Connected Components

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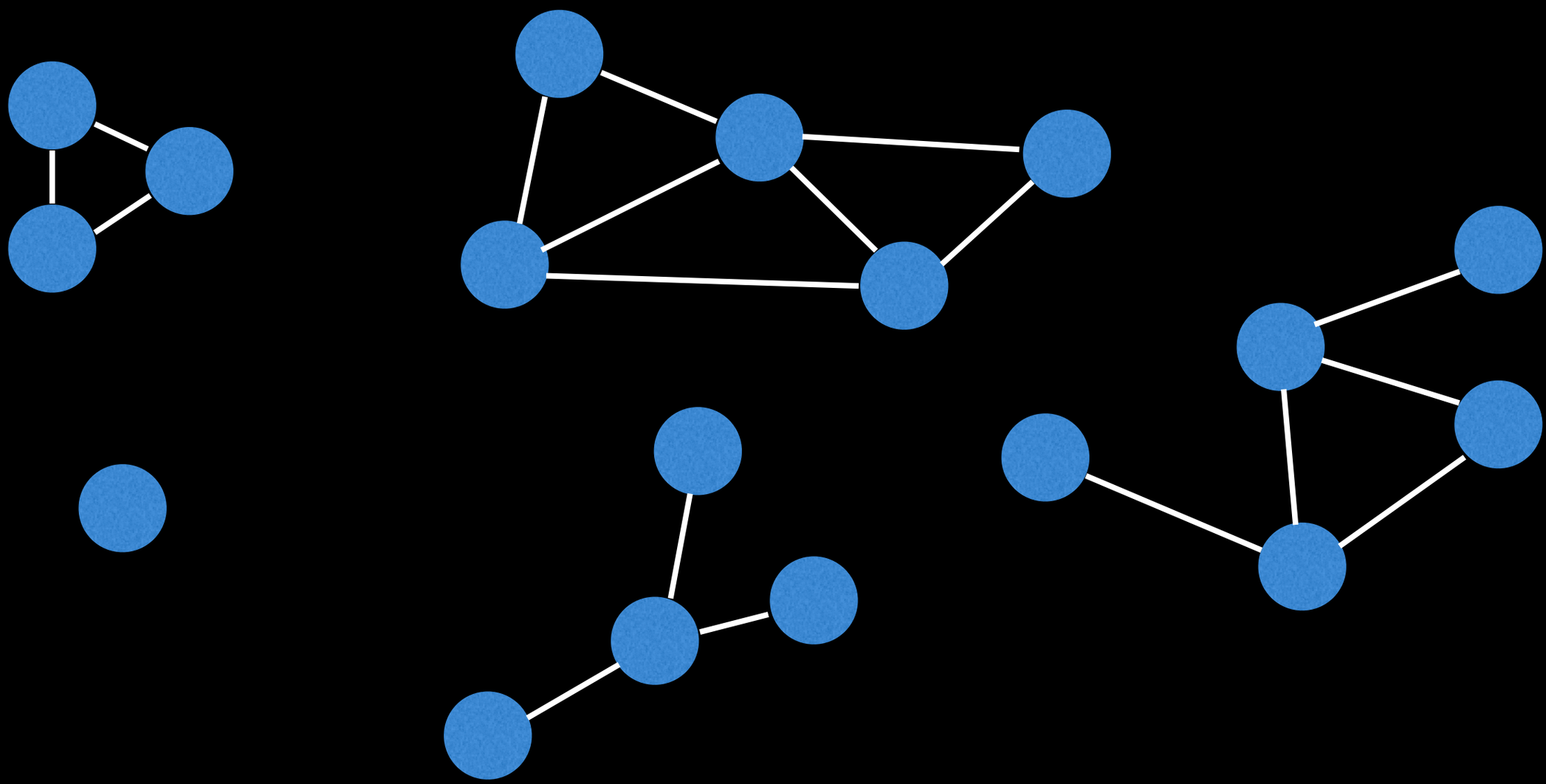
Sometimes a graph is split into multiple components. It’s useful to be able to identify and count these components.



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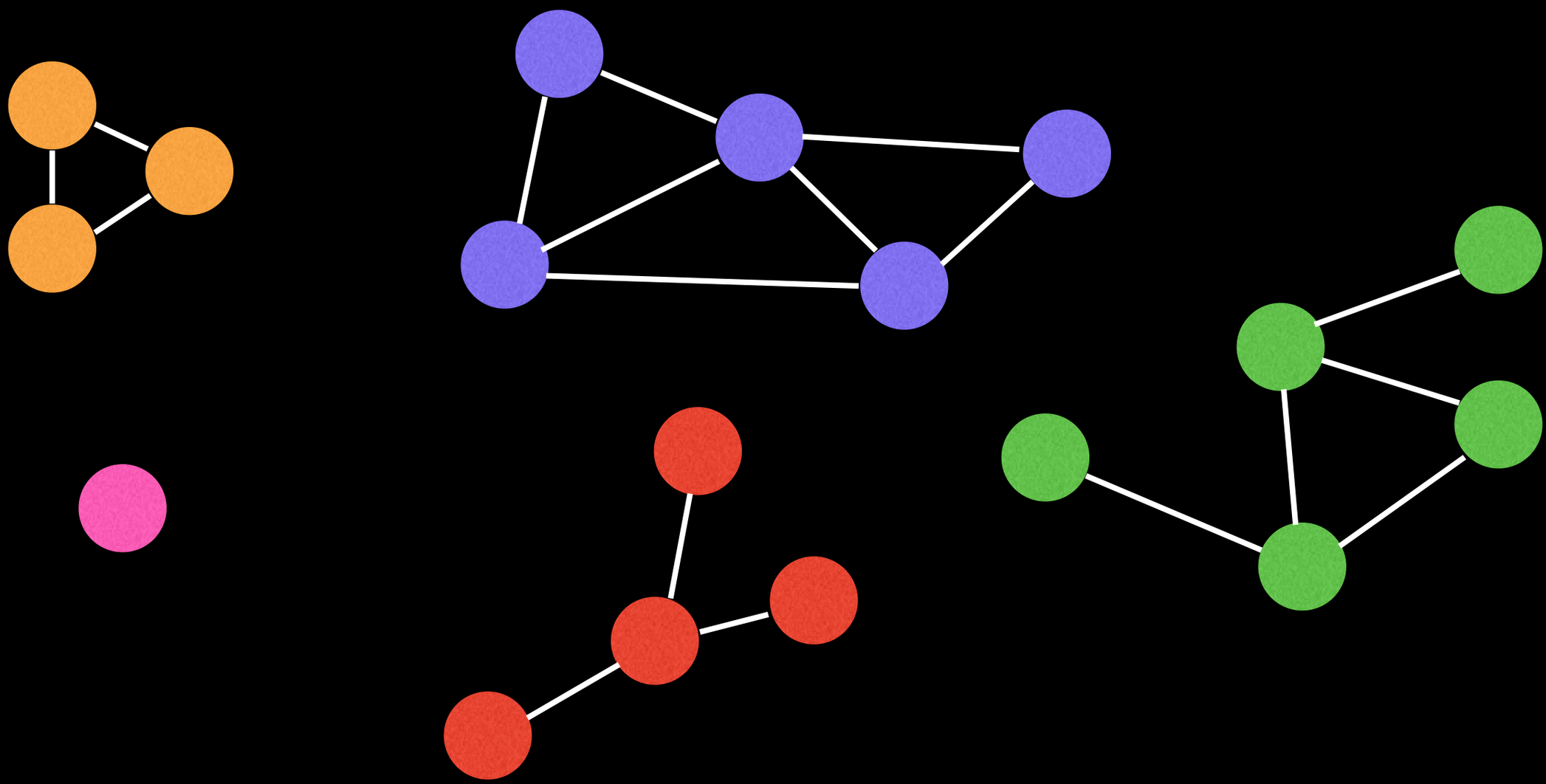
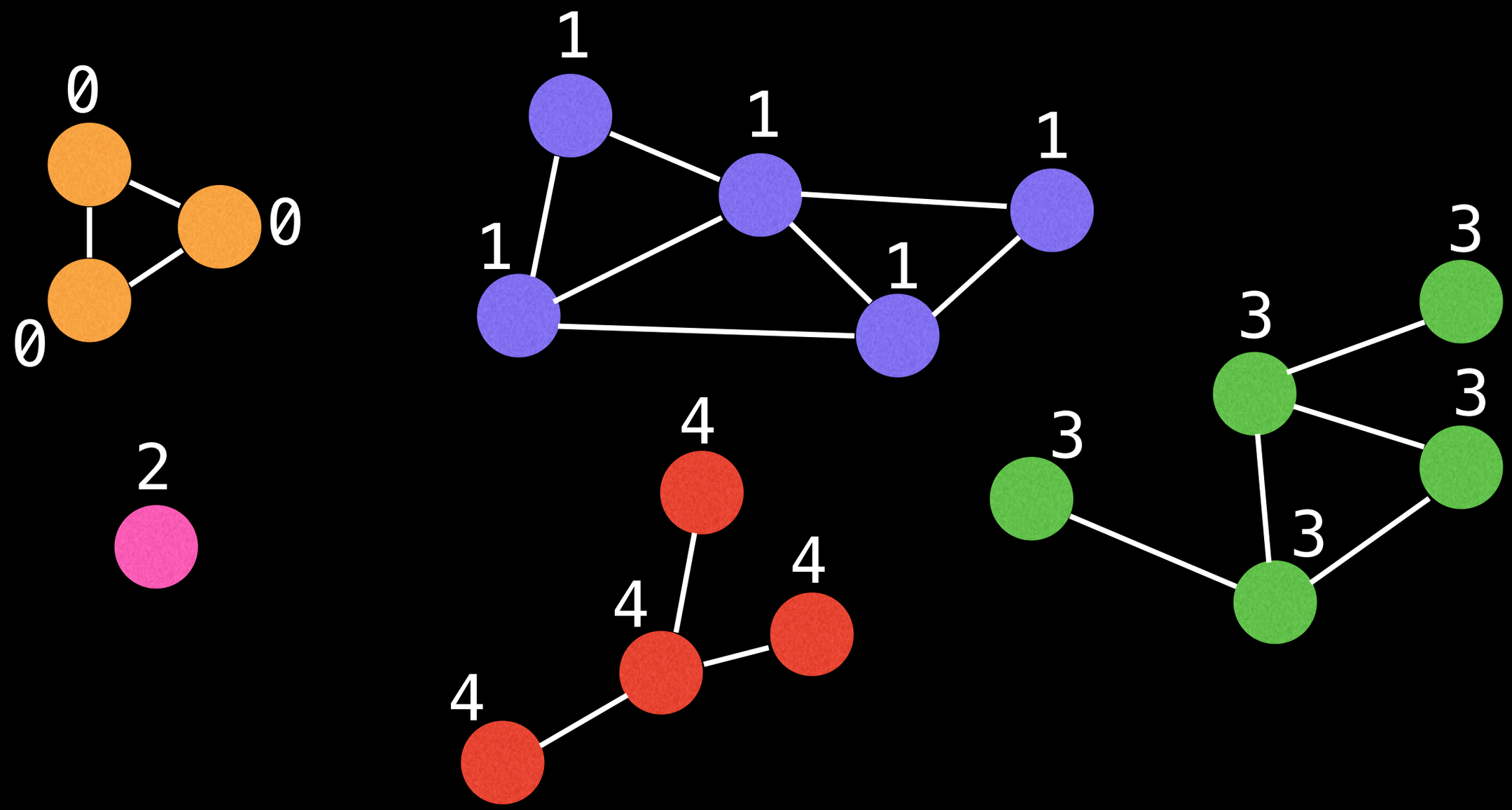
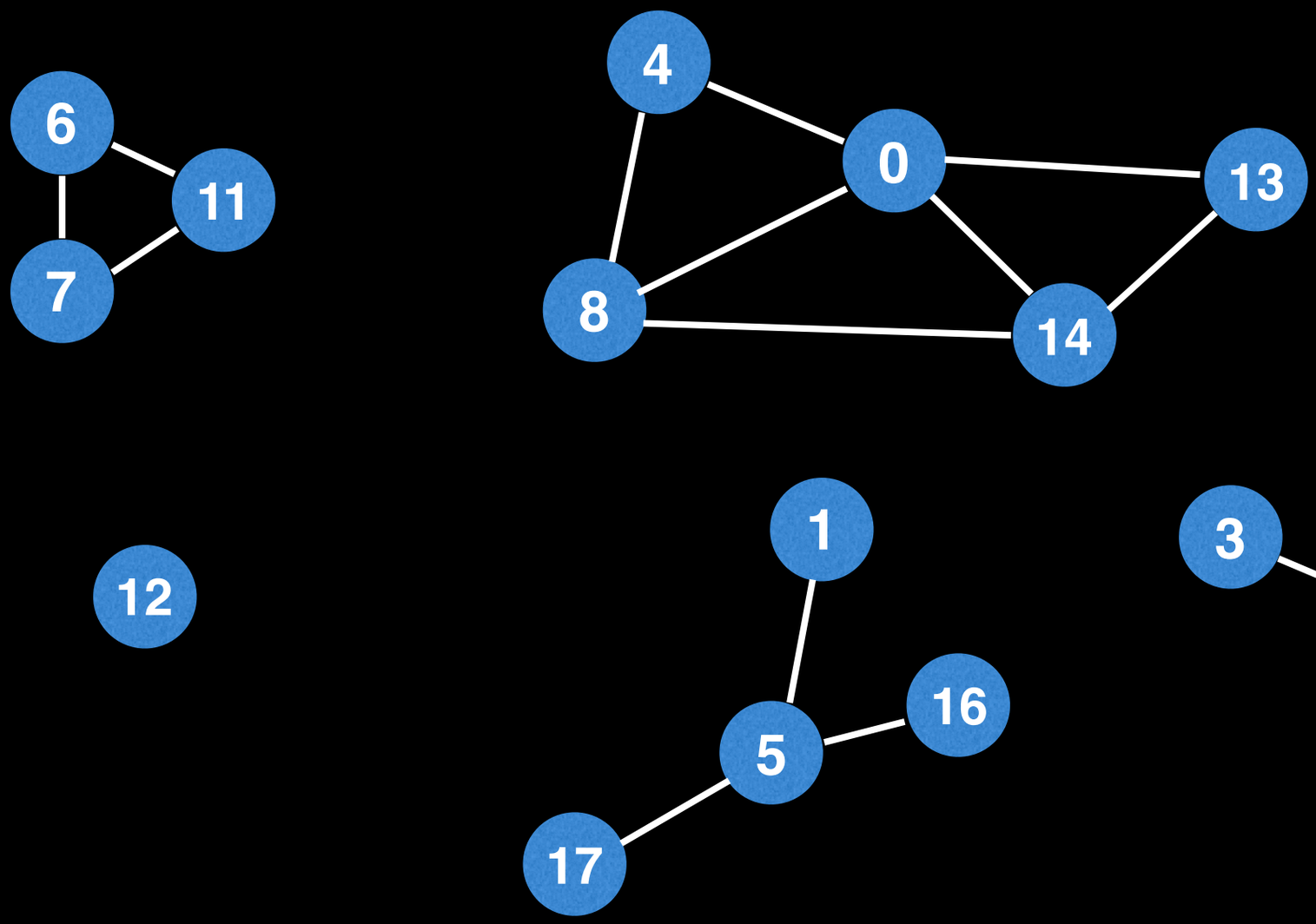


Connected Components

Assign an integer value to each group to be able to tell them apart.



We can use a DFS to identify components. First, make sure all the nodes are labeled from [0, n) where n is the number of nodes.



