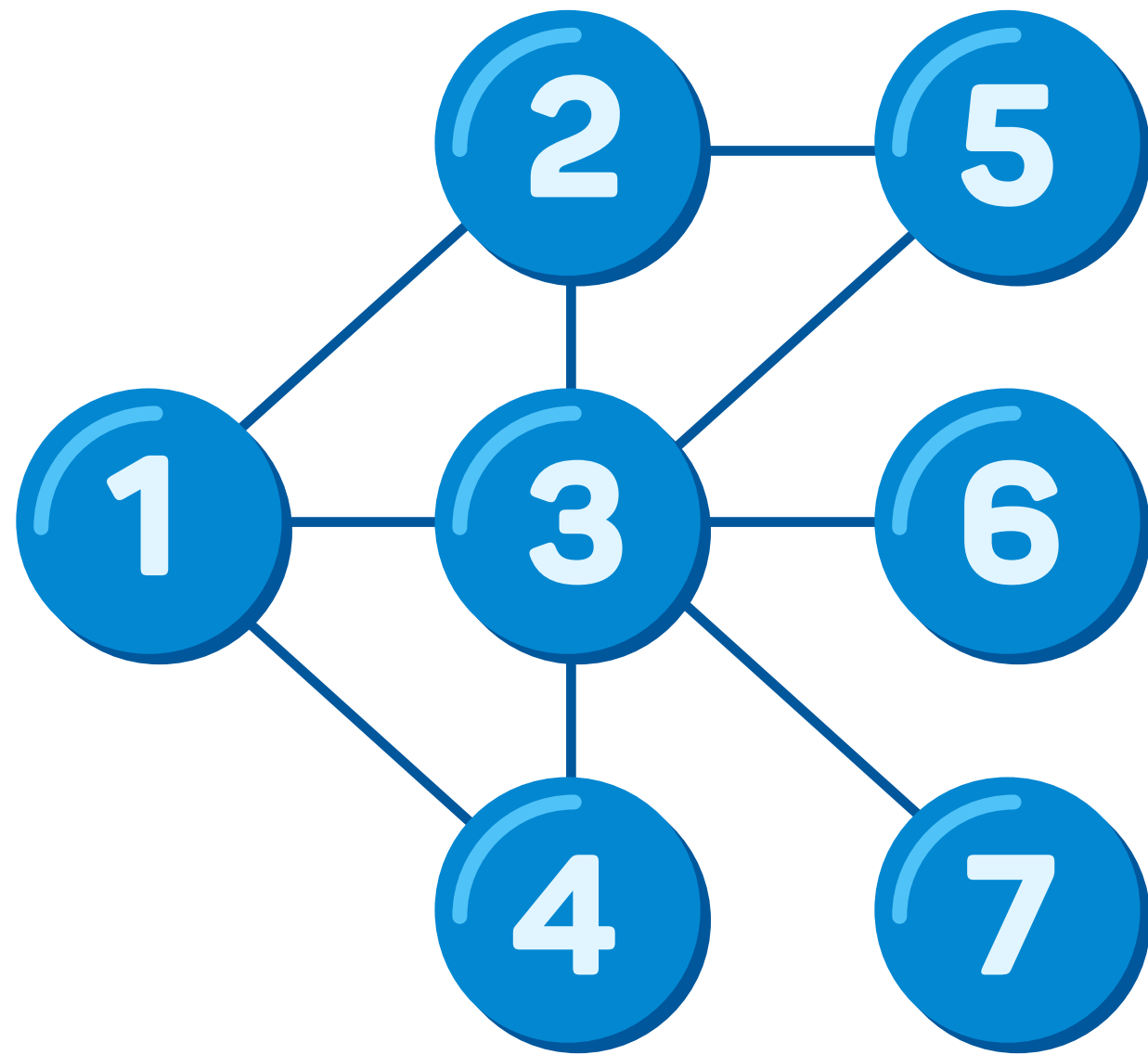
Adjacency matrix



```
[ [0, 1, 1, 1, 0, 0, 0],  
  [1, 0, 1, 0, 1, 0, 0],  
  [1, 1, 0, 1, 1, 1, 1],  
  [1, 0, 1, 0, 0, 0, 0],  
  [0, 1, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0]]
```

