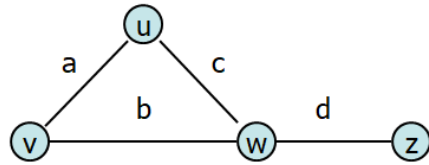


Graph Implementation #1: Edge List

Vert.	Edges
u	
v	
w	
z	



Data Structures:

Vertex Collection:

Edge Collection:

Operations on an Edge List implementation:

insertVertex(K key):

- What needs to be done?

removeVertex(Vertex v):

- What needs to be done?

incidentEdges(Vertex v):

- What needs to be done?

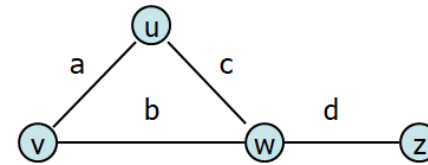
areAdjacent(Vertex v1, Vertex v2):

- Can this be faster than `G.incidentEdges(v1).contains(v2)`?

insertEdge(Vertex v1, Vertex v2, K key):

- What needs to be done?

Graph Implementation #2: Adjacency Matrix



Vert.	Edges	Adj. Matrix
u		
v		
w		
z		

Data Structures:

Operations on an Adjacency Matrix implementation:

insertVertex(K key):

- What needs to be done?

removeVertex(Vertex v):

- What needs to be done?

incidentEdges(Vertex v):

- What needs to be done?

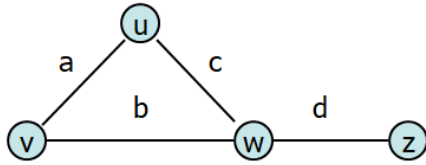
areAdjacent(Vertex v1, Vertex v2):

- Can this be faster than `G.incidentEdges(v1).contains(v2)`?

insertEdge(Vertex v1, Vertex v2, K key):

- What needs to be done?

Graph Implementation #3: Adjacency List



Vertex List	Edges
u	
v	a
w	b, c
z	d

Operations on an Adjacency Matrix implementation:

insertVertex(K key):

removeVertex(Vertex v):

incidentEdges(Vertex v):

areAdjacent(Vertex v1, Vertex v2):

insertEdge(Vertex v1, Vertex v2, K key):

Running Times of Classical Graph Implementations

	Edge List	Adj. Matrix	Adj. List
Space	n+m	n²	n+m
insertVertex	1	n	1
removeVertex	m	n	deg(v)
insertEdge	1	1	1
removeEdge	1	1	1
incidentEdges	m	n	deg(v)
areAdjacent	m	1	min(deg(v), deg(w))

Q: If we consider implementations of simple, connected graphs, what relationship between n and m?

- On connected graphs, is there one algorithm that underperforms the other two implementations?

Q: Is there clearly a single best implementation?

- Optimized for fast construction:

- Optimized for areAdjacent operations:

CS 225 – Things To Be Doing:

- 1. Programming Exam C is different than usual schedule:**
Exam: Monday, Dec 2 – Wednesday, Dec 4
- 2.** lab_dict released this week; due on Sunday, Nov. 17
- 3.** MP6 EC+7 due tonight; final due date on Monday, Nov. 18
- 4.** POTD today!