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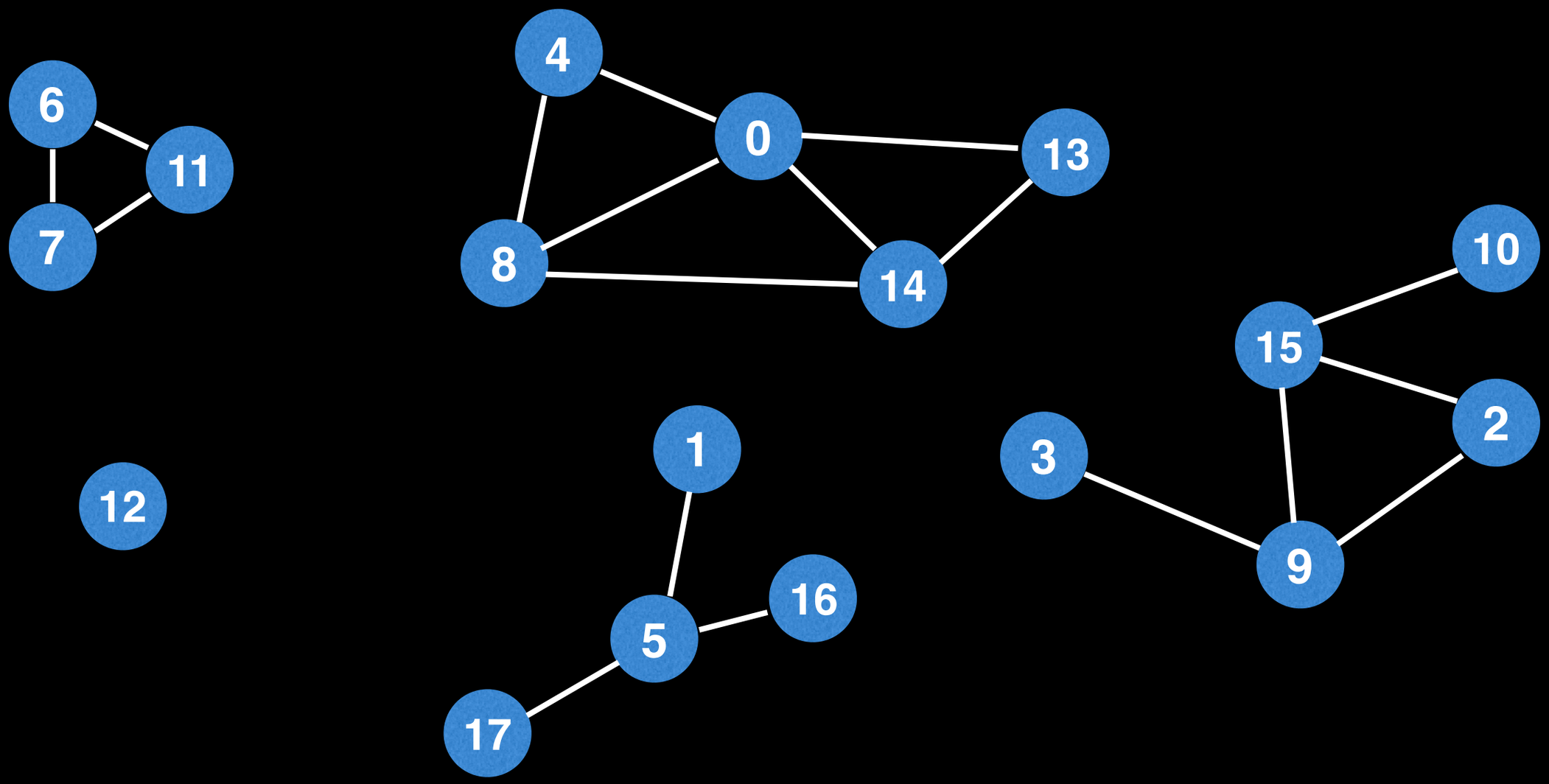

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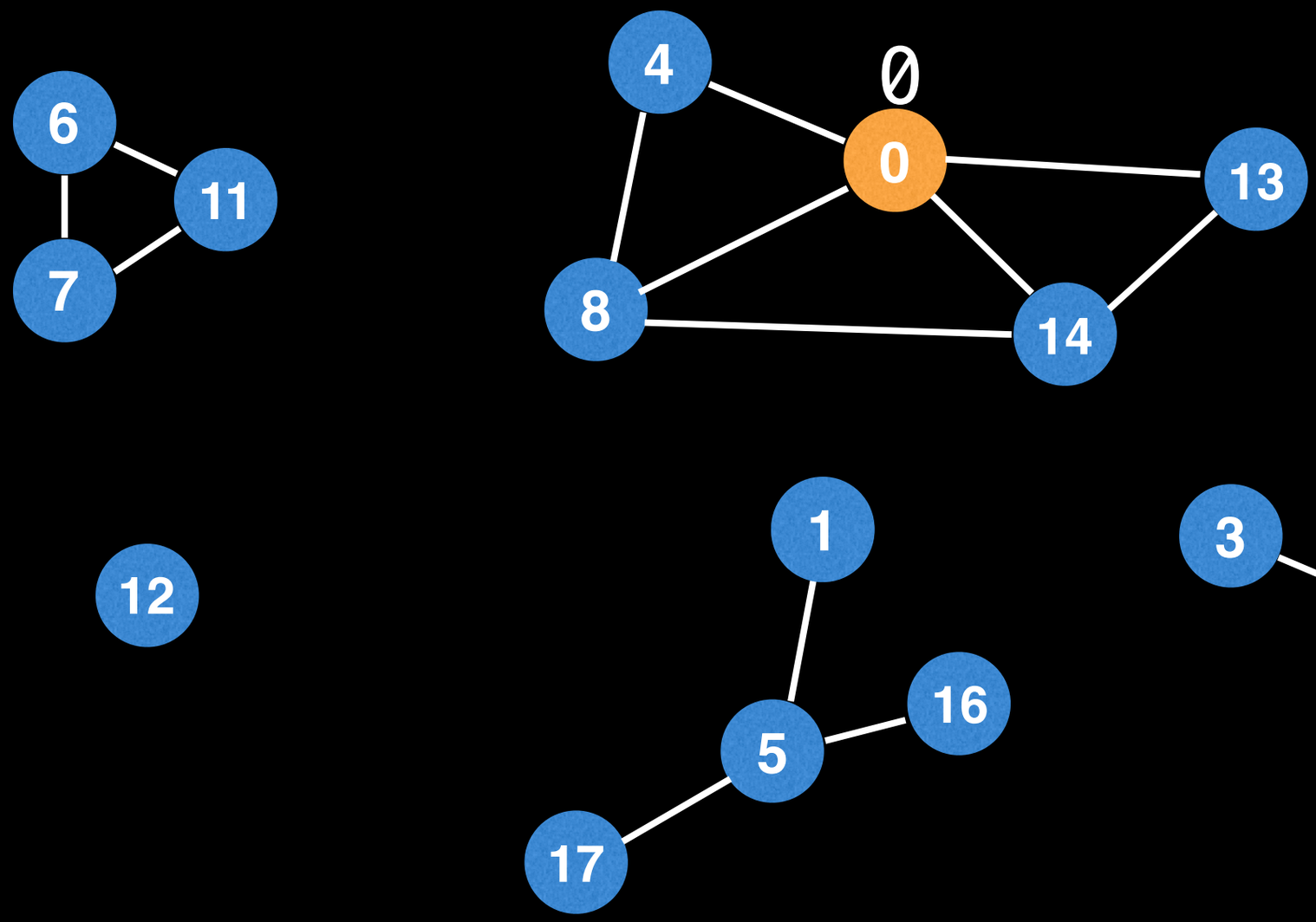

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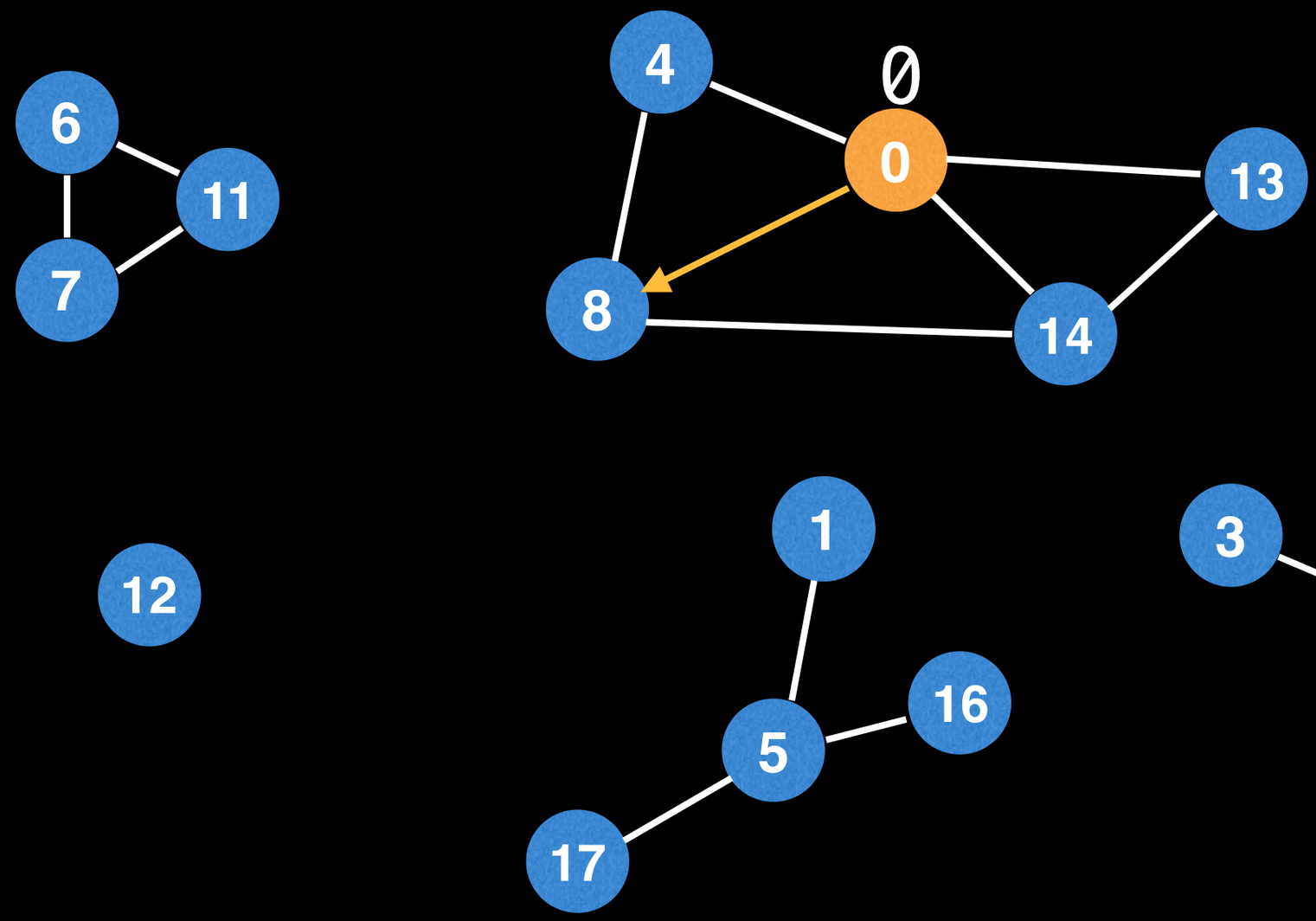

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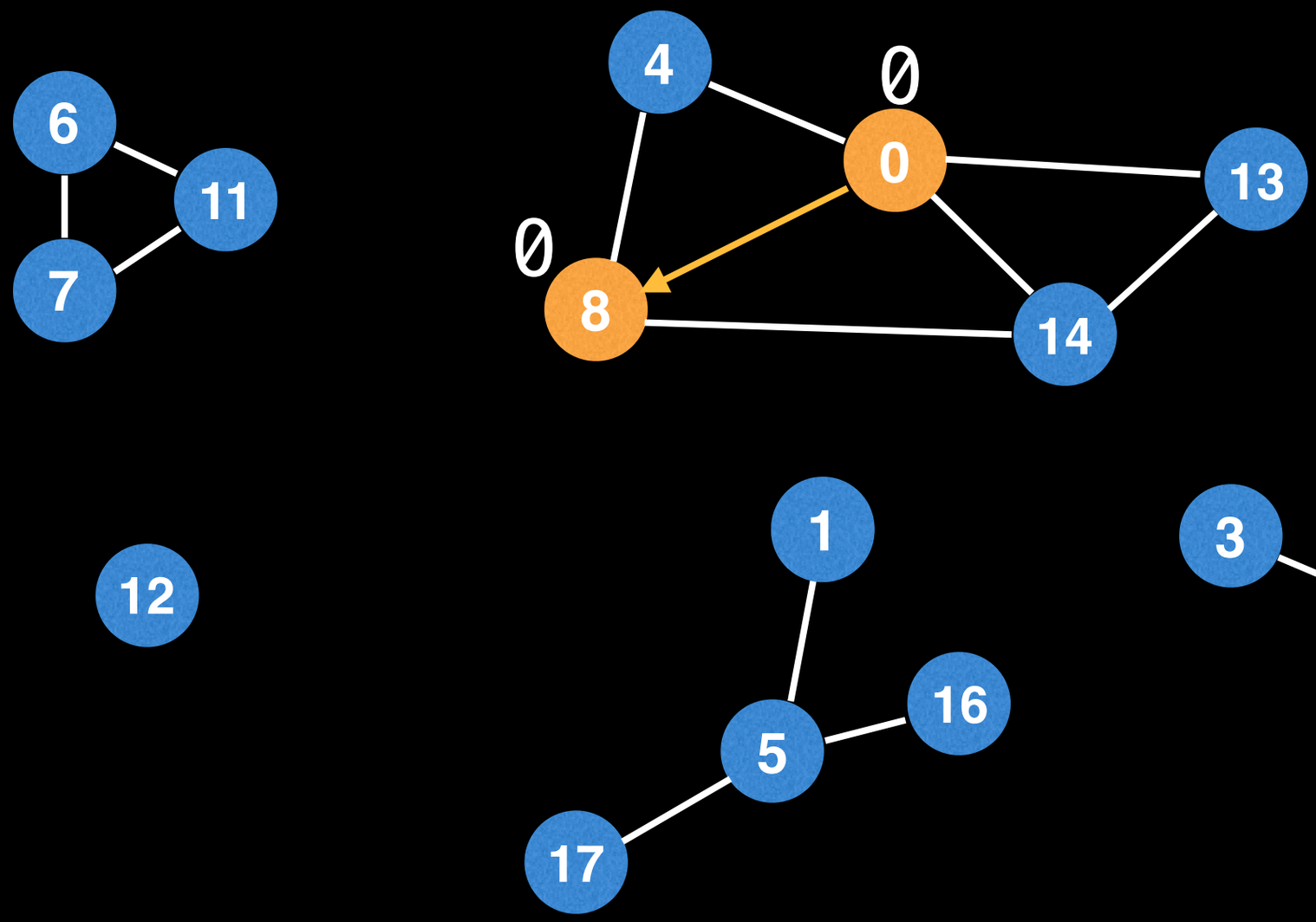

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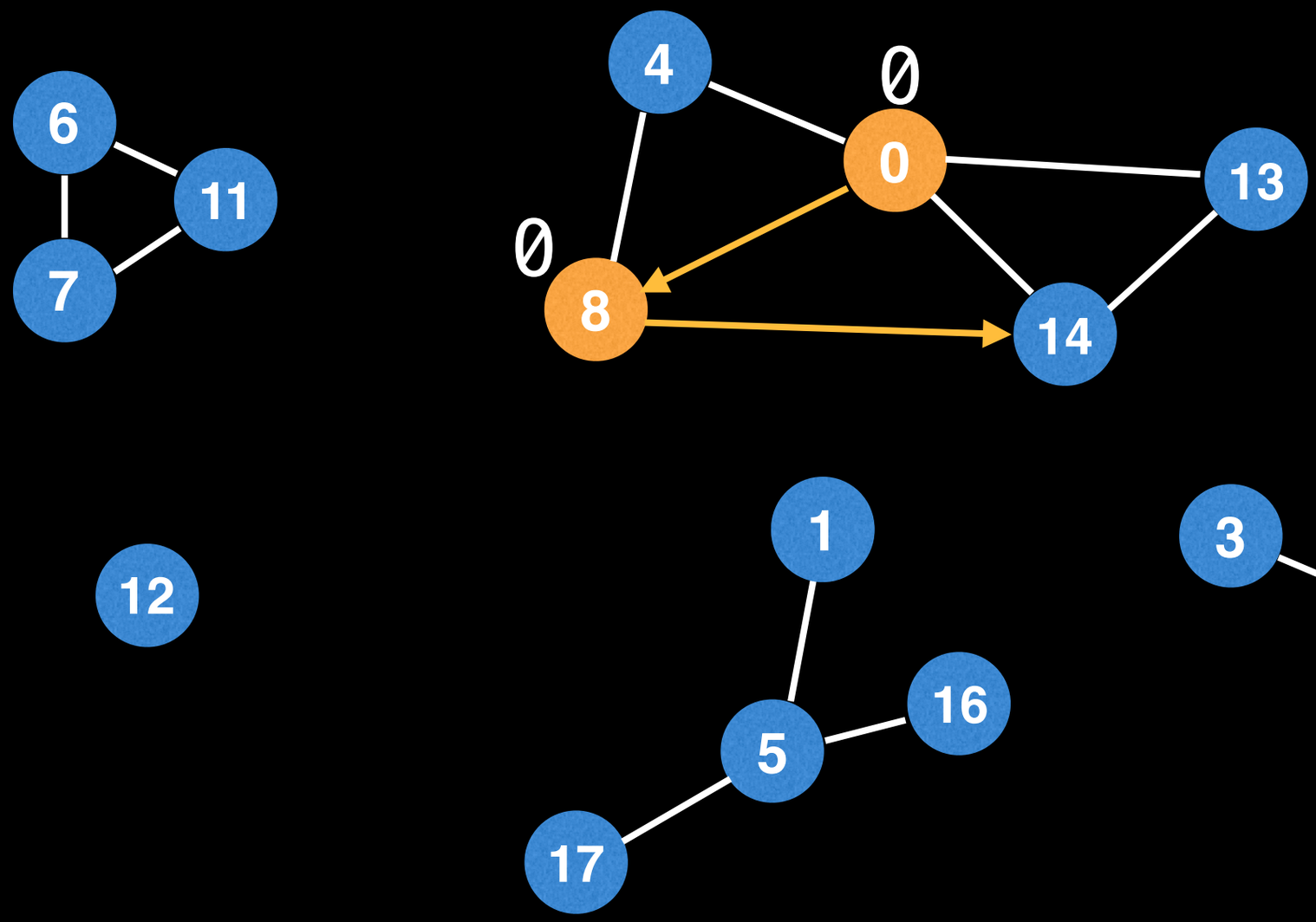