1. lots of zeros

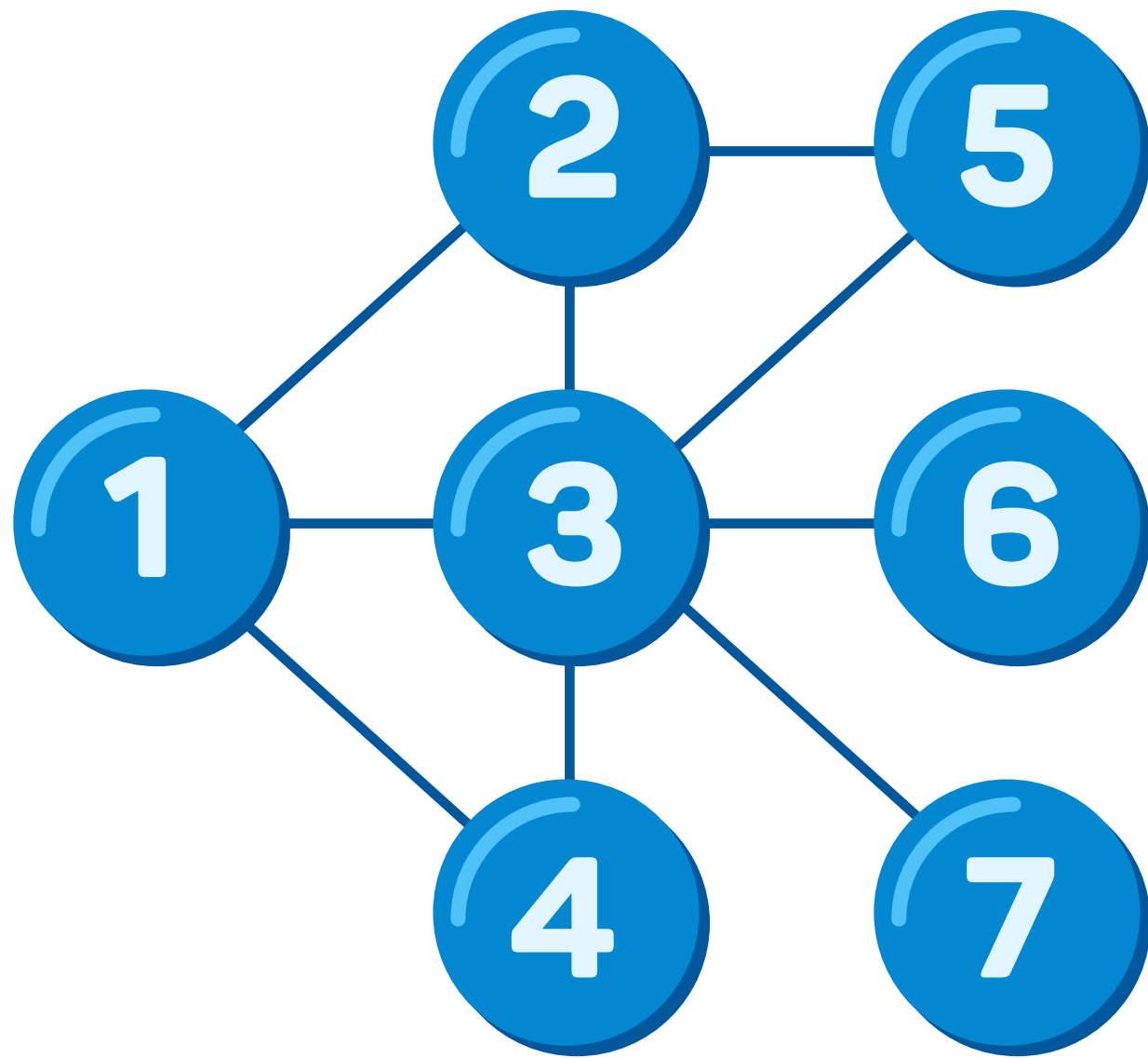
Adjacency matrix



```
[ [0, 1, 1, 1, 0, 0, 0],  
  [1, 0, 1, 0, 1, 0, 0],  
  [1, 1, 0, 1, 1, 1, 1],  
  [1, 0, 1, 0, 0, 0, 0],  
  [0, 1, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0],  
  [0, 0, 1, 0, 0, 0, 0]]
```

