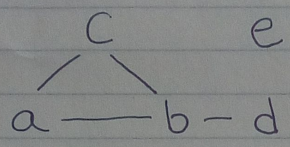
Adjacency List Vs Adj Matrix

1. **Example:**

Consider the graph below.



Adjacency Matrix:

	a	b	c	d	e
a		✓	✓		
b	✓		✓	✓	
c	✓	✓			
d		✓			
e					

- space: $\Theta(n^2)$
- who are adjacent to v: $\Theta(n)$ time
- Are v and w adjacent: $\Theta(1)$ time
- Is a 2-D array.

Adjacency List:

	Is adjacent to
a	b, c
b	a, c, d
c	a, b
d	b
e	

- We store the vertices in a 1-D array or dictionary. At entry A[i], we store the neighbours of v_i.
- If the graph is directed, we only store the out-neighbours.
- Space: $\Theta(m+n)$
- Who are adjacent to v: $\Theta(\deg(v))$ time
  I.e. Length of adjacent list
- Are v and w adjacent: $\Theta(\deg(v))$ time

2. Differences:

Although both ways can be used to represent graphs, an adjacency matrix stores the fact that there is no edge between 2 vertices, as well as the edges between 2 vertices where as an adjacency list only stores the edges between 2 vertices.