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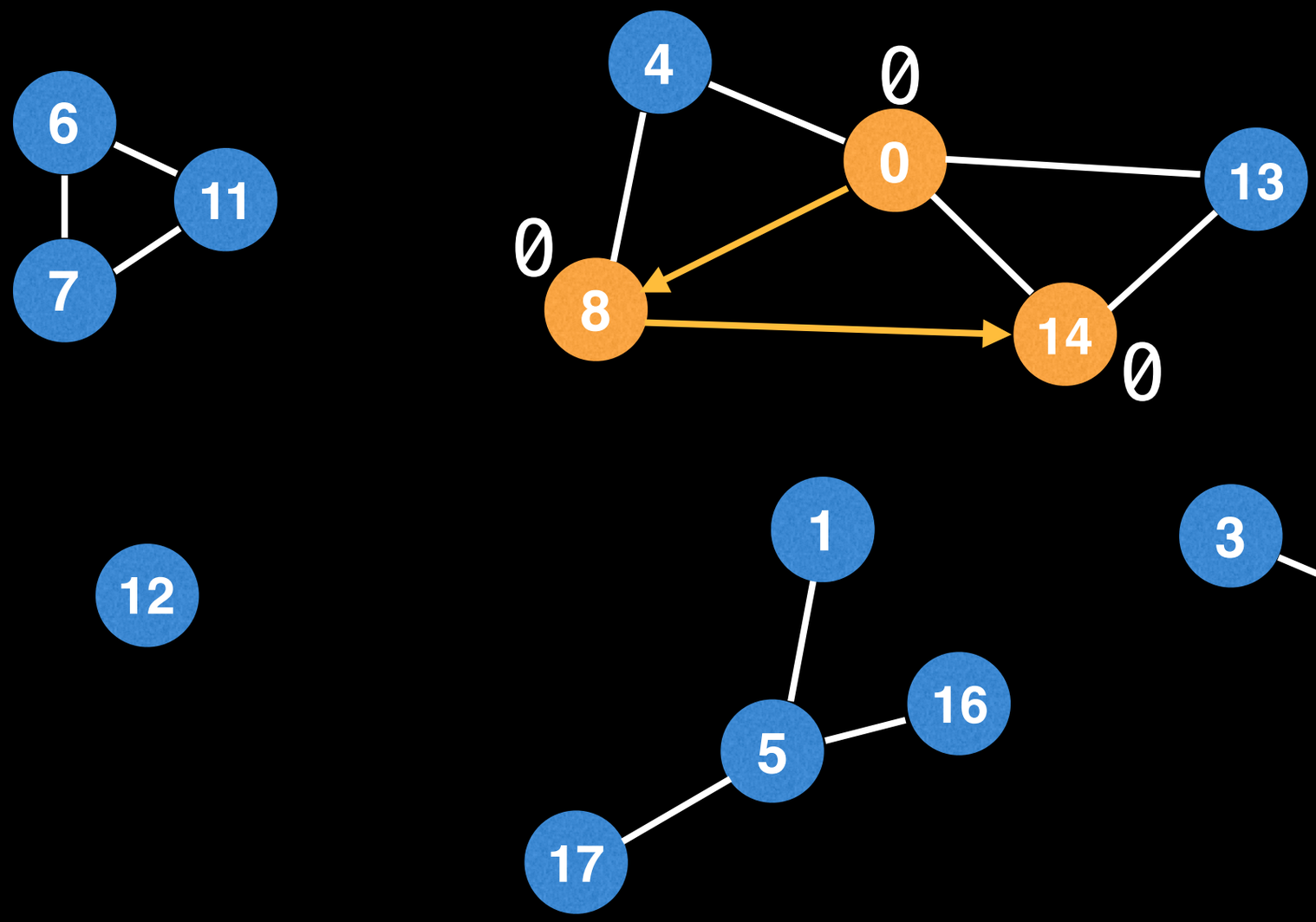

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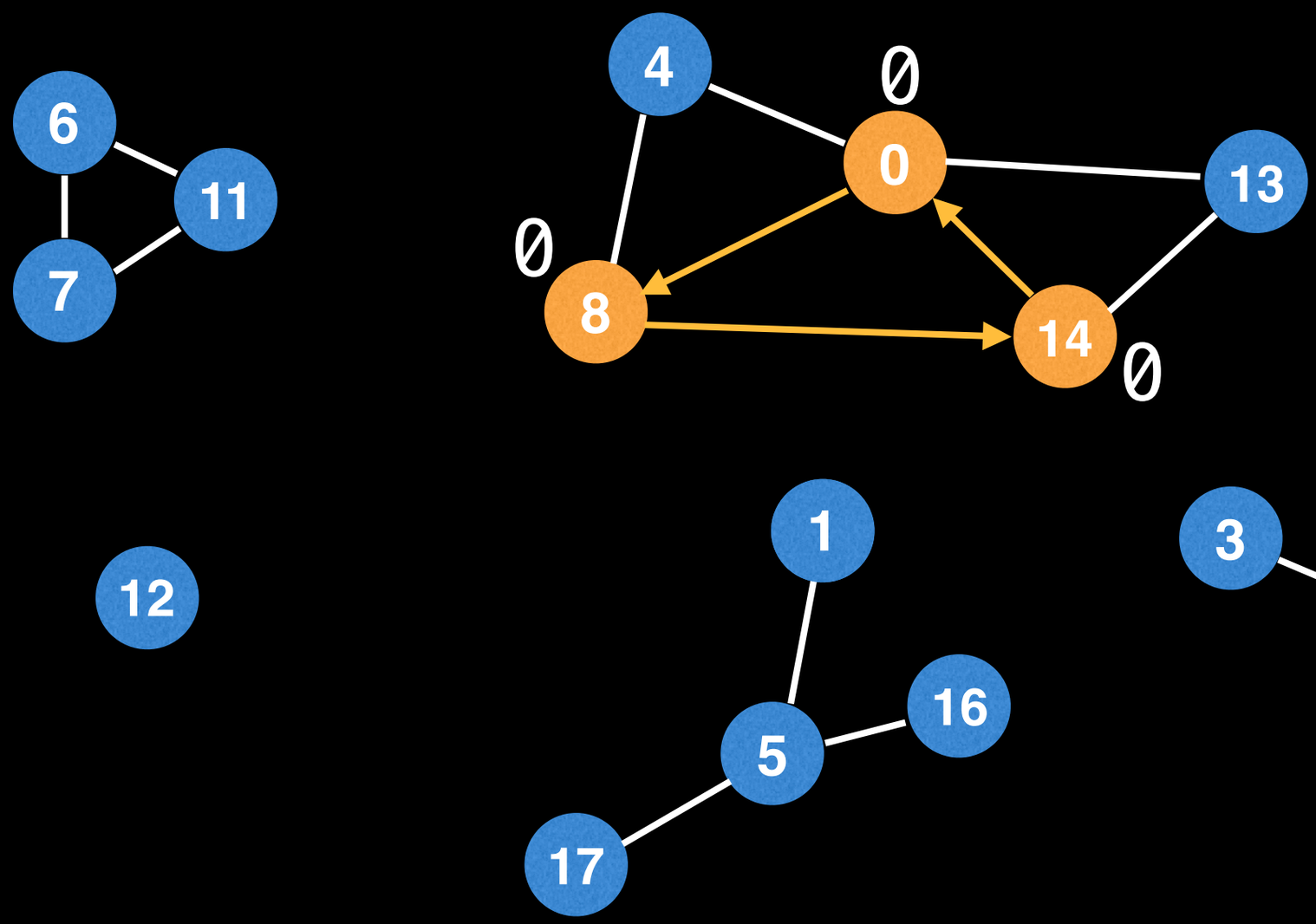

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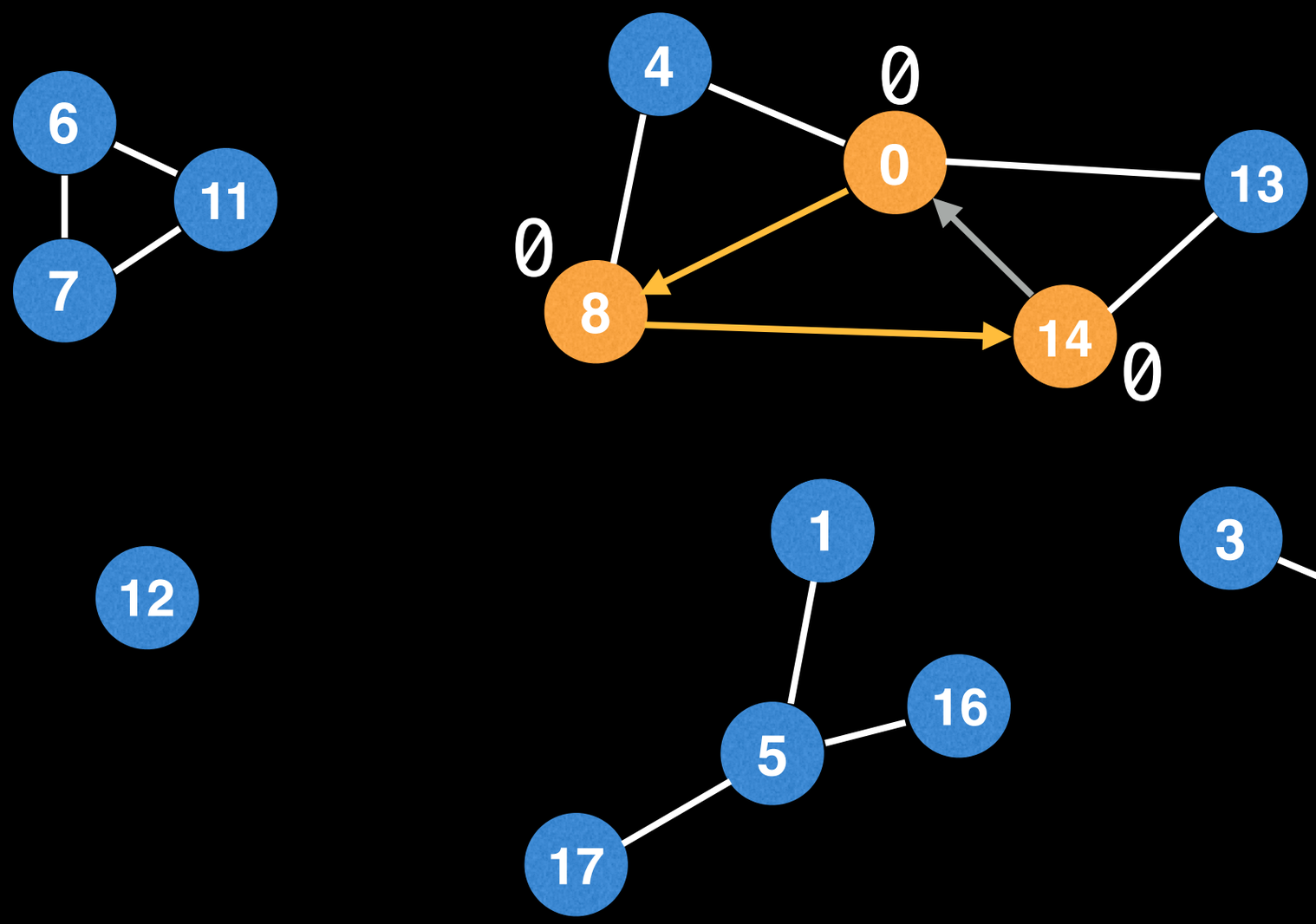

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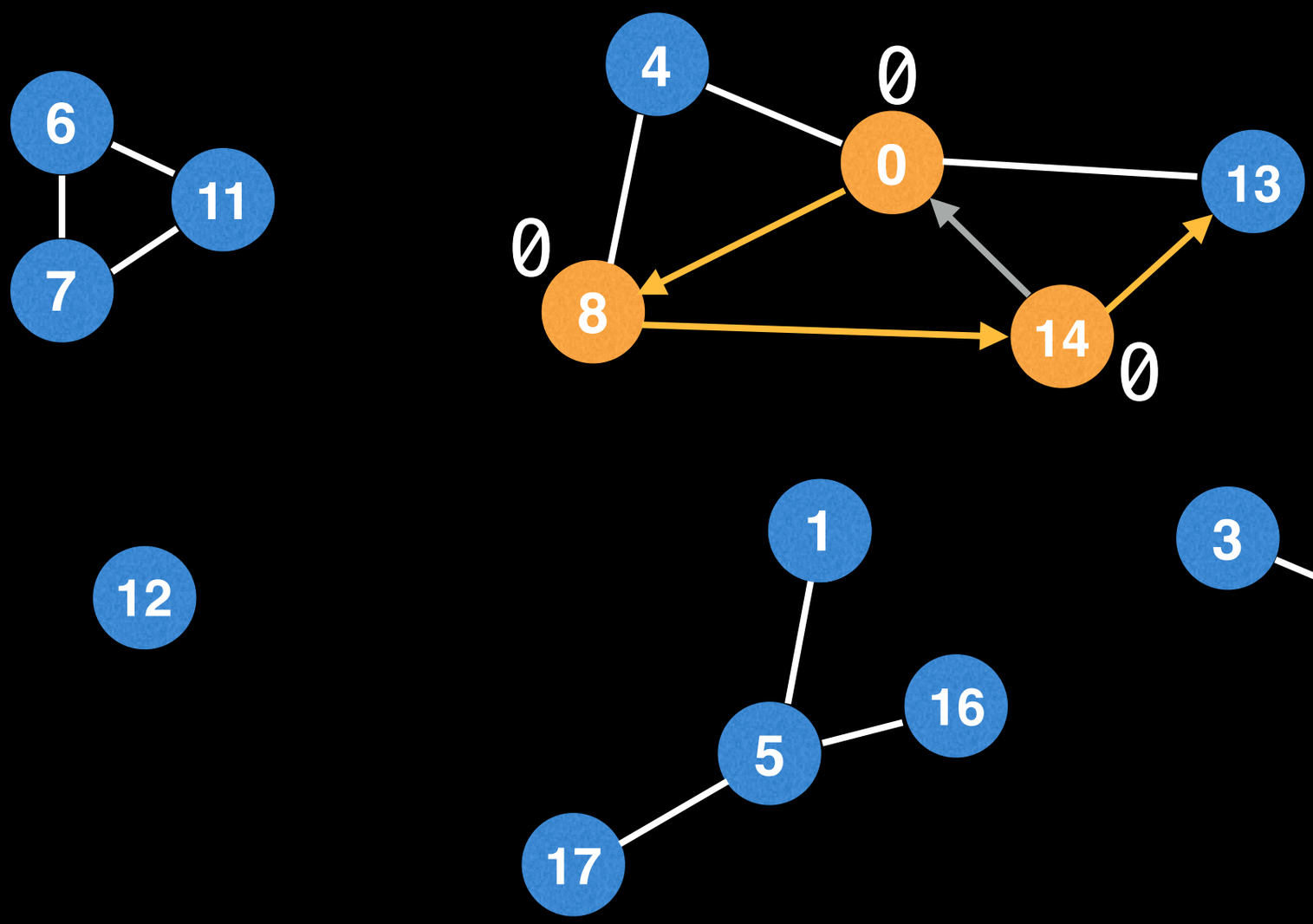