1. lots of zeros
2. linear search through row i

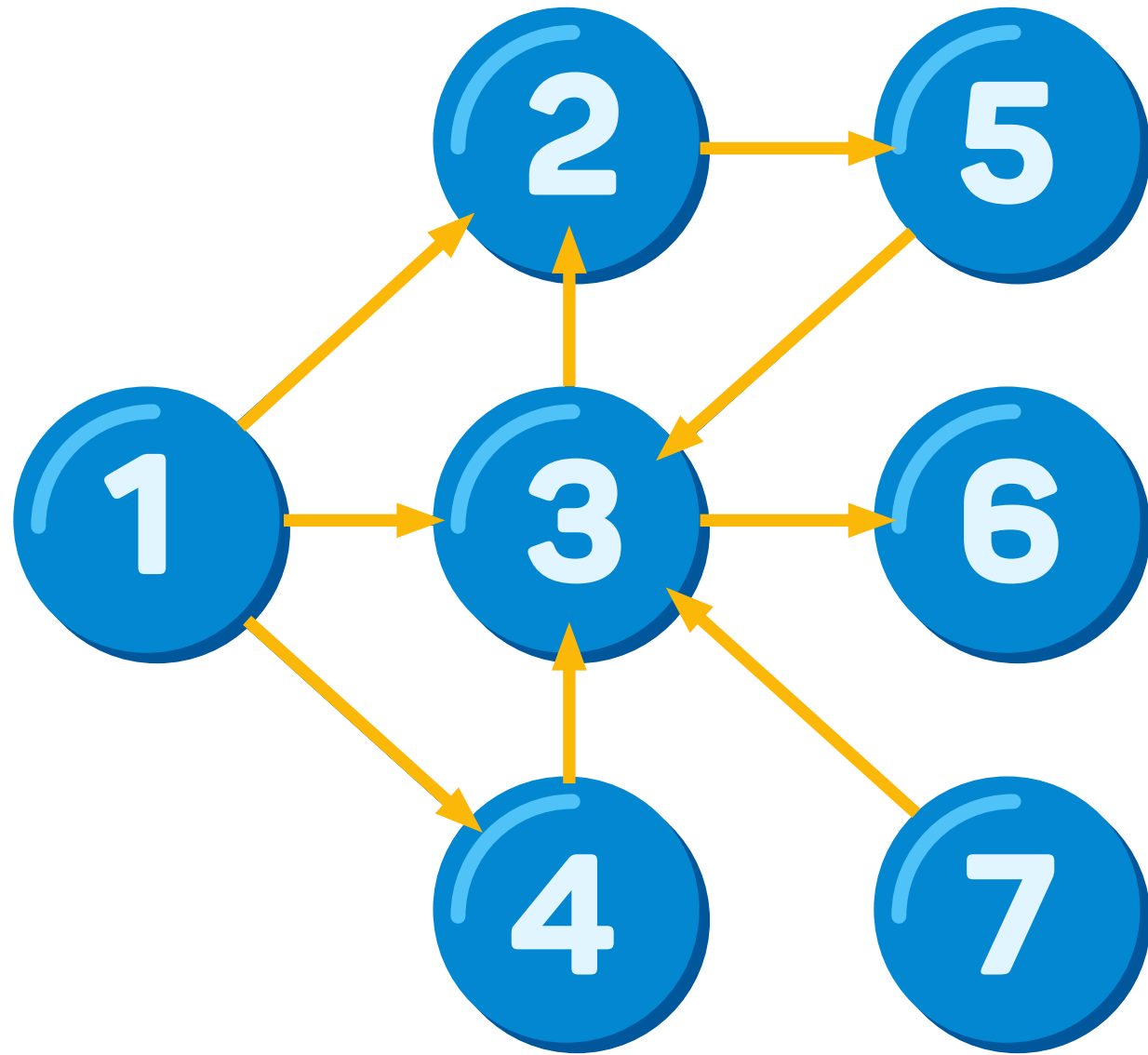
Adjacency matrix



$\begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{bmatrix}$

Symmetric for undirected graph

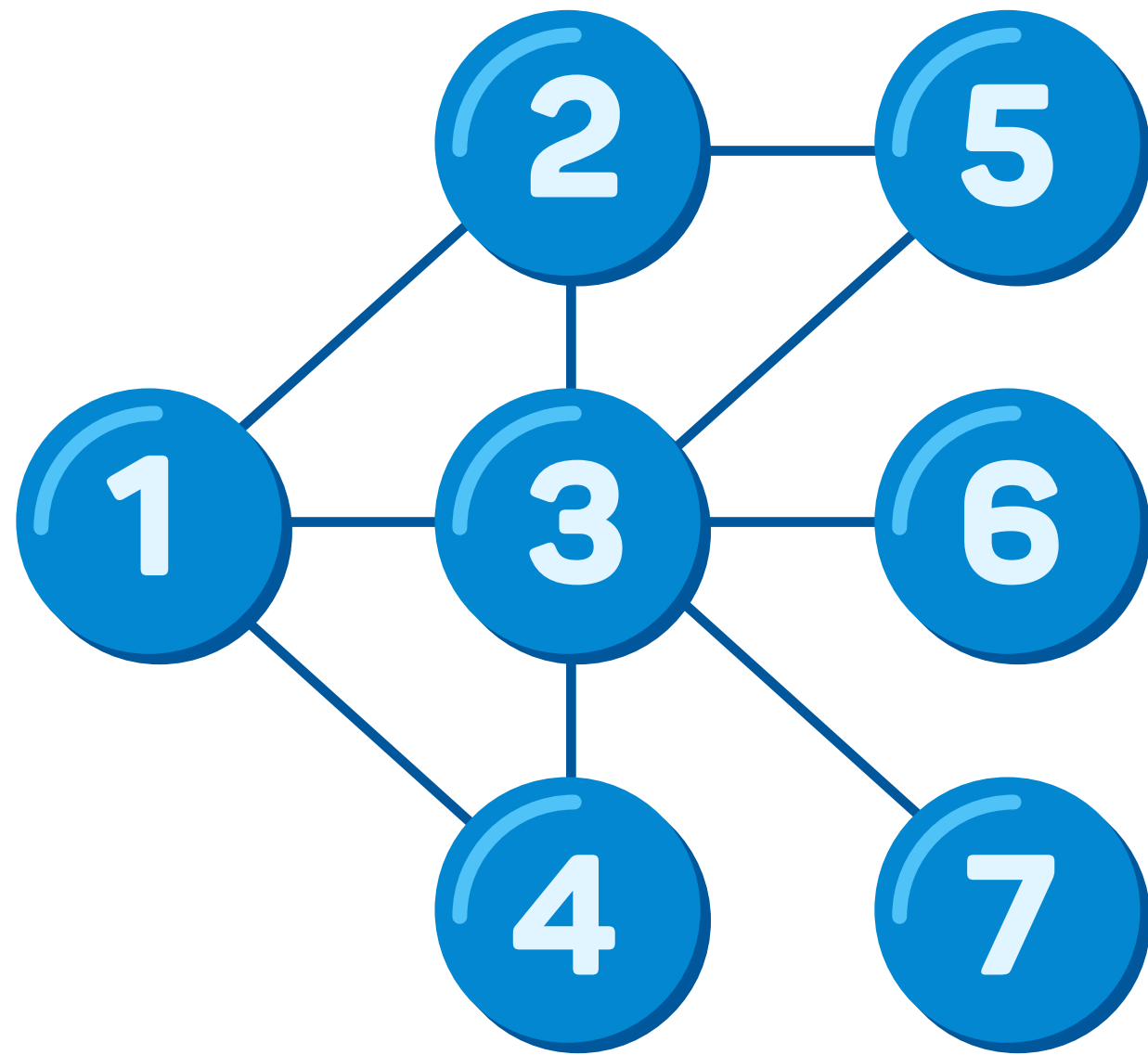
Adjacency matrix



$\begin{bmatrix} [0, 1, 1, 1, 0, 0, 0], \\ [0, 0, 0, 0, 1, 0, 0], \\ [0, 1, 0, 0, 0, 1, 0], \\ [0, 0, 1, 0, 0, 0, 0], \\ [0, 0, 1, 0, 0, 0, 0], \\ [0, 0, 0, 0, 0, 0, 0], \\ [0, 0, 1, 0, 0, 0, 0] \end{bmatrix}$

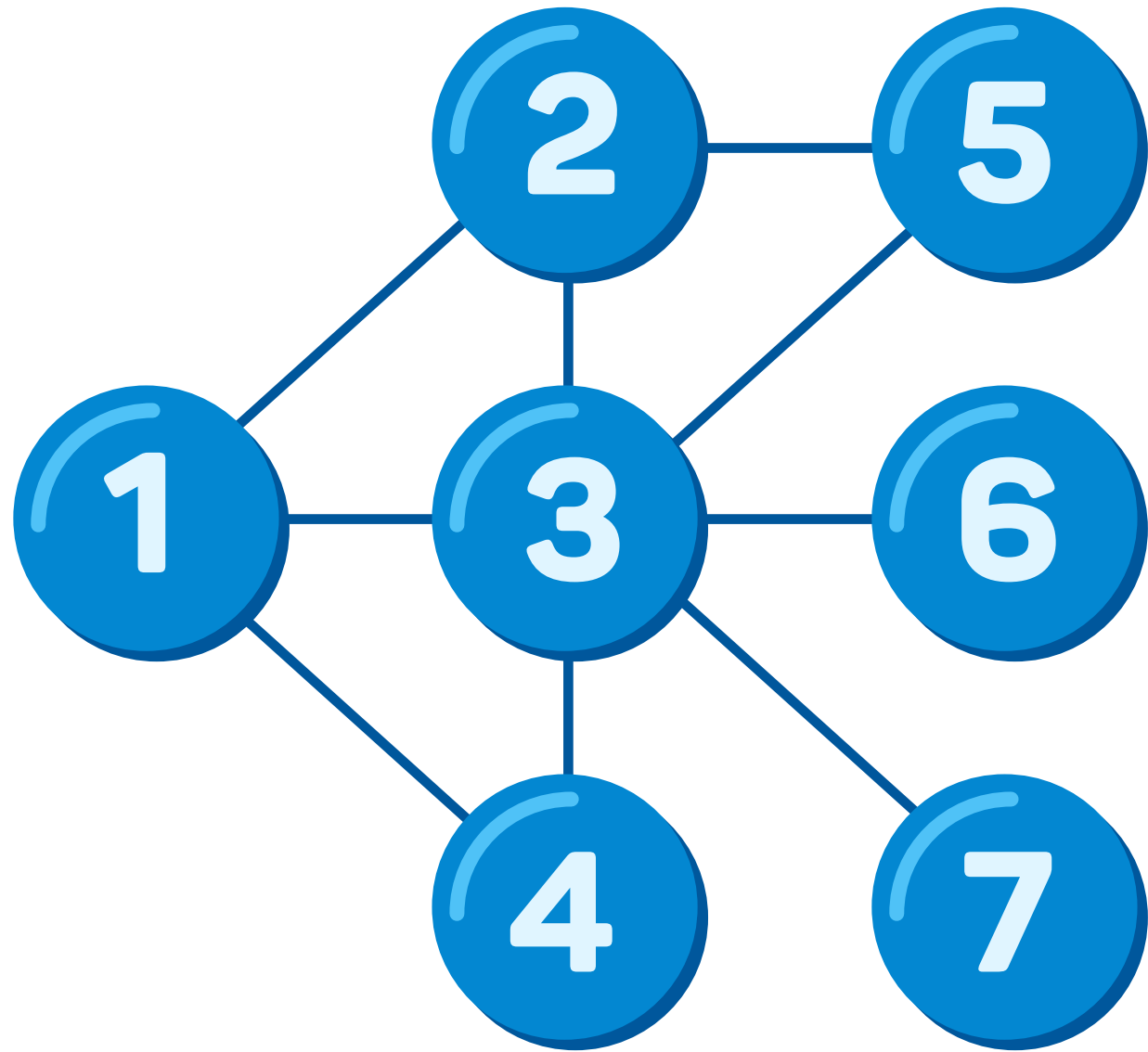
Asymmetric for directed graph

Adjacency lists



```
[ [2, 3, 4],  
  [1, 3, 5],  
  [1, 2, 4, 5, 6, 7],  
  [1, 3],  
  [2, 3],  
  [3],  
  [3]]
```