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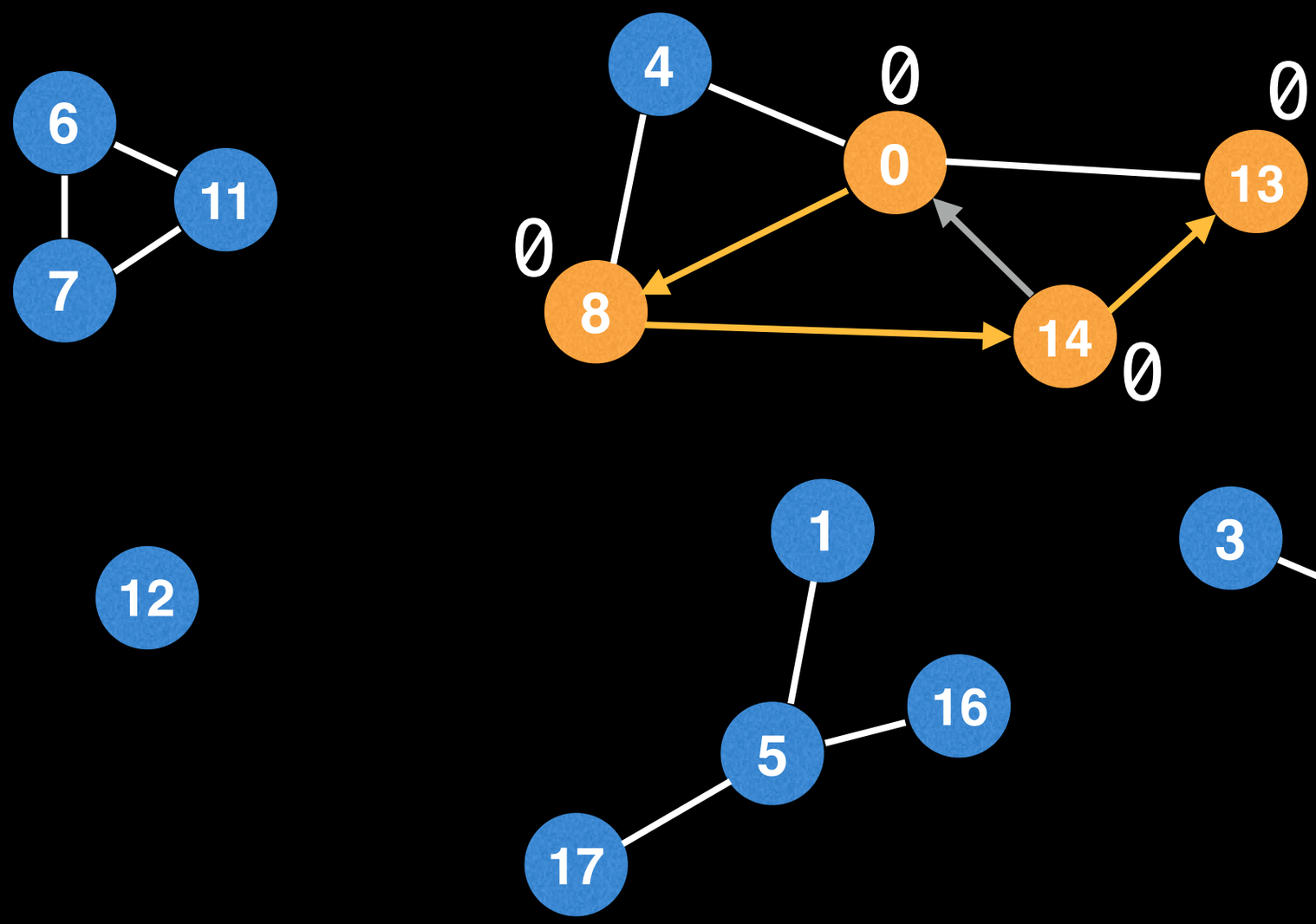

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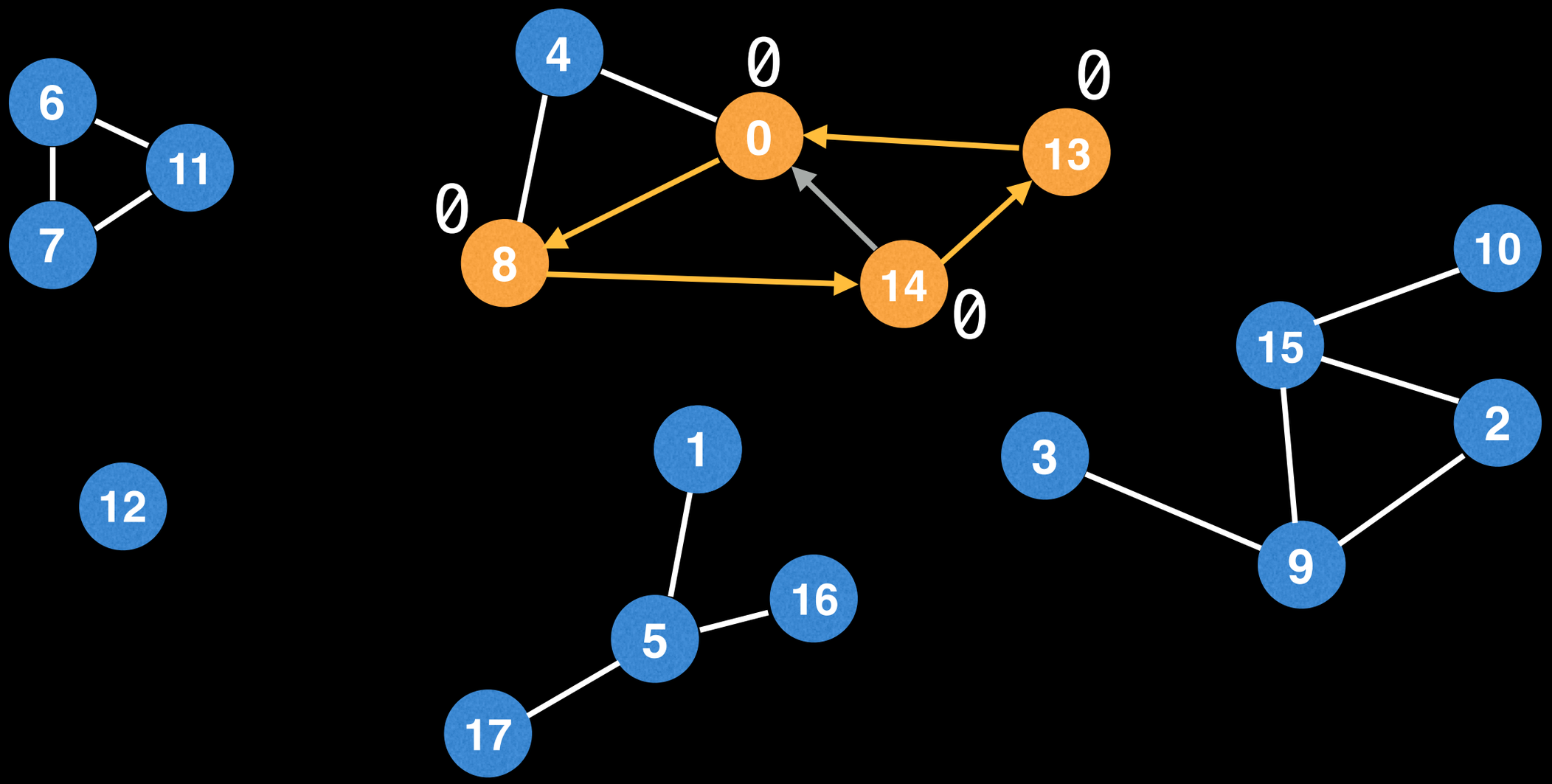

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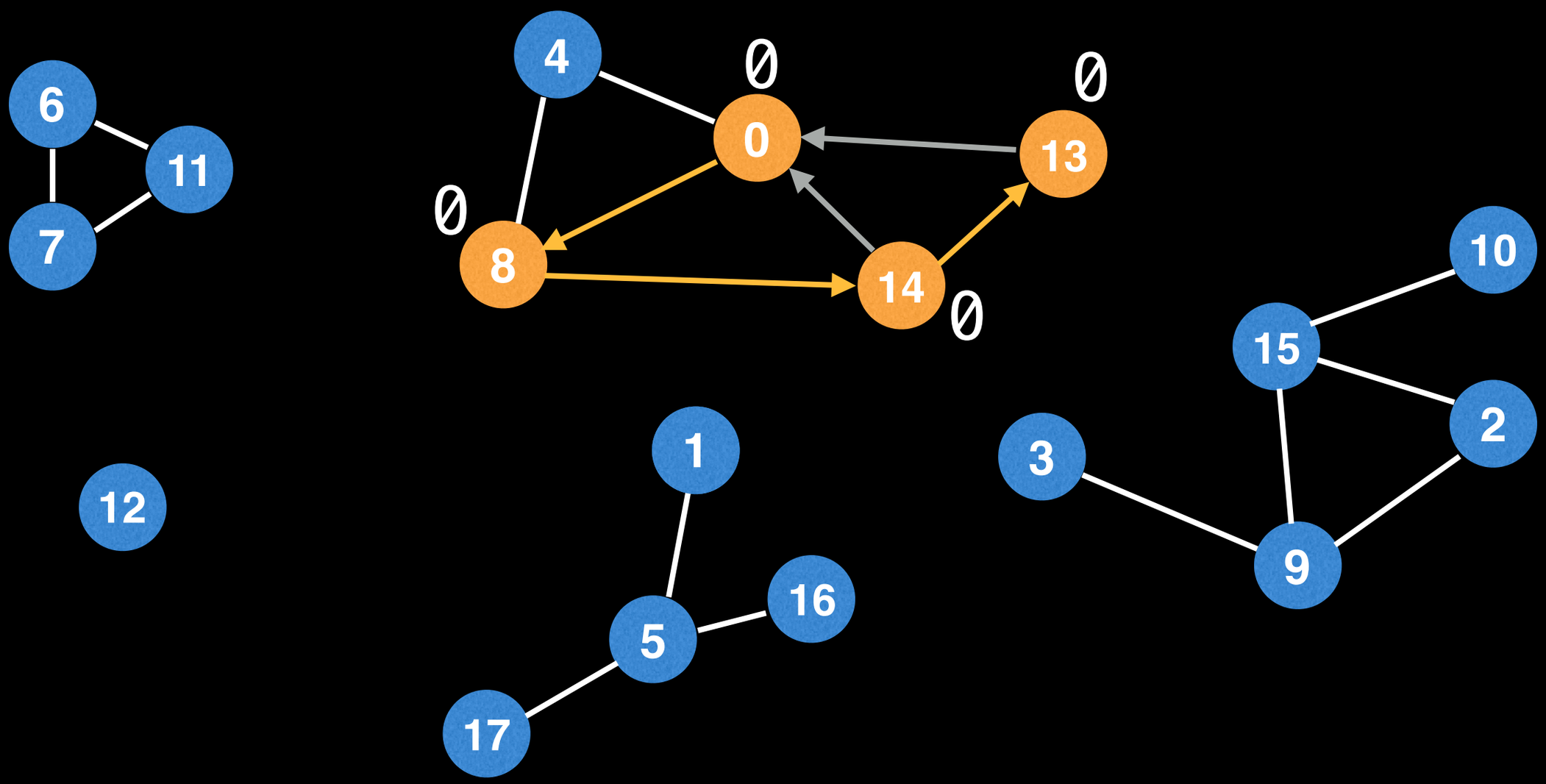

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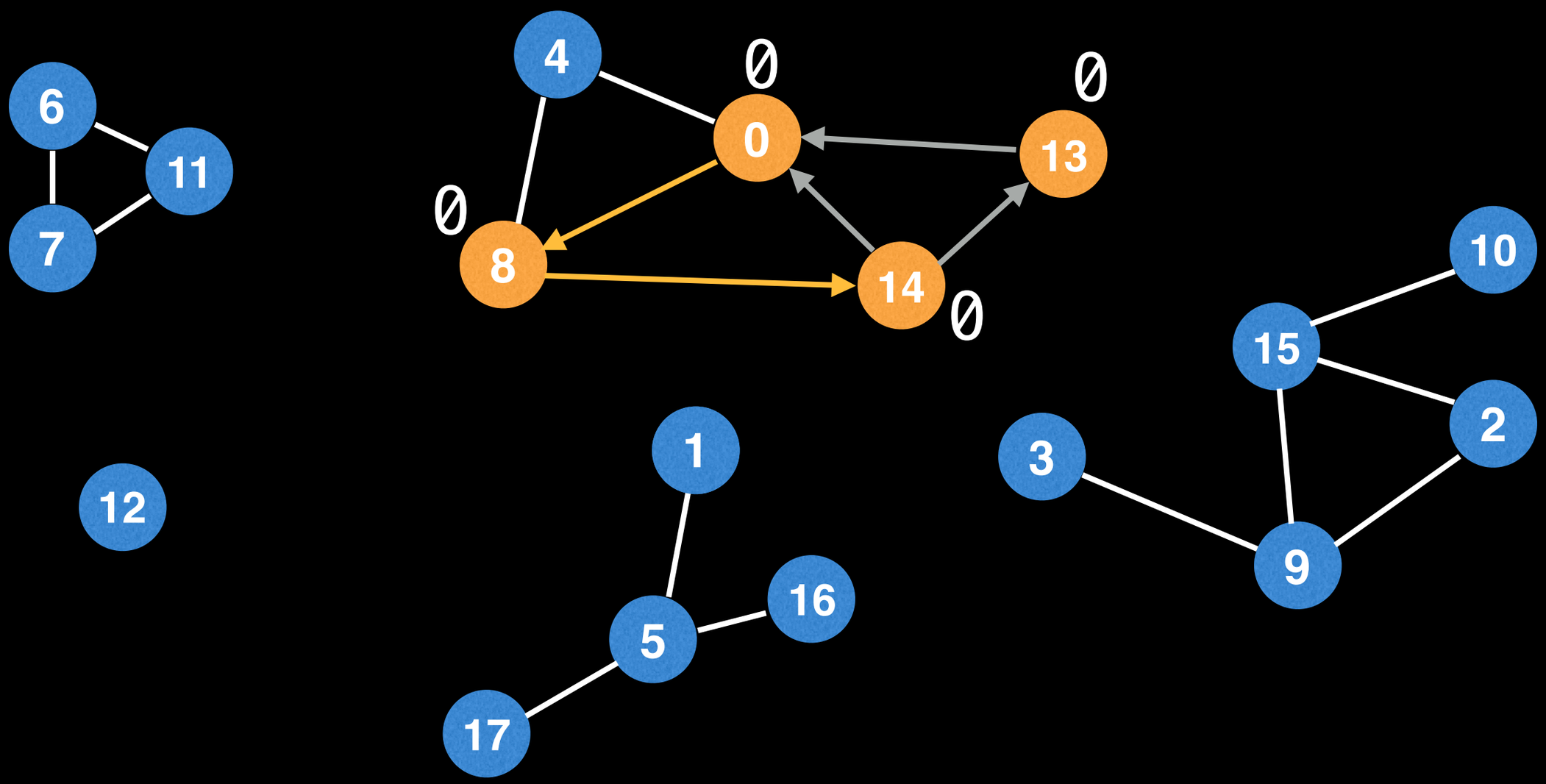

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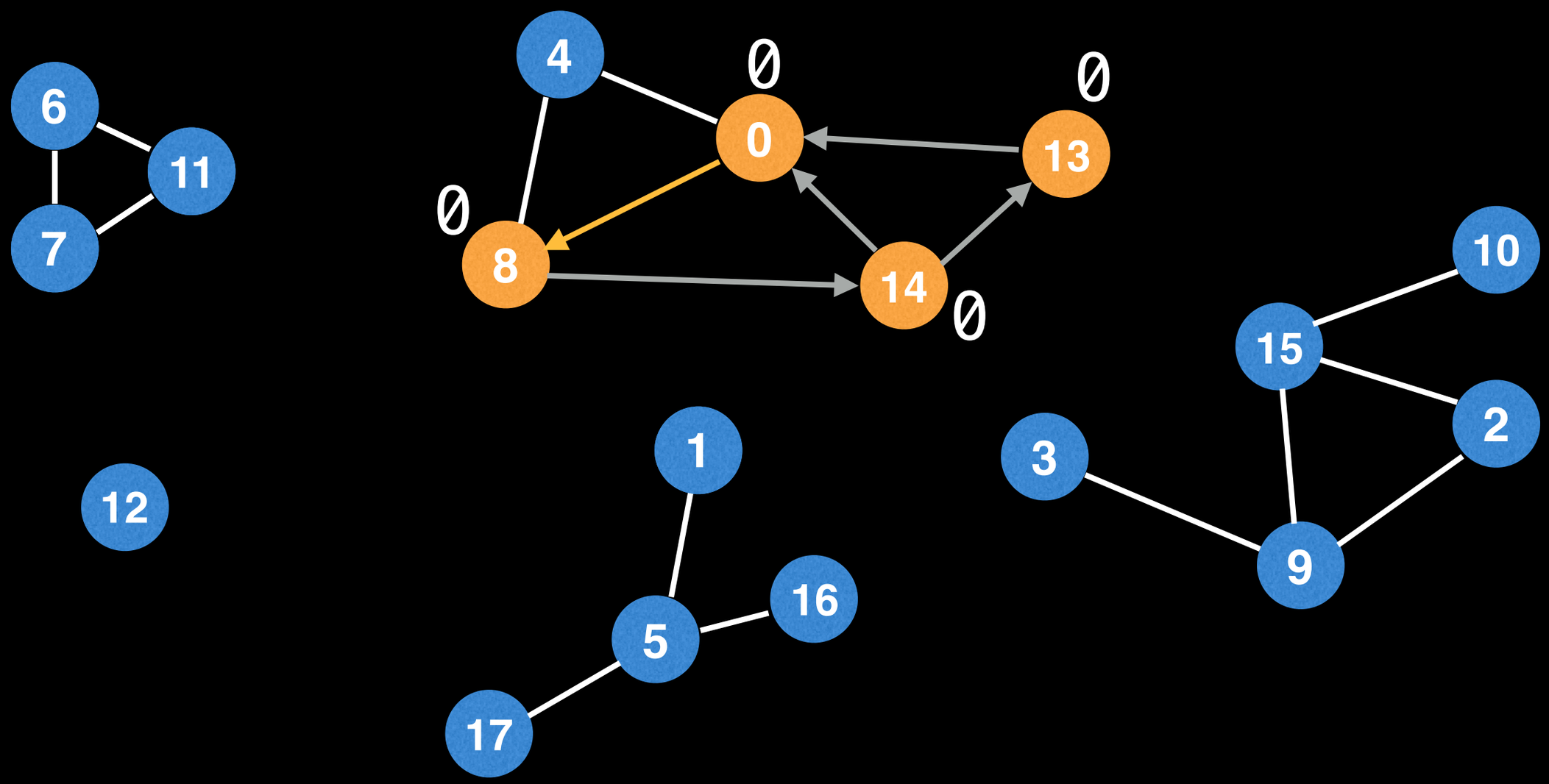

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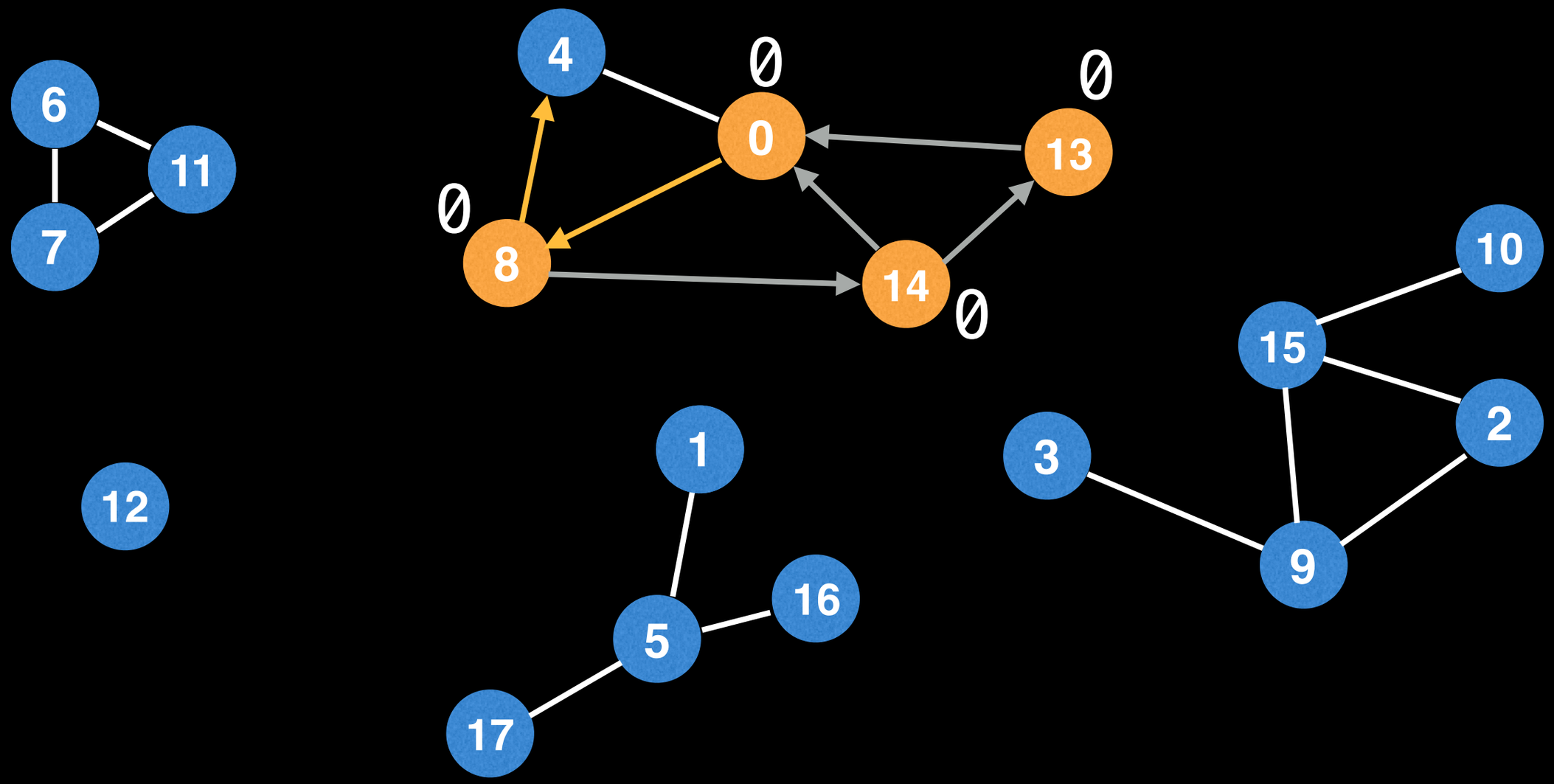

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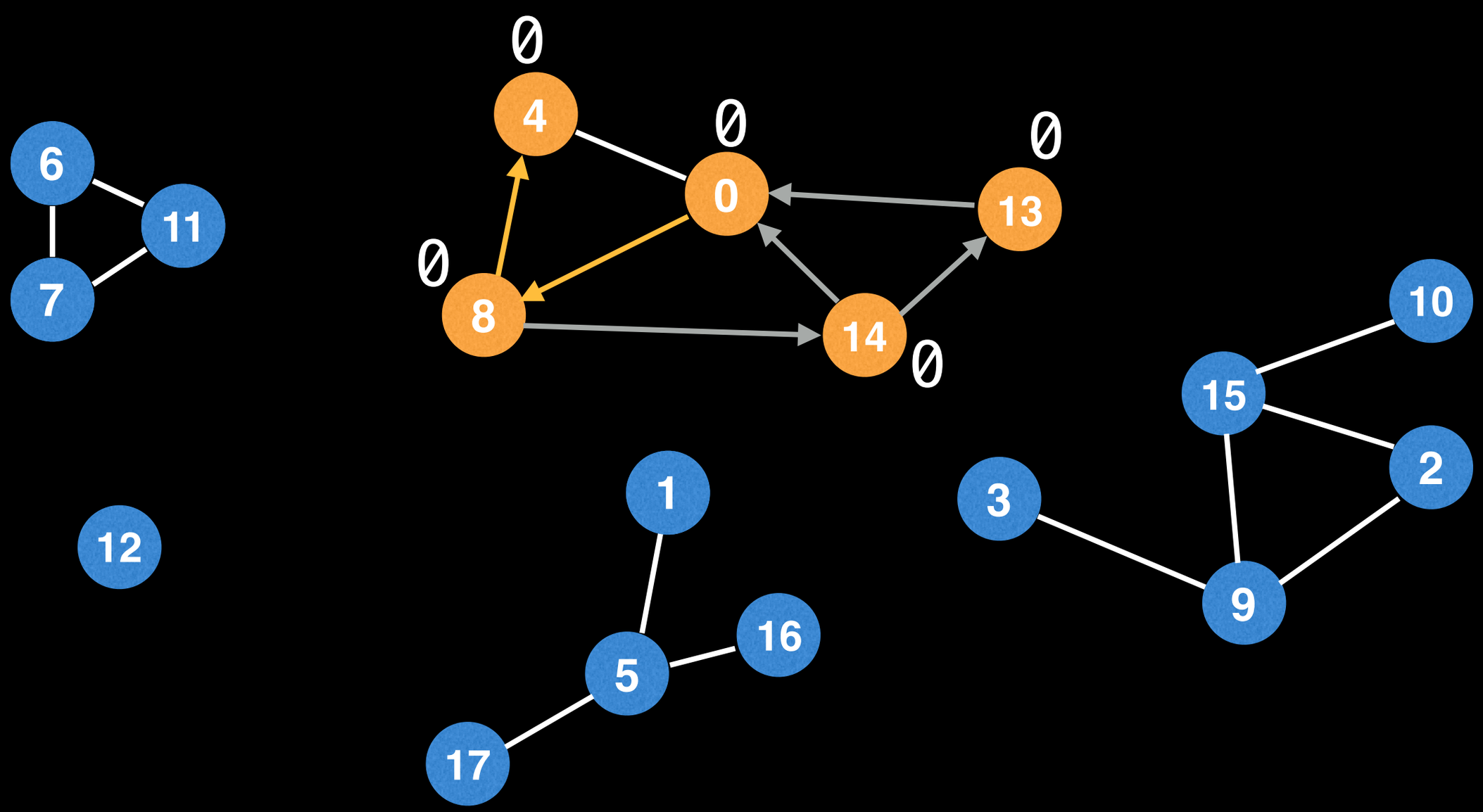

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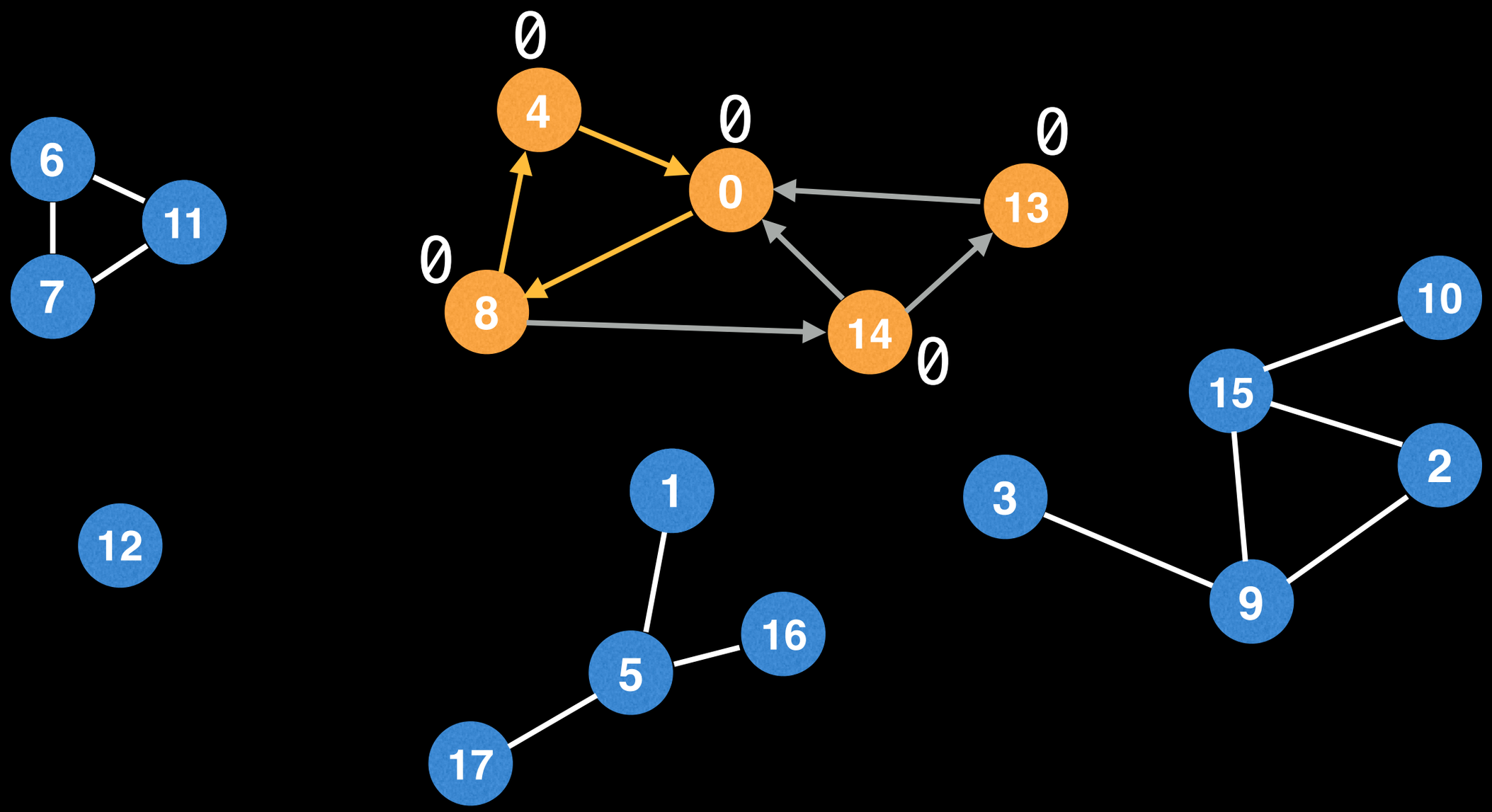

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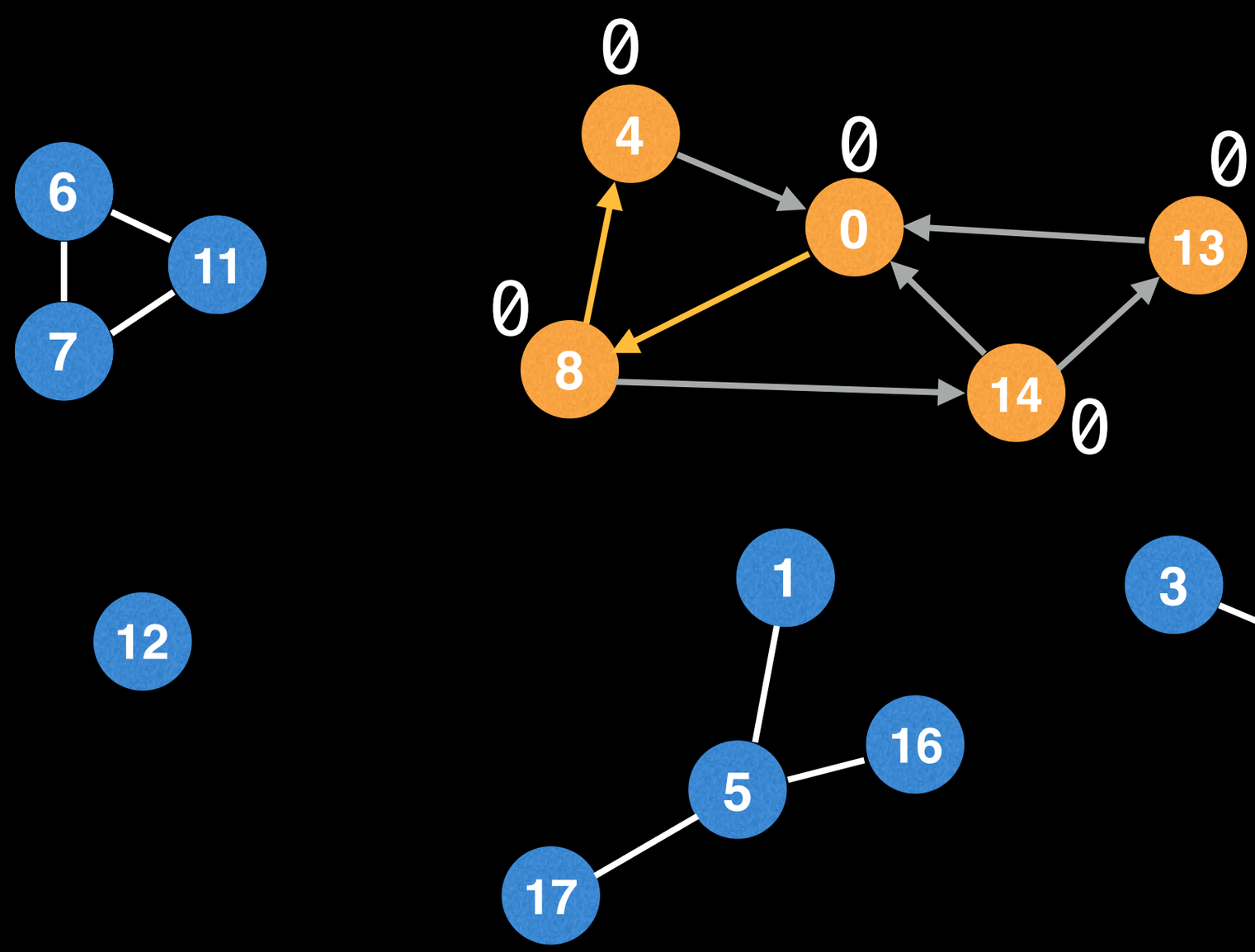