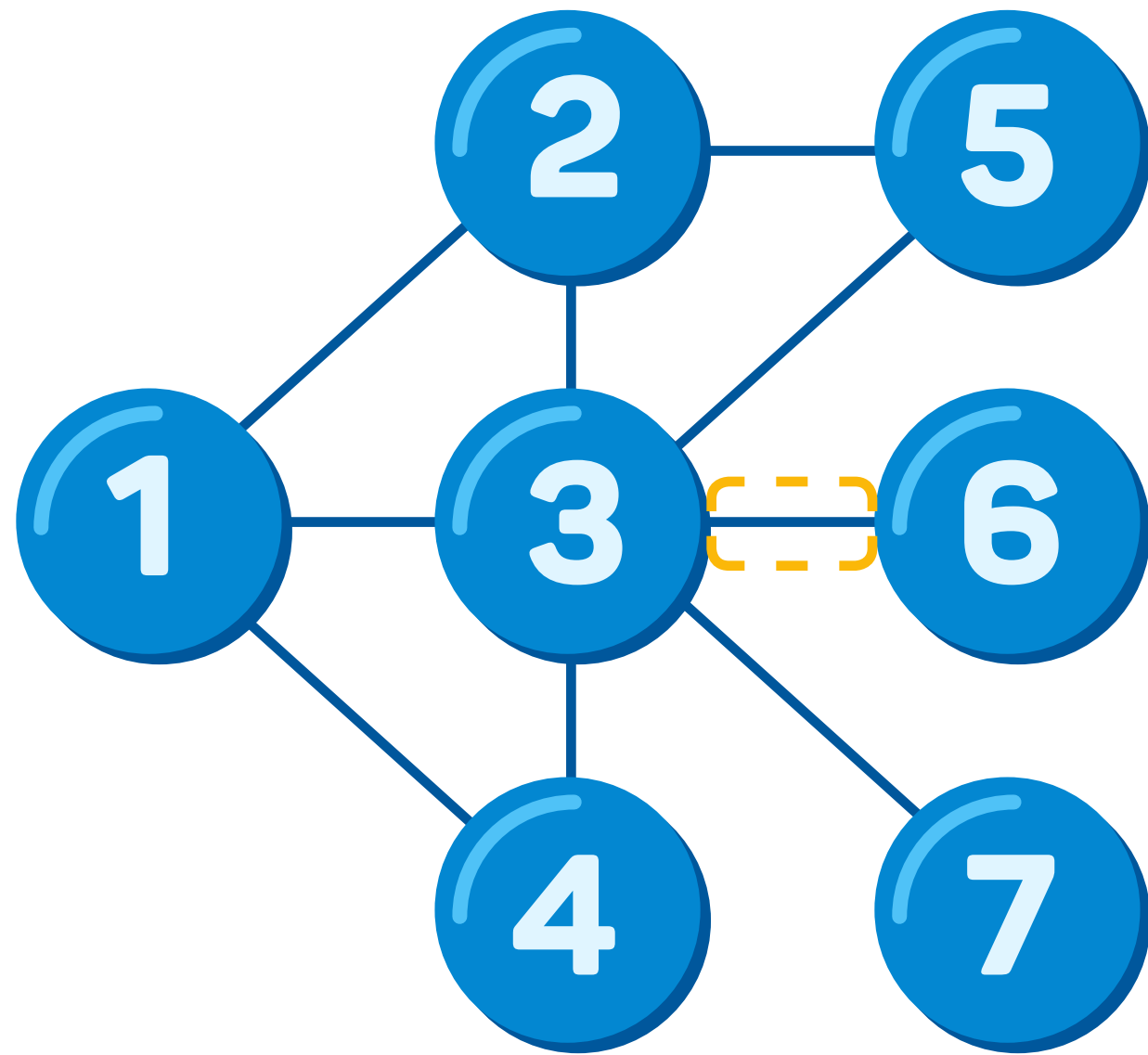
Adjacency lists



v

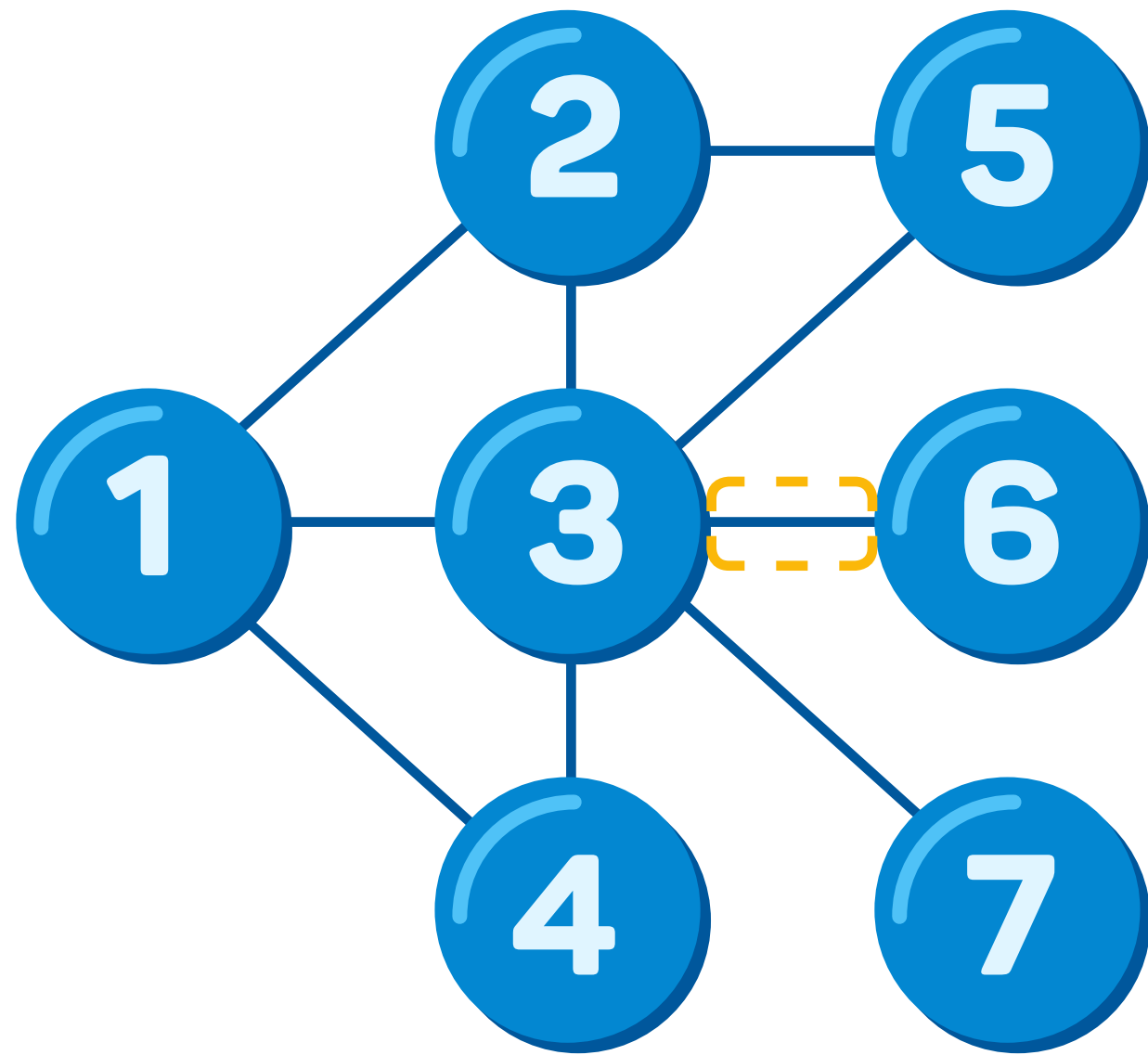
[[2, 3, 4],
[1, 3, 5],
[1, 2, 4, 5, 6, 7],
[1, 3],