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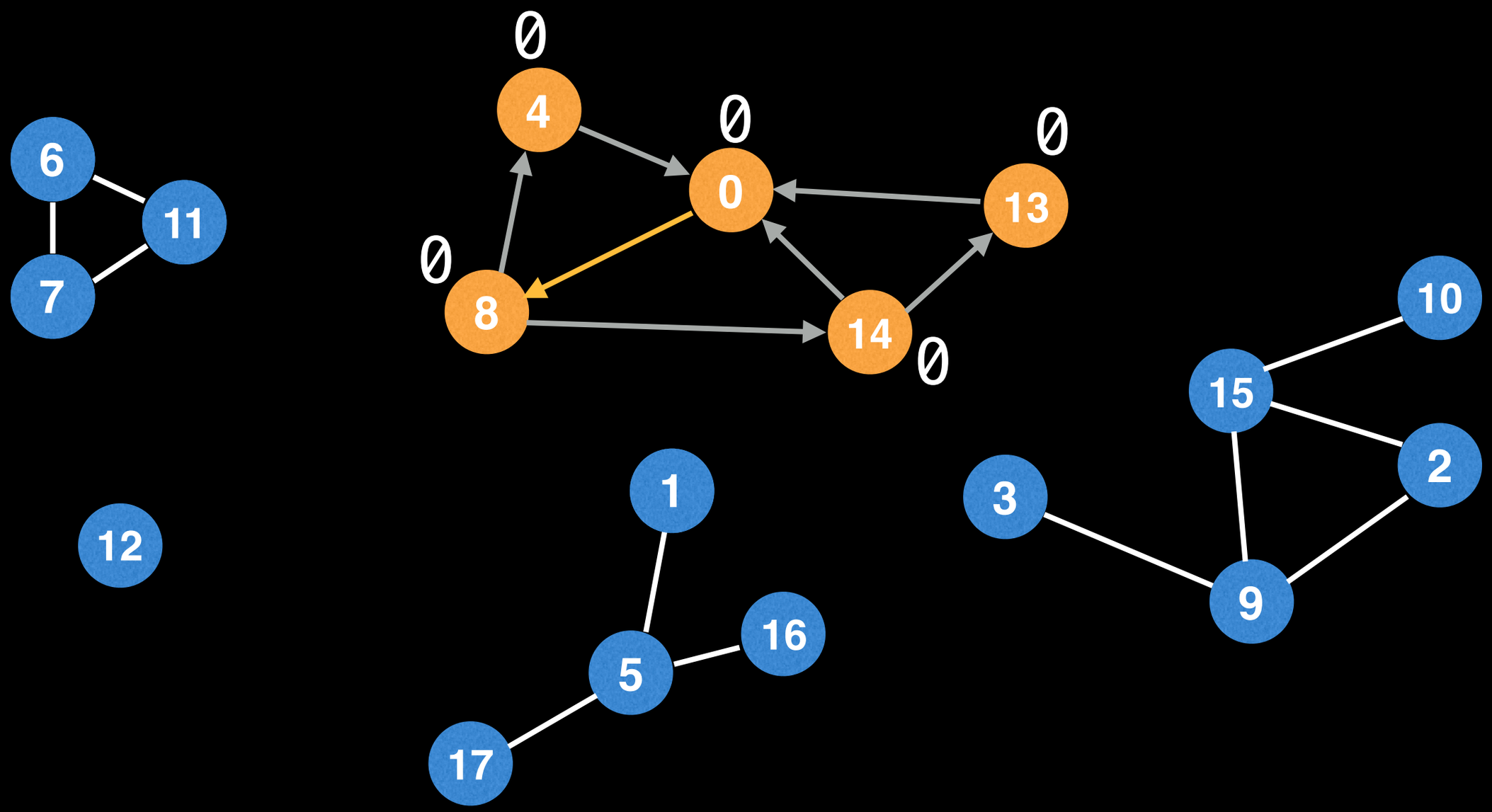

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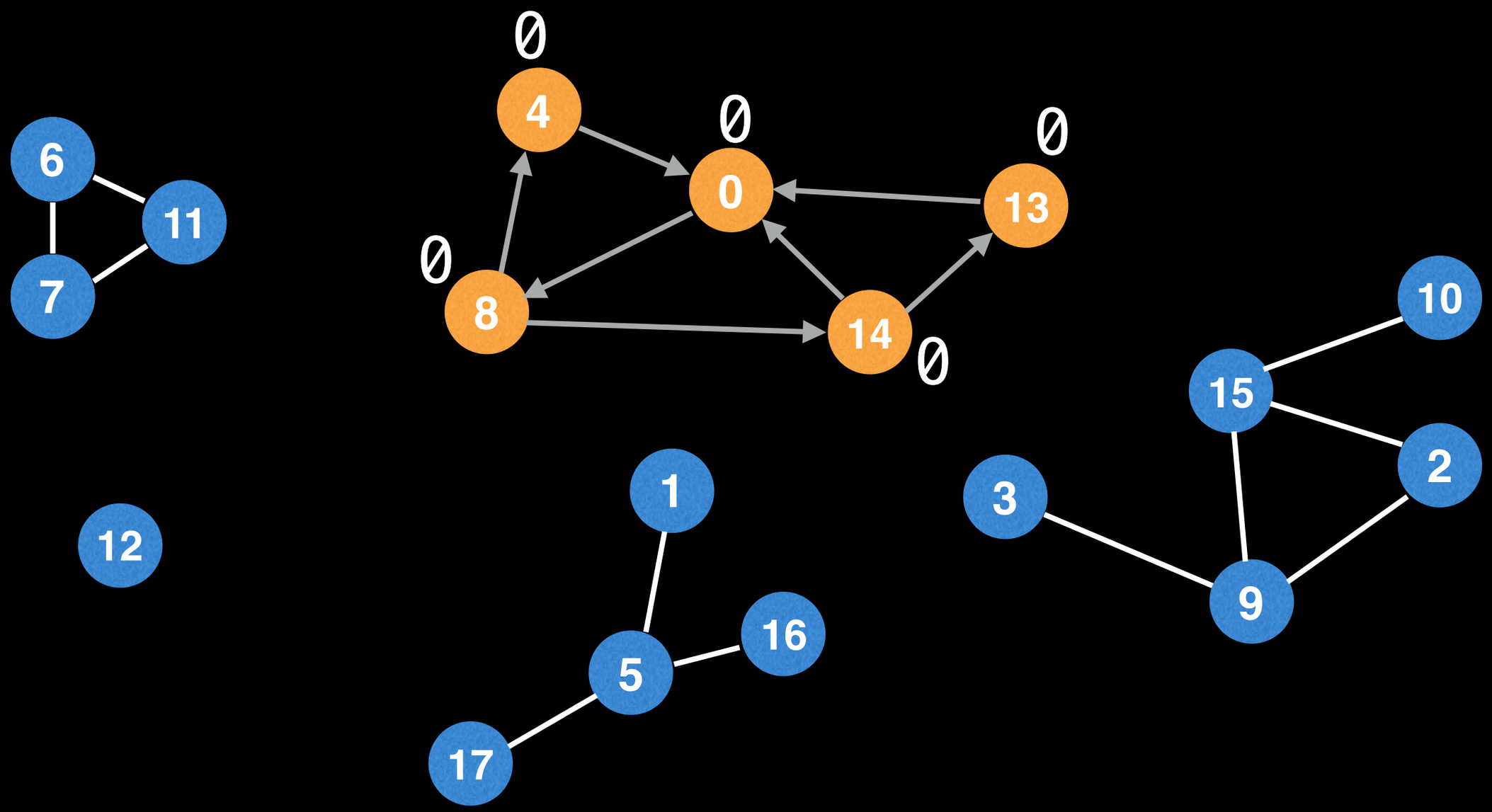

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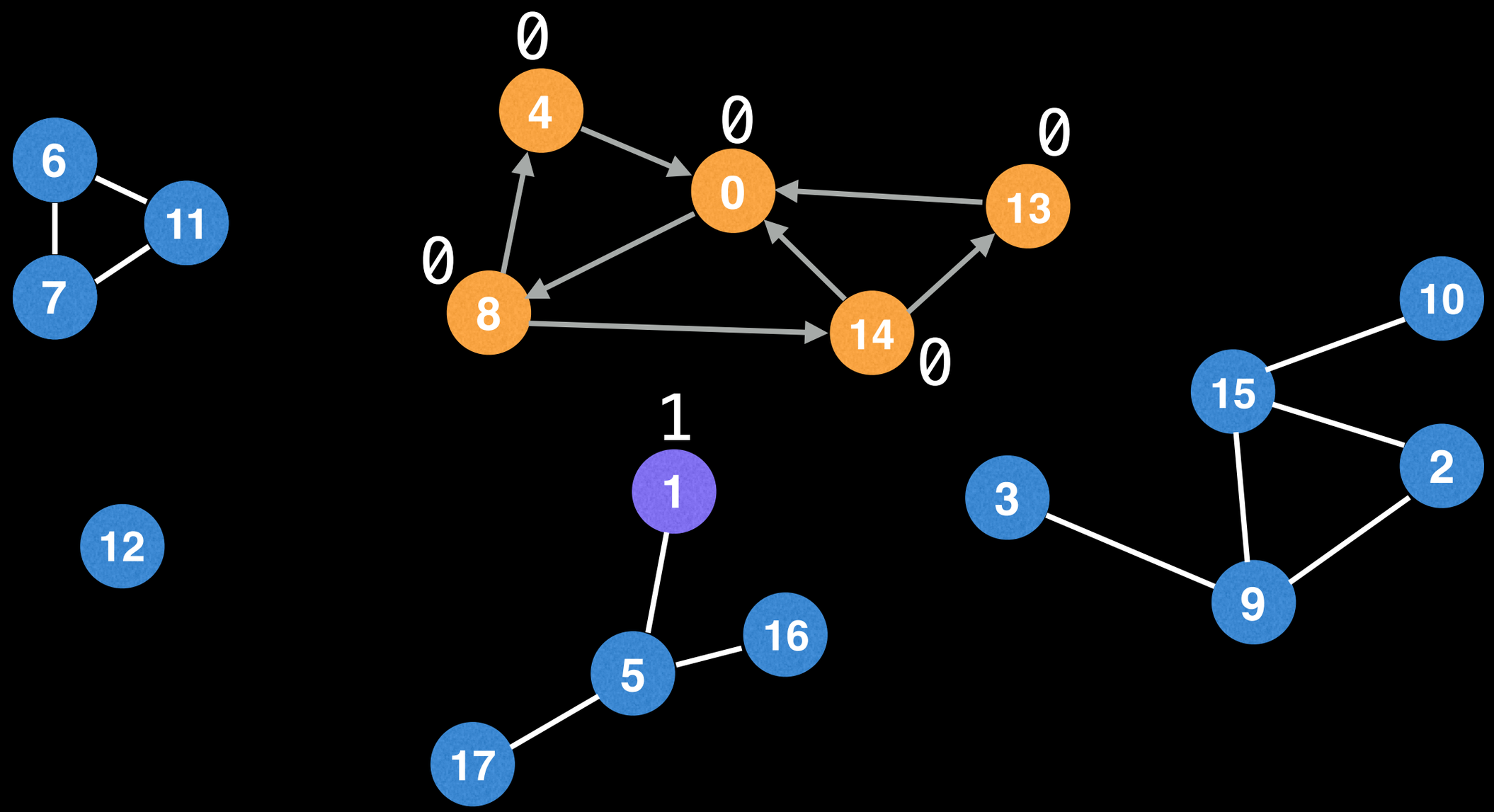

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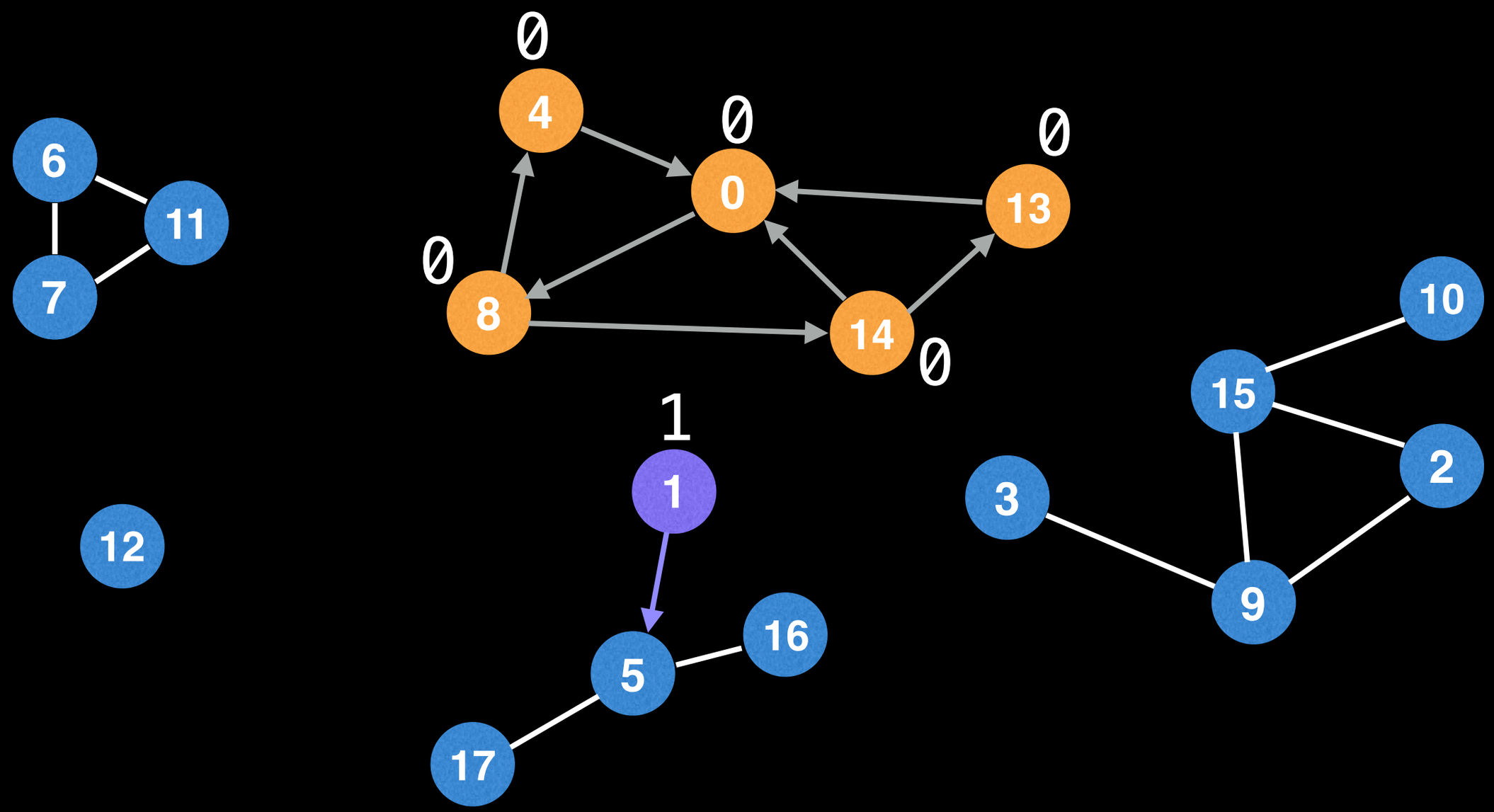

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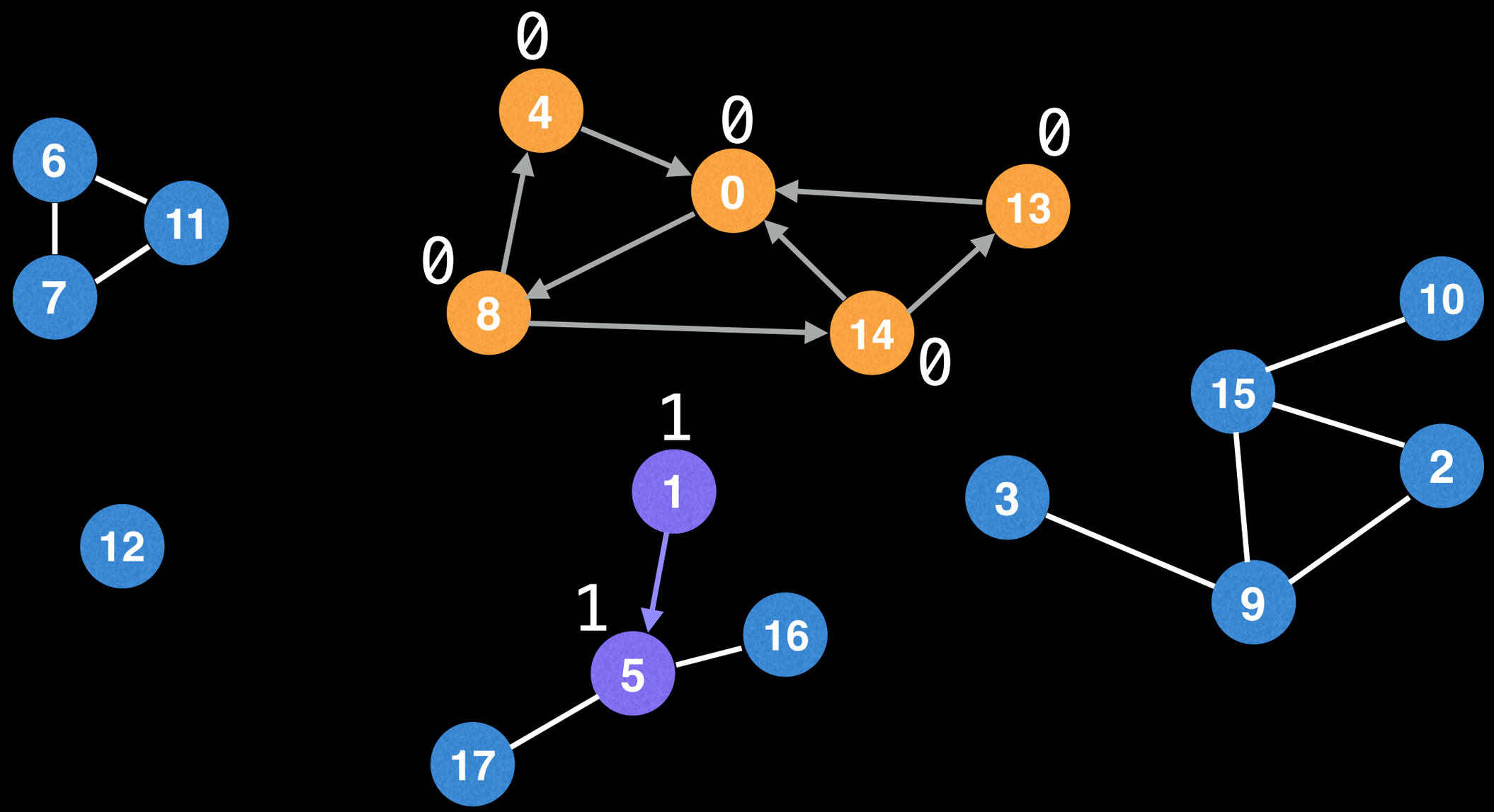

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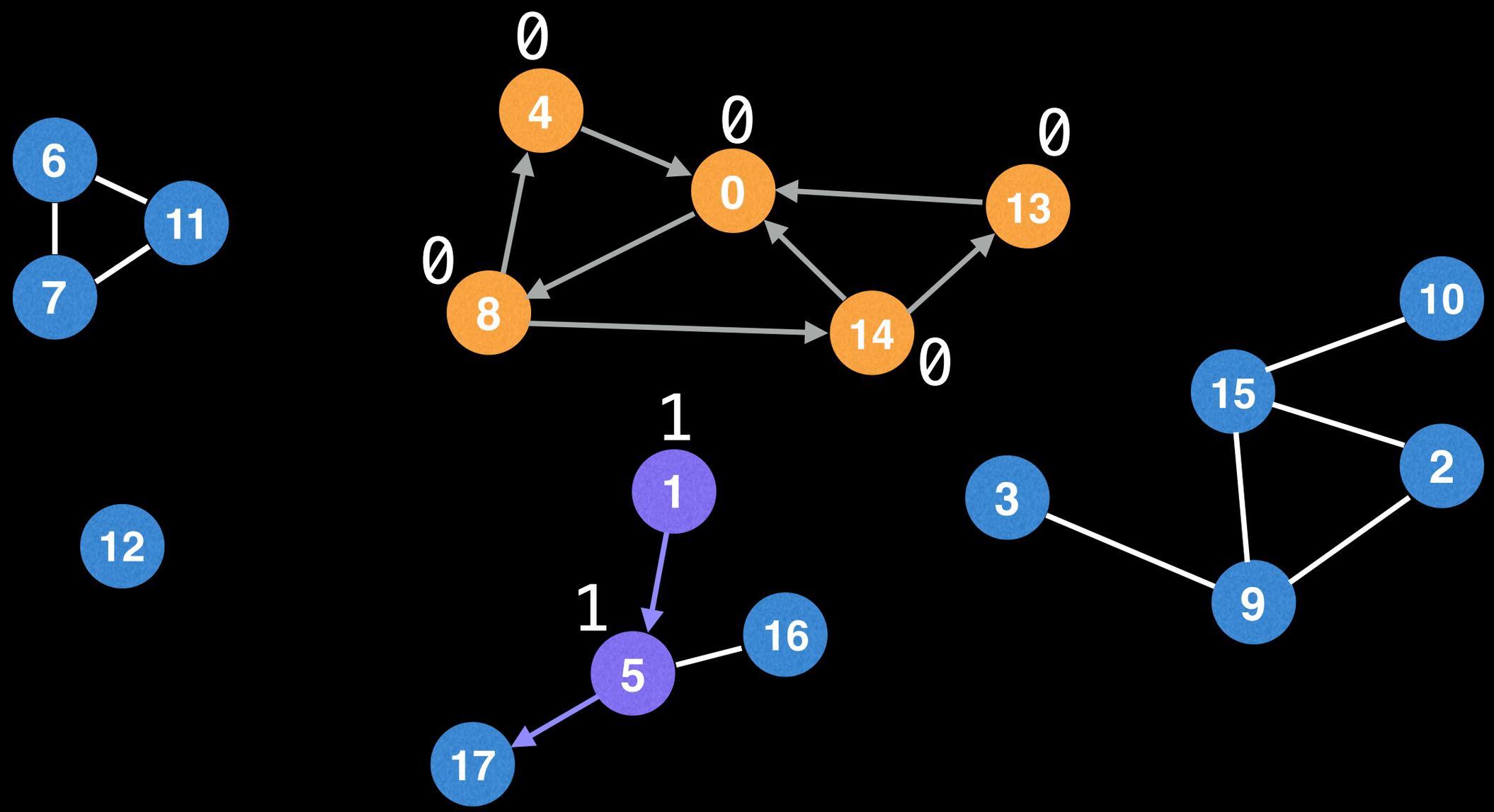

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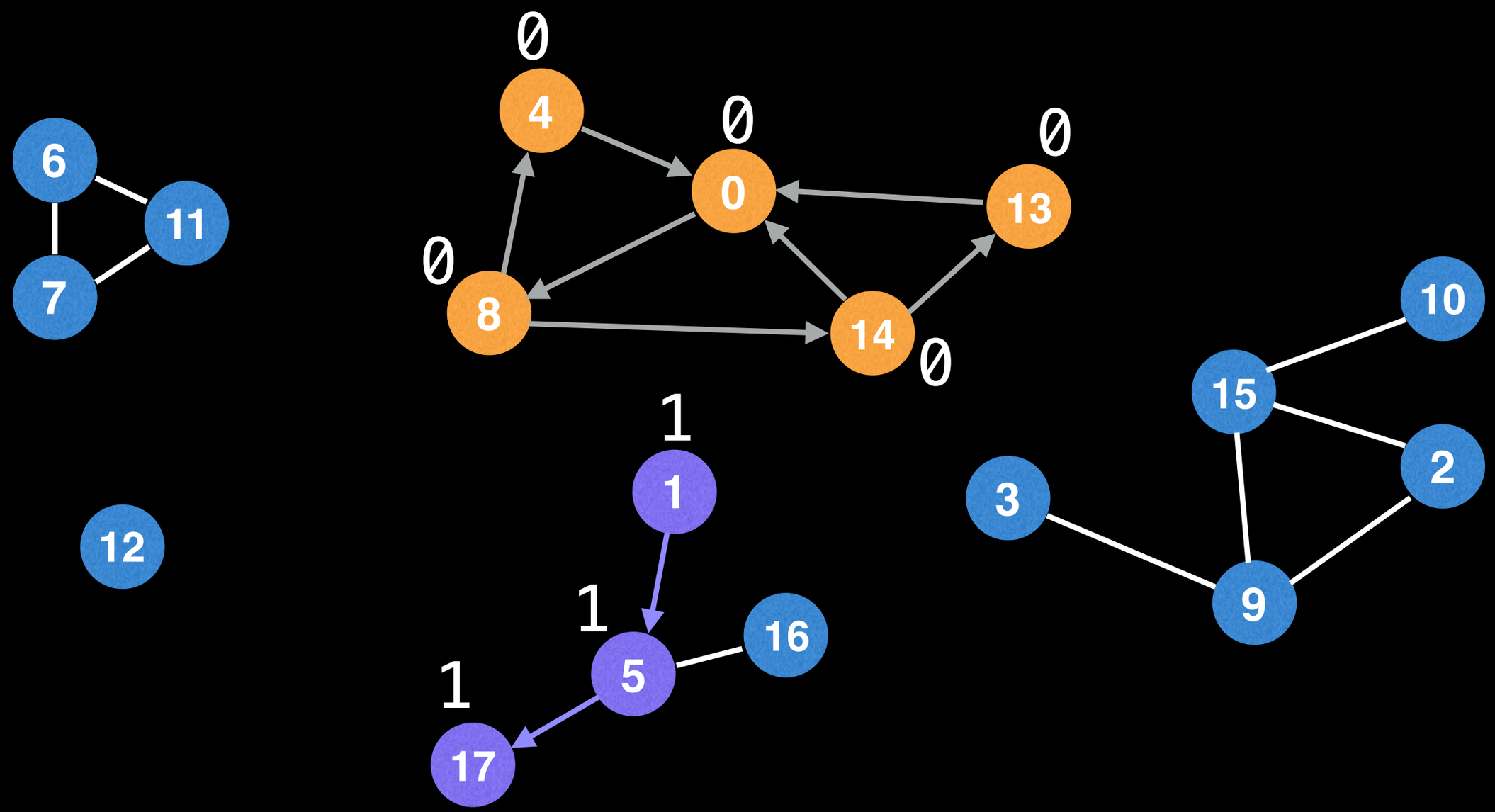

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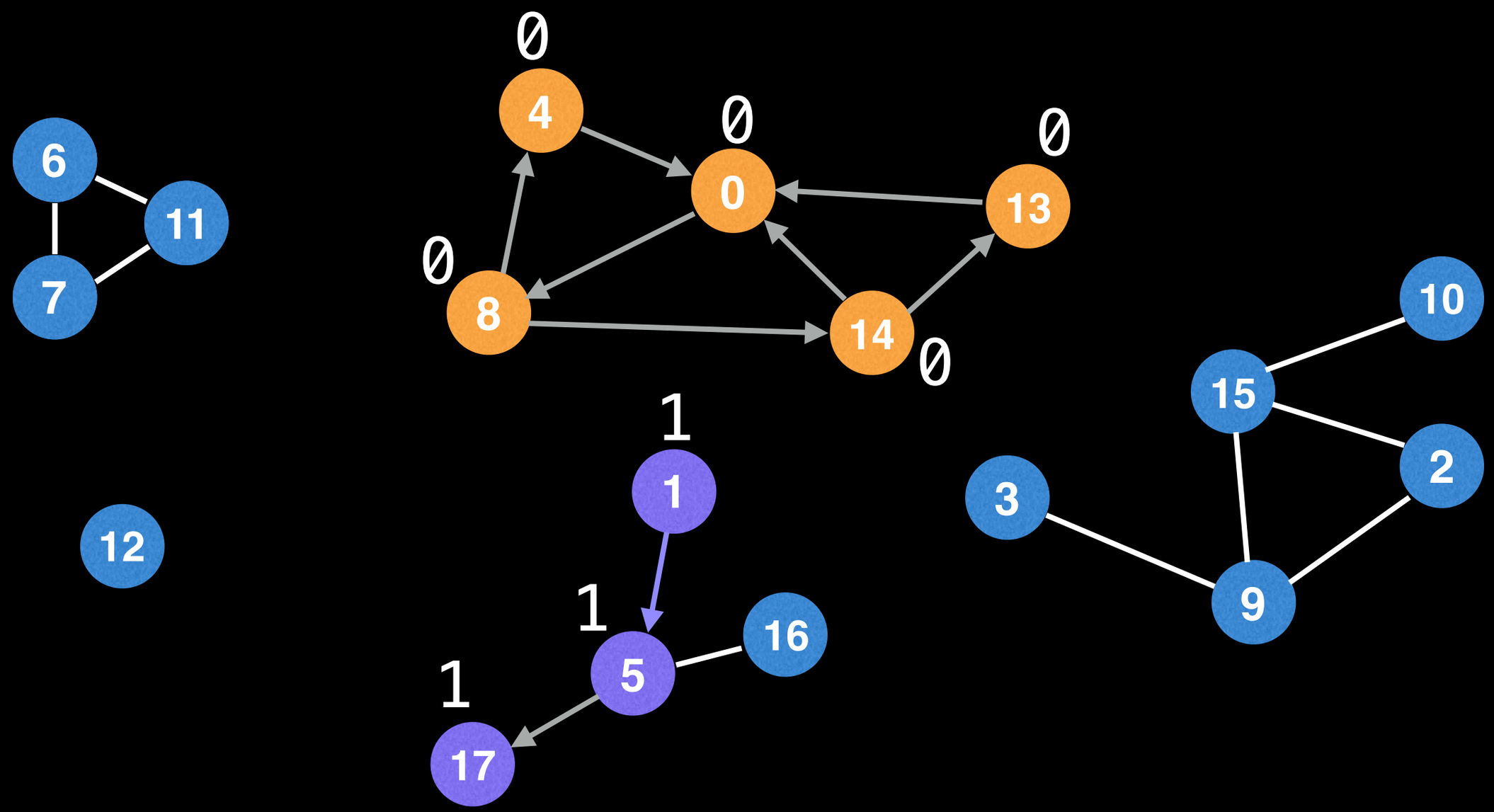

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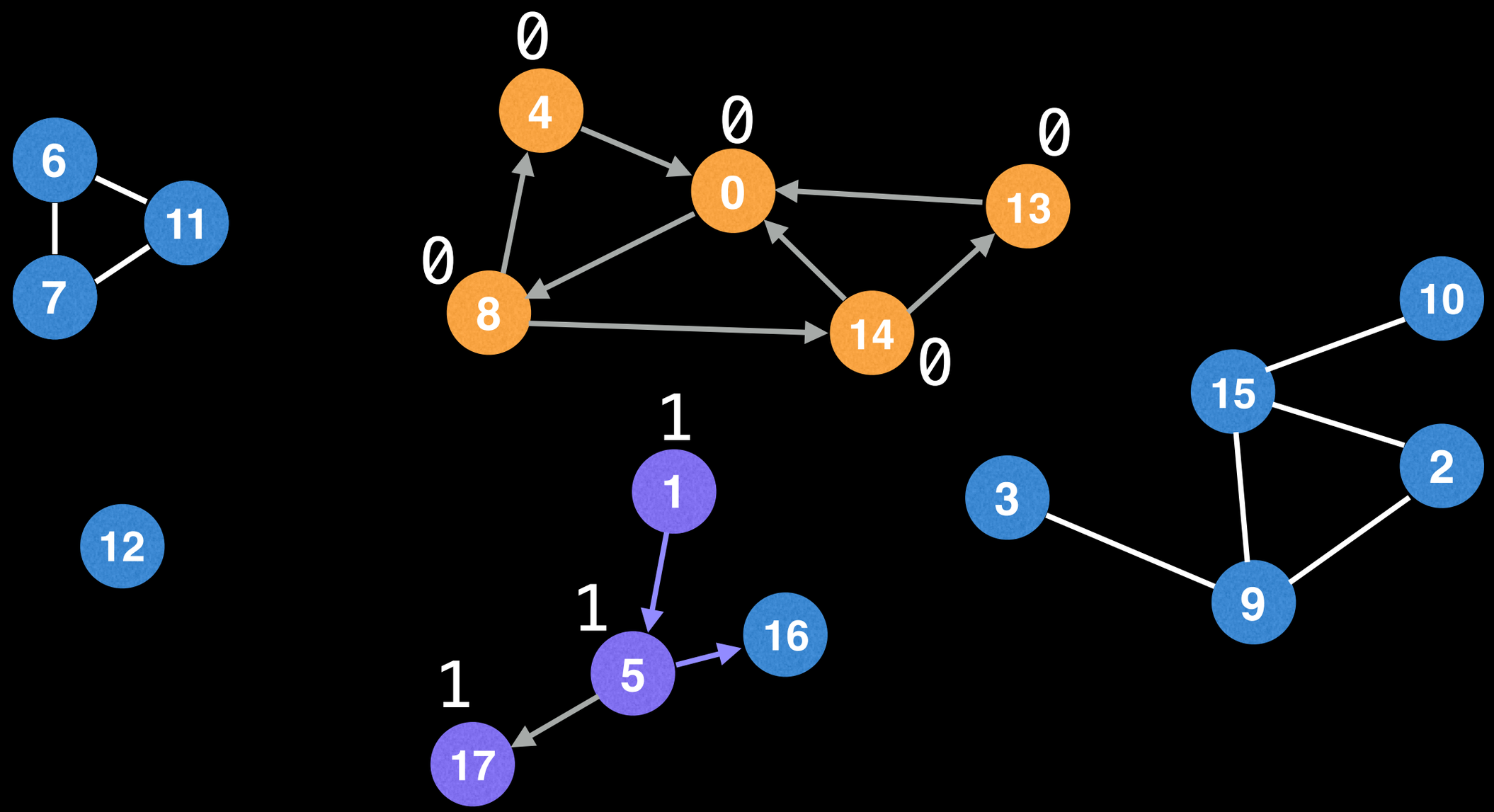