[2, 3],
[3],
[3]]

Adjacency lists



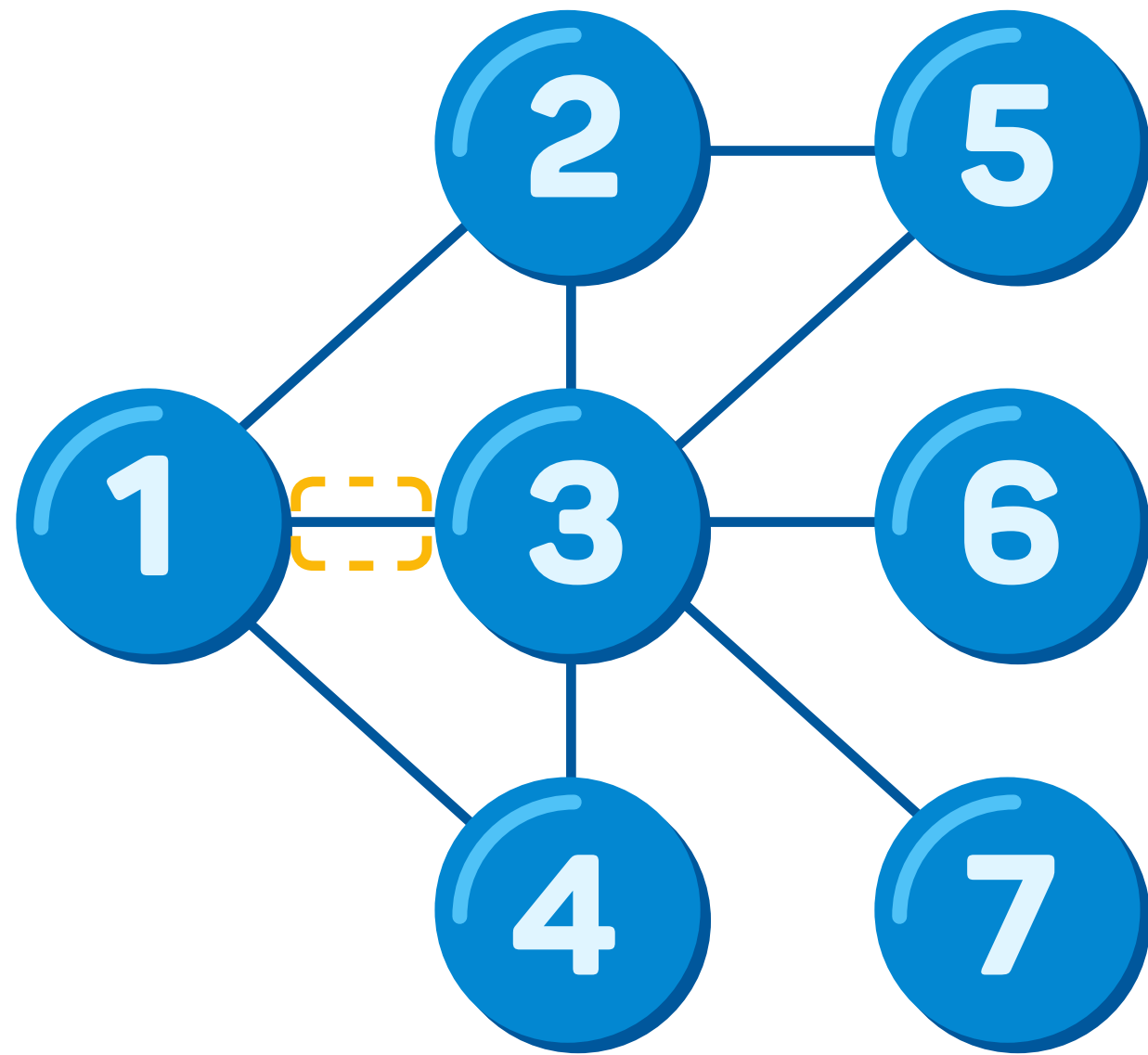
[[2, 3, 4],
[1, 3, 5],
[1, 2, 4, 5, 6, 7],
[1, 3],
[2, 3],
[3],
[3]]