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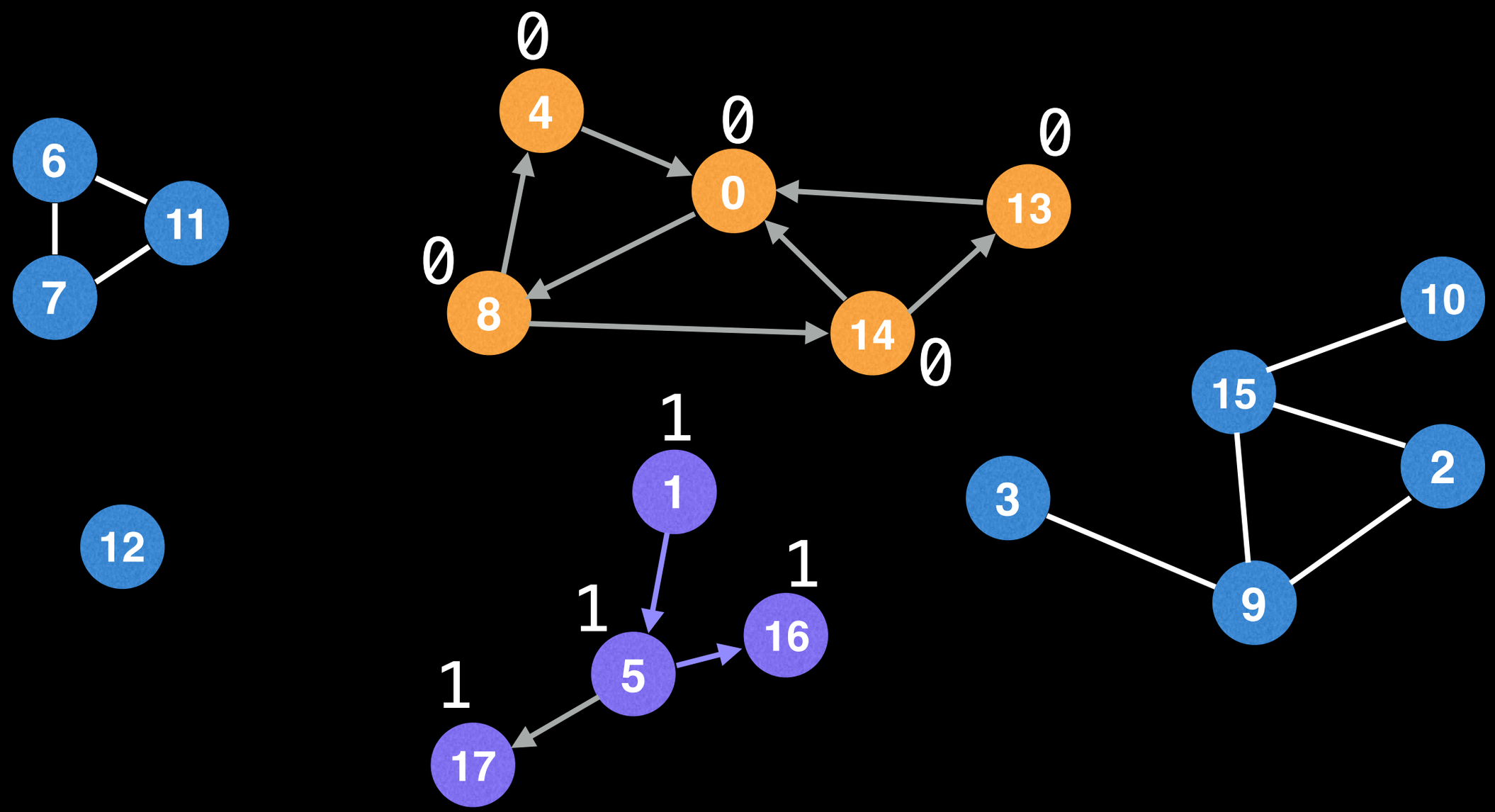

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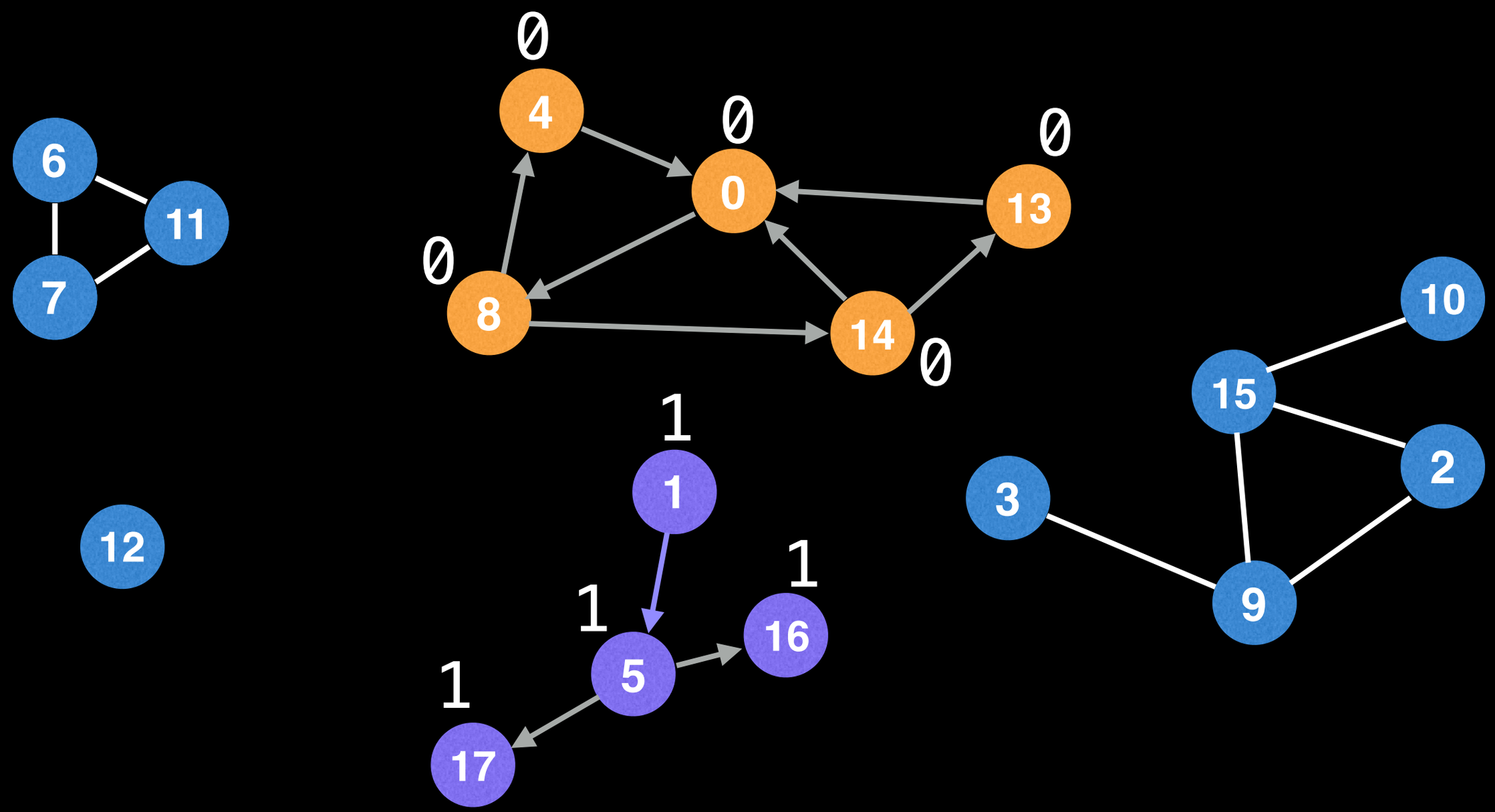

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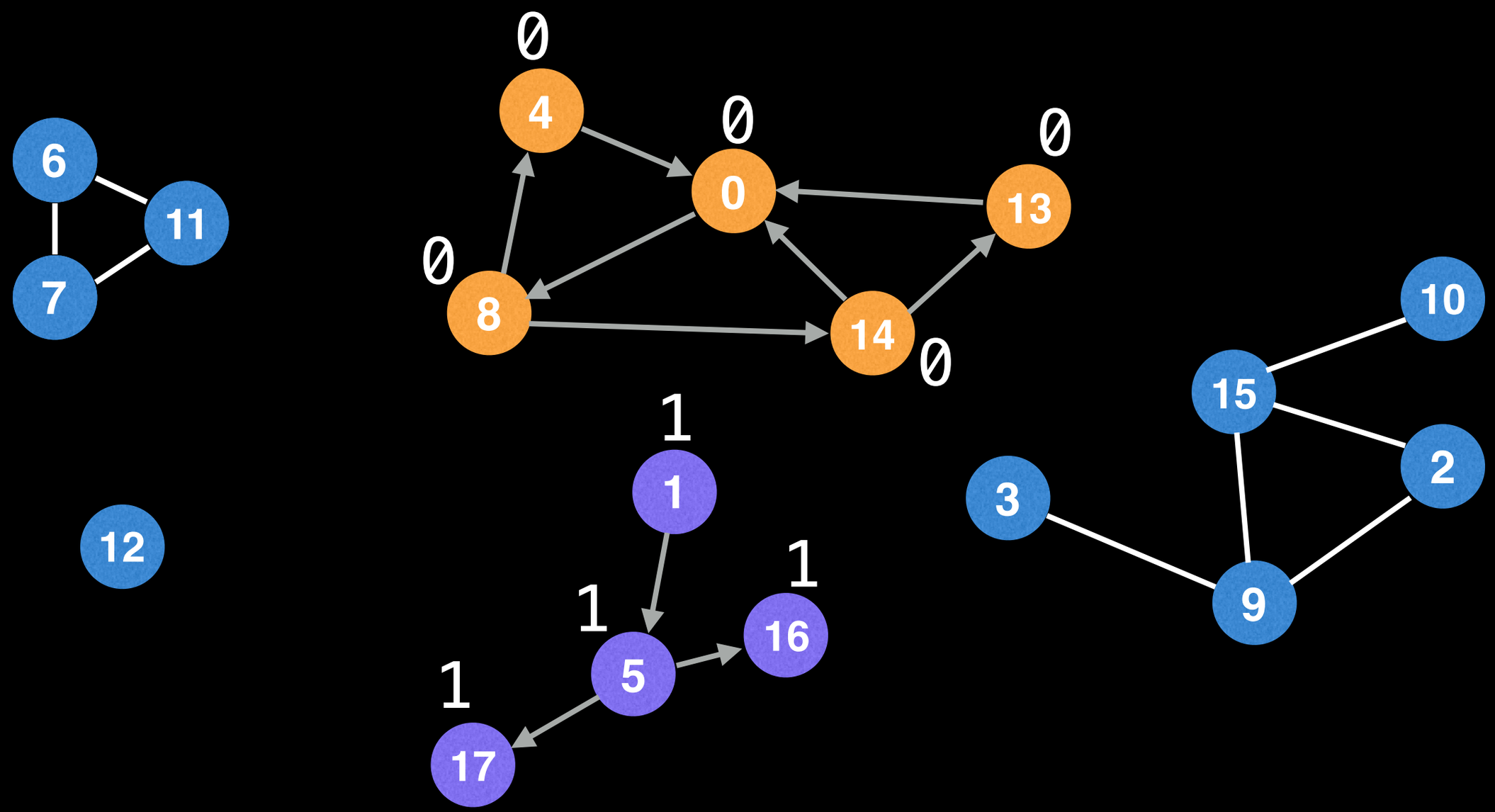
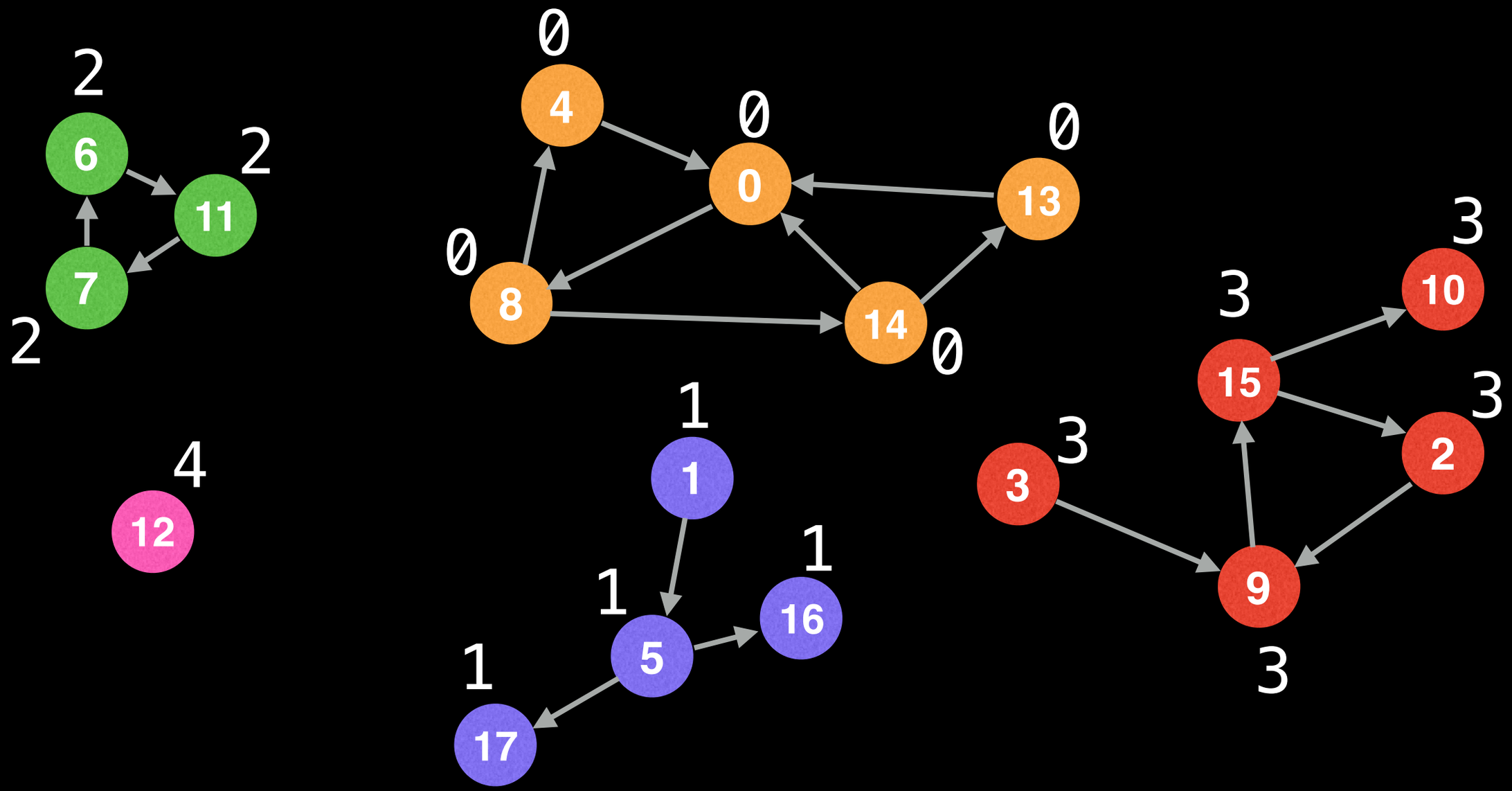


… and so on for the other components



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n = number of nodes in the graph
g = adjacency list representing graph
count = 0
components = empty integer array # size n
visited = [false, …, false] # size n

function findComponents():
  for (i = 0; i < n; i++):
    if !visited[i]:
      count++
      dfs(i)
  return (count, components)

function dfs(at):
  visited[at] = true
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What else can DFS do?

We can augment the DFS algorithm to:

- Compute a graph’s minimum spanning tree.
- Detect and find cycles in a graph.
- Check if a graph is bipartite.
- Find strongly connected components.
- Topologically sort the nodes of a graph.
- Find bridges and articulation points.
- Find augmenting paths in a flow network.
- Generate mazes.