Adjacency lists



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

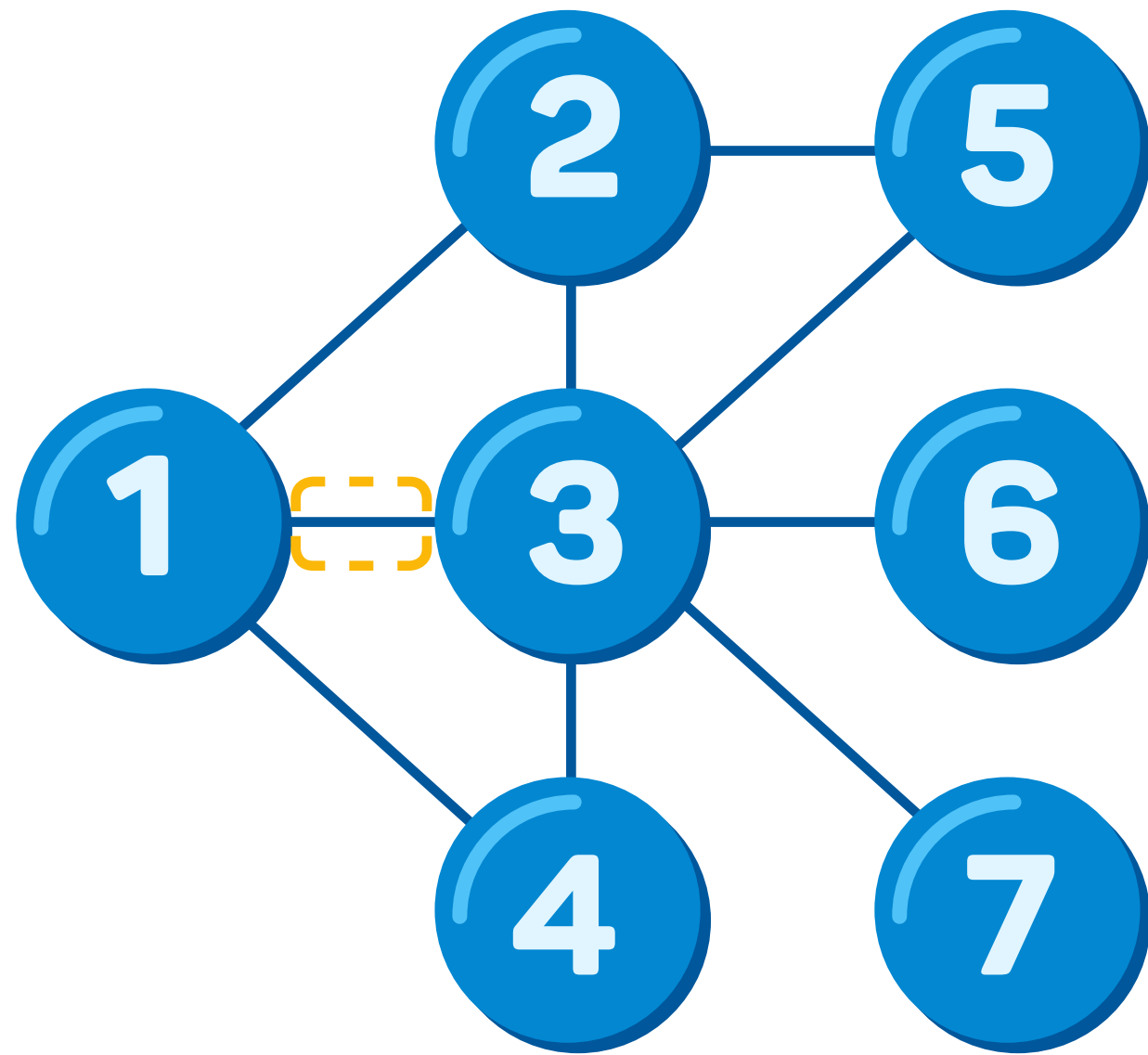
Adjacency lists



v

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

Adjacency lists

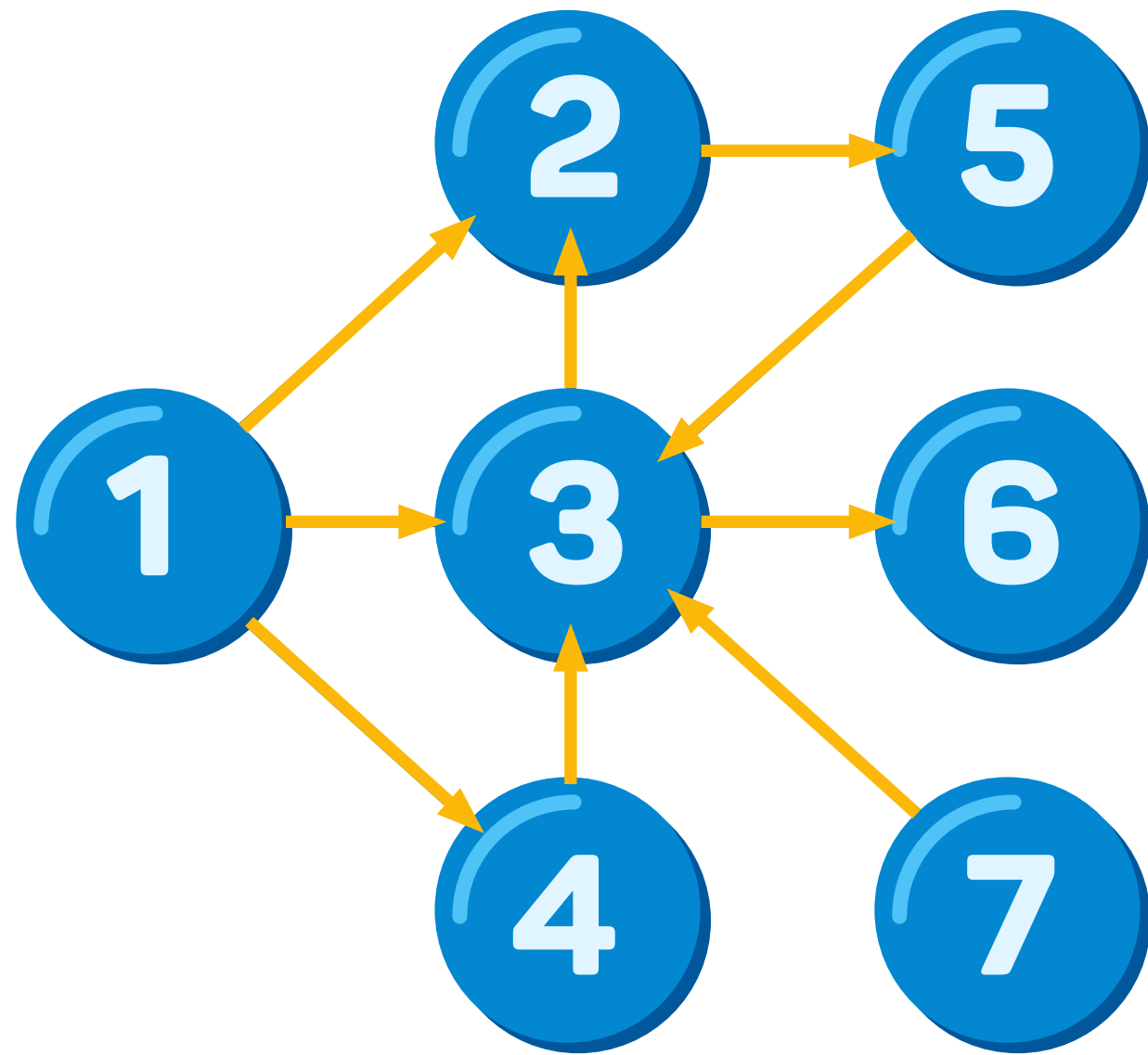


v

[[2, 3, 4],
[1, **3**, 5],
[**1**, 2, 4, 5, 6, 7],
[1, 3],
[2, 3],
[3],
[3]]

2E

Adjacency lists



v

[[2, 3, 4],
[5],
[2, 6],
[3],
[3],
[],
[3]]

E

Summary

- › Now you know there are different ways to represent graph: **edge list, adjacency matrix and adjacency lists**

Summary

- › Now you know there are different ways to represent graph: **edge list, adjacency matrix and adjacency lists**
- › Advantages and disadvantages are connected to each of them